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Final Versatile Test Reactor Environmental Impact Statement

Comment Response Document

U.S. Department of Energy
Office of Nuclear Energy

Reader’s Guide

This Comment Response Document (CRD) portion of the *Versatile Test Reactor Environmental Impact Statement* (VTR EIS) consists of four sections:

- **Section 1 – Overview of the Public Comment Process**

  This section describes the public comment process for the Draft VTR EIS; the format used in the public hearings on the Draft VTR EIS; the organization of this CRD and how to use the document; and the changes made by the U.S. Department of Energy (DOE) to the Final VTR EIS in response to the public comments and recent developments that occurred since publication of the Draft VTR EIS.

- **Section 2 – Topics of Interest**

  This section presents summaries of topics identified from the public comments received on the Draft VTR EIS and DOE’s response to each issue.

- **Section 3 – Public Comments and DOE Responses**

  This section presents a side-by-side display of all of the comments received by DOE on the Draft VTR EIS and DOE’s response to each comment. The comments were obtained at two public hearings on the Draft VTR EIS and via telephone, email, and U.S. mail.

- **Section 4 – References**

  This section contains the references cited in this CRD.

To Find a Specific Comment and DOE Response

Refer to the “List of Commenters” immediately following the Table of Contents. This list is organized alphabetically by commenter name and shows the corresponding page number(s) where commenters can find their comment(s).

DOE has made a good faith effort to interpret the spelling of names that were either hand-written on comment forms and letters, or transcribed from oral statements made during public hearings.

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LIST OF COMMENTERS

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ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ARF	airborne release fraction
ANL-W	Argonne National Laboratory-West
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASER	Annual Site Environmental Report
ASQC	American Society for Quality Control
ATF	accident transient fuels
ATR	Advanced Test Reactor
ATWIR	Annual Transuranic Waste Inventory Report
BEA	Battelle Energy Alliance, LLC
BMP	best management practice
CAP 88	Clean Air Act Assessment Package-1988
CD	Critical Decision
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRD	Comment Response Document
DD&D	decontamination, decommissioning, and dismantling
DEAR	Department of Energy Acquisition Regulation
DEQ	Idaho Department of Environmental Quality
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
DOE-NE	U.S. Department of Energy Office of Nuclear Energy
DOI	U.S. Department of the Interior
DOL	U.S. Department of Labor
DOT	U.S. Department of Transportation
DSA	Documented Safety Analysis
EA	Environmental Assessment
EBR	Experimental Breeder Reactor
EEOICP	Energy Employee Occupation Illness Compensation Program
EIS	environmental impact statement
EISA	Energy Independence and Security Act
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
ESER	Environmental Surveillance, Education, and Research

ETW	Exceptional Tennessee Waters
FCF	Fuel Conditioning Facility
FFTF	Fast Flux Test Facility
FGR	Federal Guidance Report
FMF	Fuel Manufacturing Facility
GEH	GE Hitachi Nuclear Energy
GHG	greenhouse gas
GTCC	greater-than-Class C
HALEU	high-assay low-enriched uranium
HAPs	hazardous air pollutants
HEPA	high-efficiency particulate air
HFEF	Hot Fuels Examination Facility
HFIR	High Flux Isotope Reactor
HHS	Department of Health and Human Services
HLW	high-level radioactive waste
IAEA	International Atomic Energy Agency
ICRP	International Committee on Radiation Protection
INEL	Idaho National Engineering Laboratory
INL	Idaho National Laboratory
ISCORS	Interagency Steering Committee on Radiation Standards
ISMS	Integrated Safety Management System
ISO	International Organization for Standardization
LANL	Los Alamos National Laboratory
LCF	latent cancer fatality
LEED	Leadership in Energy and Environmental Design
LLW	low-level radioactive waste
LWA	Land Withdrawal Act
LWR	light-water-reactor
M&O	management and operations
MACCS2	MELCOR Accident Consequence Code System, Generation 2
MAR	material at risk
MARVEL	Microreactor Applications Research, Validation and Evaluation
MCL	maximum concentration limit
MEI	maximally exposed individual
MFC	Materials and Fuels Complex
MLLW	mixed low-level radioactive waste
MOU	memorandum of understanding
MOX	mixed oxide
MT	metric ton
MTHM	metric tons of heavy metal
MWh	megawatt hour
NASA	National Aeronautics and Space Administration

NDA	Nuclear Decommissioning Authority
NEICA	Nuclear Energy Innovation Capabilities Act
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFO	Nevada Field Office
NIOSH	National Institute for Occupational Safety and Health
NMED	New Mexico Environment Division
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NPAS	Nuclear Proliferation Assessment Statement
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRF	Naval Reactors Facility
NSUF	Nuclear Science User Facilities
NUREG	U.S. Nuclear Regulatory Commission Regulation
ODSs	ozone-depleting substances
ORNL	Oak Ridge National Laboratory
OST	DOE Office of Secure Transportation
OSTI	Office of Scientific and Technical Information
PISA	potentially inadequate safety analysis
PM	particulate matter
PMDA	Plutonium Management and Disposition Agreement
PMR	Permit Modification Request
PRISM	Power Reactor Innovative Small Module
Pub. L.	Public Law
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
RF	respirable fraction
ROD	Record of Decision
ROI	region of influence
RWMC	Radioactive Waste Management Complex
SC	safety class
SER	Safety Evaluation Report
SHRT	Shutdown Heat Removal Test
SNF	spent nuclear fuel
SRIP	Sustainability Report and Implementation Plan
SRNL	Savannah River National Laboratory
SRPA	Snake River Plain Aquifer
SRPPF	Savannah River Plutonium Processing Facility
SRS	Savannah River Site
SS	safety significant
SSCs	structures, systems, and components

SWEIS	Site-wide Environmental Impact Statement
SWPPP	Stormwater Pollution Prevention Plan
TDEC	Tennessee Department of Environment and Conservation
TED	total effective dose
TEPP	Transportation Emergency Preparedness Program
TMSP	Tennessee Multi Sector Permit
TRU	transuranic
TSR	technical safety requirement
TWRA	Tennessee Wildlife Resources Agency
U/Pu/Zr	uranium, plutonium, zirconium
UK	United Kingdom
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
USQ	Unreviewed Safety Question
VOC	volatile organic compounds
VTR	Versatile Test Reactor
WCS	Waste Control Specialists LLC
WIPP	Waste Isolation Pilot Plant
ZPRR	Zero Power Physics Reactor

CONVERSIONS

METRIC TO ENGLISH			ENGLISH TO METRIC		
Multiply	**by**	**To get**	**Multiply**	**by**	**To get**
Area					
Square meters	10.764	Square feet	Square feet	0.092903	Square meters
Square kilometers	247.1	Acres	Acres	0.0040469	Square kilometers
Square kilometers	0.3861	Square miles	Square miles	2.59	Square kilometers
Hectares	2.471	Acres	Acres	0.40469	Hectares
Concentration					
Kilograms/square meter	0.16667	Tons/acre	Tons/acre	0.5999	Kilograms/square meter
Milligrams/liter	1 [a]	Parts/million	Parts/million	1 [a]	Milligrams/liter
Micrograms/liter	1 [a]	Parts/billion	Parts/billion	1 [a]	Micrograms/liter
Micrograms/cubic meter	1 [a]	Parts/trillion	Parts/trillion	1 [a]	Micrograms/cubic meter
Density					
Grams/cubic centimeter	62.428	Pounds/cubic feet	Pounds/cubic feet	0.016018	Grams/cubic centimeter
Grams/cubic meter	0.0000624	Pounds/cubic feet	Pounds/cubic feet	16,025.6	Grams/cubic meter
Length					
Centimeters	0.3937	Inches	Inches	2.54	Centimeters
Meters	3.2808	Feet	Feet	0.3048	Meters
Kilometers	0.62137	Miles	Miles	1.6093	Kilometers
Temperature					
Absolute					
Degrees Celsius + 17.78	1.8	Degrees Fahrenheit	Degrees Fahrenheit - 32	0.55556	Degrees Celsius
Relative					
Degrees Celsius	1.8	Degrees Fahrenheit	Degrees Fahrenheit	0.55556	Degrees Celsius
Velocity/Rate					
Cubic meters/second	2118.9	Cubic feet/minute	Cubic feet/minute	0.00047195	Cubic meters/second
Grams/second	7.9366	Pounds/hour	Pounds/hour	0.126	Grams/second
Meters/second	2.237	Miles/hour	Miles/hour	0.44704	Meters/second
Volume					
Liters	0.26418	Gallons	Gallons	3.78533	Liters
Liters	0.035316	Cubic feet	Cubic feet	28.316	Liters
Liters	0.001308	Cubic yards	Cubic yards	764.54	Liters
Cubic meters	264.17	Gallons	Gallons	0.0037854	Cubic meters
Cubic meters	35.314	Cubic feet	Cubic feet	0.028317	Cubic meters
Cubic meters	1.3079	Cubic yards	Cubic yards	0.76456	Cubic meters
Cubic meters	0.0008107	Acre-feet	Acre-feet	1233.49	Cubic meters
Weight/Mass					
Grams	0.035274	Ounces	Ounces	28.35	Grams
Kilograms	2.2046	Pounds	Pounds	0.45359	Kilograms
Kilograms	0.0011023	Tons short	Tons short	907.18	Kilograms
Metric tons	1.1023	Tons short	Tons short	0.90718	Metric tons
ENGLISH TO ENGLISH					
Acre-feet	325,850.7	Gallons	Gallons	0.000003046	Acre-feet
Acres	43,560	Square feet	Square feet	0.000022957	Acres
Square miles	640	Acres	Acres	0.0015625	Square miles

[a] **This conversion is only valid for concentrations of contaminants or other materials in water.**

METRIC PREFIXES

Prefix	Symbol	Multiplication factor
exa-	E	1,000,000,000,000,000,000 = 10^{18}
peta-	P	1,000,000,000,000,000 = 10^{15}
tera-	T	1,000,000,000,000 = 10^{12}
giga-	G	1,000,000,000 = 10^{9}
mega-	M	1,000,000 = 10^{6}
kilo-	k	1,000 = 10^{3}
deca-	D	10 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	µ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}

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SECTION 1
OVERVIEW OF THE PUBLIC COMMENT PROCESS

1.0 OVERVIEW OF THE PUBLIC COMMENT PROCESS

This section of this Comment Response Document (CRD) describes the public comment process for the *Draft Versatile Test Reactor Environmental Impact Statement* (Draft VTR EIS) and the procedures used to respond to those comments. Section 1.1 describes the public comment process and the means of receiving comments on the Draft VTR EIS. It also identifies the comment period and the locations and dates of the public hearings on the Draft VTR EIS. Section 1.2 addresses the public hearing format. Section 1.3 describes the organization of this CRD, including how the comments were categorized, addressed, and documented. Section 1.4 summarizes the changes made to the environmental impact statement (EIS) that resulted from the public comment process and recent developments that occurred since publication of the Draft VTR EIS. Section 1.5 summarizes the next steps the U.S. Department of Energy (DOE) will take after publication of this *Final Versatile Test Reactor Environmental Impact Statement* (Final VTR EIS).

Comment document – A communication in the form of an electronic statement (website entry, document upload, or email), a letter, transcript, or written comment from a public hearing that contains comments from a sovereign nation, government agency, organization, or member of the public regarding the Draft VTR EIS.

Comment – A statement or question regarding draft EIS content that conveys approval or disapproval of proposed actions, recommends changes, or seeks additional information.

Response – The DOE answer to a statement or question or an explanation of a topic raised by a comment.

1.1 Public Comment Process

DOE prepared the Draft VTR EIS in accordance with the National Environmental Policy Act of 1969 (NEPA) and Council on Environmental Quality and DOE NEPA regulations (Title 40 of the *Code of Federal Regulations* (CFR) Parts 1500–1508 and 10 CFR Part 1021, respectively). An important part of the NEPA process is solicitation of public comments on a draft EIS and consideration of those comments in preparing a final EIS. DOE made copies of the Draft VTR EIS available online at https://www.energy.gov/nepa/ and https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor. Through emails, press releases, and a *Federal Register* Notice of Availability (85 FR 83068), on December 21, 2020, DOE notified Federal agencies, State and local governmental entities, Native American tribes, and members of the public known to be interested in or affected by implementation of the alternatives evaluated in the VTR EIS that the draft was available for review. On December 31, 2020, the U.S. Environmental Protection Agency (EPA) published a *Federal Register* Notice of Availability (85 FR 86919) announcing the start of a comment period with a scheduled end date of February 16, 2021. DOE decided to extend the comment period based upon several requests for extensions. On February 12, 2021, EPA published an amended *Federal Register* notice announcing DOE's extension of the public comment period to March 2, 2021 (86 FR 9335).

During the public comment period, Federal agencies, State and local governmental entities, Native American tribes, and members of the public were invited to submit comments via a toll-free phone number, the U.S. mail, or via email at VTR.EIS@nuclear.energy.gov. Additionally, DOE held two webcast public hearings – on January 27 and January 28, 2021. The webcasts provided participants with opportunities to learn more about the VTR and the content of the Draft EIS from DOE representatives that presented an overview of the project and the results of the Draft EIS analyses. The two webcast public hearings also provided opportunities for participants to submit oral comments. The webcast presentations and other information on the VTR are available on the Versatile Test Reactor website at https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor. **Table 1–1** lists the date of each webcast hearing as well as the numbers of attendees and commenters. **Table 1–2** lists the number of comment documents received by each method of submission.

Table 1–1. Webcast Hearings Attendance and Numbers of Commenters

Date	*Attendance*	*Number of Oral Commenters*
January 27, 2021	71	4
January 28, 2021	36	7
Total	107	11

Table 1–2. Numbers of Comment Documents Received by Method of Submission

Method of Submission	*Number of Comment Documents*
Toll-Free Phone	0
U.S. mail [a]	1
Email	73
Campaigns [b]	8
Public hearings (oral)	11
Total	93

[a] DOE received multiple comments via U.S. mail, but most mailed comments were duplicates of materials sent via email. One comment received via U.S. mail was not a duplicate.
[b] DOE received campaign comments by email.

Upon receipt, all written comment documents were assigned a document number for tracking during the comment response process. Each commenter's name in the transcripts from the public hearings also was assigned a document number. All comment documents were then processed for inclusion in this CRD. In processing the comment documents, each document was analyzed to identify individual comments (which were numbered sequentially) and DOE prepared responses to each numbered comment. In preparing this Final VTR EIS, DOE responded to all comments received, including the few received after the end of the comment period, March 2, 2021. Comments that DOE determined to be outside the scope of the VTR EIS are acknowledged as such in this CRD. The remaining comments were then reviewed and responded to by policy experts, subject matter experts, and NEPA specialists, as appropriate. This CRD presents the comment documents, including the campaigns,[1] as well as the public hearing transcripts and DOE's responses to the comments. **Figure 1–1** illustrates the process used for collecting, tracking, and responding to the comments.

The comments and DOE responses were compiled in a side-by-side format, with each identified comment receiving a separate response. All comments and responses are numbered with a comment identification number to facilitate matching a comment with its response.

During preparation of this Final VTR EIS, all comments received on the Draft EIS were considered and responses were prepared. This effort served to focus the revision process and ensure consistency throughout the final document. The comments assisted in determining whether the alternatives and analyses presented in the Draft EIS should be modified or augmented, whether information presented in the Draft EIS needed to be corrected or updated, and whether additional clarification was necessary to facilitate better understanding of certain issues. Change bars in the margins of pages in Volumes 1 and 2 of this Final VTR EIS indicate where substantive changes were made and where text was added or deleted. Editorial changes are not marked.

[1] A comment document was considered to be part of a campaign if a number of comment documents were received with the same text appearing in the body of the comment.

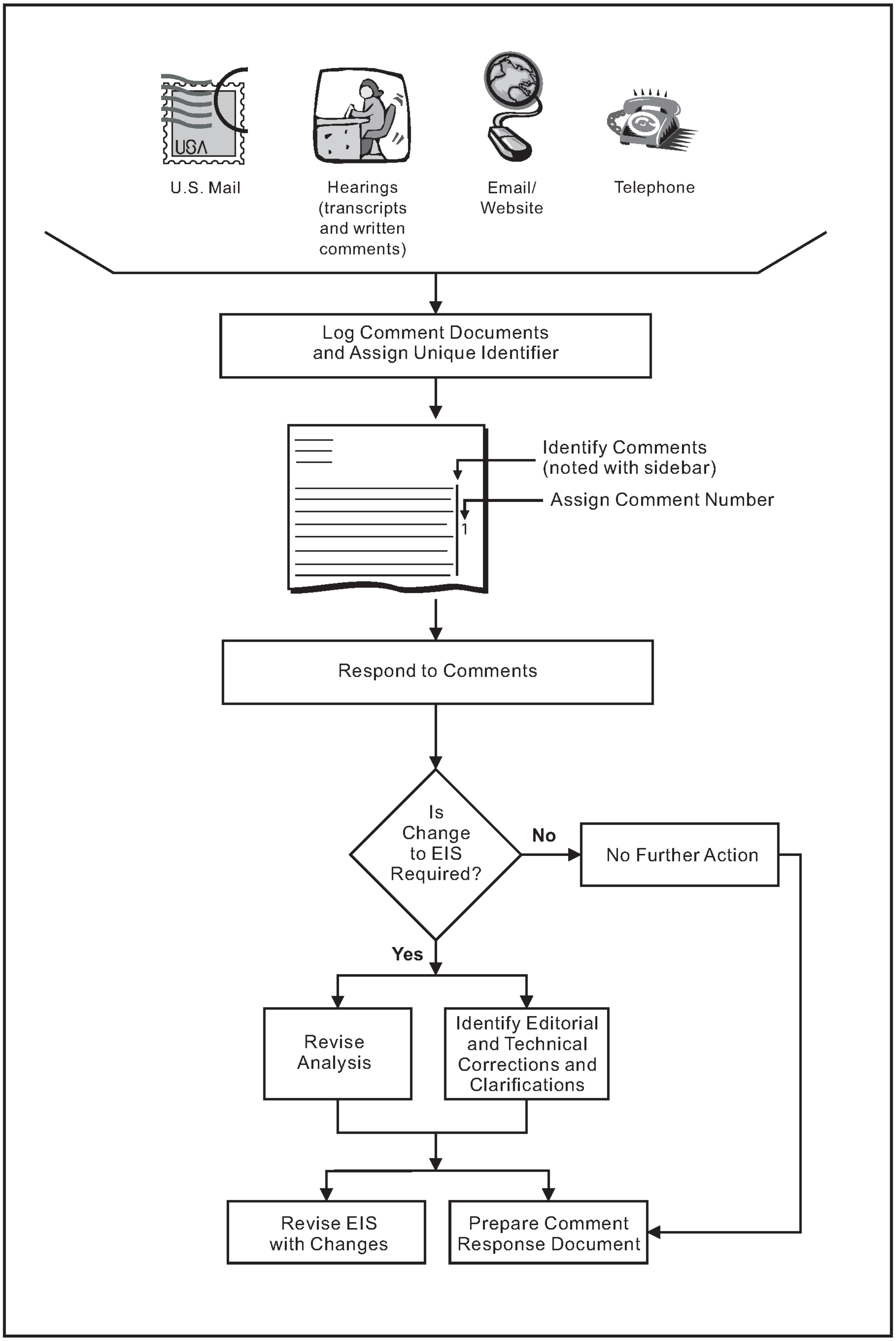


Figure 1–1. Comment Response Process for the Final Versatile Test Reactor Environmental Impact Statement

1.2 Public Hearing Format

The two public hearings were designed to offer information about the NEPA process, DOE's proposed action, and the results of analysis of alternatives presented in the Draft VTR EIS. At the hearings, DOE also invited public comments on the document. A court reporter recorded and prepared a transcript of the comments that were presented at the hearing. These transcripts are included in Section 3 of this CRD.

The DOE VTR Program Director for the Office of Nuclear Energy opened the two hearings with welcoming remarks and information about the VTR project. The DOE NEPA Document Manager then gave an overview of the Draft VTR EIS and the NEPA process. After the overview presentations, a meeting moderator opened the comment session. A time limit was established to ensure that everyone who wished to speak would have an opportunity to provide oral comments. Everyone who was asked to conclude their remarks to comply with the time limitation was encouraged to submit additional comments in writing. Additionally, the commenters were given the opportunity to provide a second comment during the webcast hearings. As part of the comment response process, the transcripts collected at the hearings were reviewed for comments on the Draft VTR EIS, as described in Section 1.1 of this CRD.

1.3 Organization of this Comment Response Document

This CRD is organized into the following sections:

- Section 1 describes the public comment process for the Draft EIS, the format used in the hearings on the Draft EIS, the organization of this document and how to use this CRD, and the changes made by DOE to the Draft VTR EIS in preparing the Final VTR EIS in response to the public comments.
- Section 2 presents topics of interest from the public comments received on the Draft EIS that appeared frequently in the comments as well as DOE's response to each topic of interest.
- Section 3 presents comment documents, received via email and U.S. mail, and the transcripts of the oral comments, received during the hearings. The comment documents and DOE's responses to the comments delineated within each comment document are presented side by side.
- Section 4 lists the references cited in this CRD. The references are available via https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor.

1.4 Changes from the *Draft Versatile Test Reactor Environmental Impact Statement*

In preparing this Final VTR EIS, DOE revised the Draft VTR EIS in response to comments received from other Federal agencies and State and local government entities; Native American tribes; and the public. In addition, DOE updated information due to events or the availability of information in other documents that were not completed in time to be incorporated into the Draft EIS that was published for public comment in December 2020. DOE also revised the EIS to provide more-recent environmental baseline information, updated project data, and revised consequence analyses, as well as to correct inaccuracies, make editorial corrections, and clarify text. Vertical change bars appear alongside such changes in Volumes 1 and 2 of this Final EIS. Editorial changes are not marked. The following descriptions summarize the major changes made to the Final VTR EIS.

Public Comment Period and Comments Received on the Draft VTR EIS

Sections 1.7.2 and S.4.2 were added to this Final EIS in Chapter 1 and the Summary, respectively, to describe the public comment period for the Draft EIS and the types of comment received.

Changes Made for the Final VTR EIS

Section 1.8 was added to Chapter 1 to list the substantive changes made to the Draft EIS in preparing this Final EIS.

Additional Studies and Reports

Sections of this Final VTR EIS were updated based on new reports and studies that became available after publication of the Draft VTR EIS. Chapter 3 of the Final EIS was updated with data available in more recent versions of annual DOE reports (e.g., the *Annual Site Environmental Reports* for Idaho National Laboratory, Oak Ridge National Laboratory, and Savannah River Site). Minor revisions were made to selected resource areas to reflect the most recent reports.

Dark Sky Resource

Sections of this Final VTR EIS were revised to include additional information regarding potential impacts on the dark sky resource at Craters of the Moon National Monument and Preserve. The changes included acknowledging cumulative impacts of light pollution and that lighting design for the VTR project could avoid potential impacts.

Cultural Resources

The Final EIS was updated to include additional information in the affected environment section of cultural resources to reflect information requested by the Shoshone and Bannock Tribes.

Spent Nuclear Fuel Management

Sections of this Final VTR EIS were revised to explicitly indicate that there is currently not a geologic repository for disposal of spent nuclear fuel and that the fuel would be safely stored on site pending the availability of an offsite storage or disposal location.

Cumulative Impacts Analysis

The cumulative impacts analysis in Chapter 5 of this Final VTR EIS was revised to address additional reasonably foreseeable actions, including the following proposed projects:

- Microreactor Applications Research, Validation and Evaluation (MARVEL) Project (DOE/EA-2146)
- Oak Ridge Enhanced Technology and Training Center (DOE/EA-2144)
- Lithium Processing Facility at the Y-12 National Security Complex (DOE/EA-2145)
- Kairos Power Test Reactor at East Tennessee Technology Park
- Surplus Plutonium Disposition Program (DOE/EIS-0549)
- Commercial Disposal of SRS Contaminated Process Equipment (DOE/EA-2115).

Additional Laws, Regulations, Permits, and Agreements

Chapter 7 of this Final VTR EIS was revised to address additional laws, regulations, permits, and agreements that have been enacted or changed since the Draft EIS was published. For example, Chapter 7 was updated to reflect changes to regulations due to the new Presidential administration in January 2021. Chapter 7 was also updated to reflect ongoing interactions with outside agencies regarding cultural and biological resources.

1.5 Next Steps

DOE will use the analysis presented in this Final VTR EIS, as well as other information, in preparing one or more Records of Decision (RODs) for the VTR project. DOE will issue a ROD no sooner than 30 days after the EPA publication of the Notice of Availability of this Final VTR EIS in the *Federal Register*. If DOE has not identified its preferred alternative (or option in the case of reactor fuel production) in this EIS, DOE will issue a ROD for that alternative (or option) no sooner than 30 days after announcing its preferred alternative (or option) in the *Federal Register*. The ROD(s) will describe the alternative(s) and/or options selected for implementation and explain how environmental impacts will be avoided, minimized, or mitigated, as appropriate.

SECTION 2
TOPICS OF INTEREST

2.0 TOPICS OF INTEREST

Upon review of the comments received on the *Draft Versatile Test Reactor Environmental Impact Statement* (Draft VTR EIS), the U.S. Department of Energy (DOE) identified several topics of interest to be addressed in this section of the Comment Response Document (CRD). These include topics of broad interest or concern as indicated by their recurrence in comments or technical topics that warrant a more detailed discussion than might be afforded in responding to an individual comment. This section summarizes the comments received on a topic of interest, followed by DOE's response:

- Support and Opposition
- Purpose and Need
- Nonproliferation
- Plutonium Use and Disposition
- Radioactive Wastes and Spent Nuclear Fuel Management and Disposal
- Snake River Plain Aquifer
- Versatile Test Reactor (VTR) Facility Accidents
- Intentional Destructive Acts
- Transportation
- Ongoing Idaho National Laboratory (INL) Site Cleanup
- High-Efficiency Particulate Air Filter Performance

2.1 Support and Opposition

Comments Summary

Many commenters included a statement of support or opposition to the VTR, often including reasons and concerns to support their position. In general, commenters expressed

- Support for the VTR project in general;
- Support for locating the VTR at the INL Site;
- Opposition to locating the VTR at the INL Site;
- Opposition to locating the VTR at Oak Ridge National Laboratory (ORNL); or
- Opposition to the VTR project in general or support for the No Action Alternative.

Many of those in favor of the VTR cited the ability of the VTR to meet the need for a fast-neutron test facility and/or net positive environmental impacts. These commenters expressed the opinion that the VTR would enable "green energy" technologies[1] with environmental impacts that are less severe and more easily addressed than those associated with the burning of fossil fuels. When identifying the INL Site as their preferred location for the VTR and fuel production capabilities, commenters pointed to INL's

[1] Green power or green energy is a subset of renewable energy and represents those renewable energy resources and technologies that provide the highest environmental benefit by reducing the emissions associated with traditional electricity sources. Sources of renewable energy include wind power solar power, geothermal technologies, landfill gas, biomass power, and low-impact small hydropower. Although fast reactors do not fit within the EPA definition of "green energy," they would be a source of low-carbon-emitting energy.

history of nuclear testing and development, the existing nuclear expertise at the site, and the available site infrastructure.

Those in opposition to the VTR expressed concerns regarding several aspects of the proposed action.

Two issues identified by the commenters addressed the need for and selection of a fast-neutron test reactor. Some questioned whether there was a purpose and need for a fast-neutron test reactor, expressing the opinion that DOE failed to identify a need by any organizations other than DOE. Others expressed the desire for DOE to reconsider the selection of a new reactor to meet the purpose and need. These commenters suggested DOE reconsider the use of existing thermal-neutron-spectrum test reactors or the Fast Flux Test Facility (FFTF). Other issues raised by commenters addressed aspects of the VTR alternative. The issues included:

- Environmental impacts – commenters expressed general concern about the environmental impacts of VTR operations;
- Proliferation – commenters expressed concerns that the use of plutonium could impact the U.S. nonproliferation efforts;
- Accident risk and safety – commenters expressed concerns about the safety of a facility that uses plutonium as a fuel;
- Cost – in addition to concerns about the total cost of the VTR, some commenters expressed the desire to see the money spent on renewable energy research;
- Potential impacts on the Snake River Plain Aquifer – commenters identified the aquifer as a vital part of the Idaho environment and expressed concerns on the impact on it from VTR operation; and
- Spent nuclear fuel (SNF) and waste management – commenters expressed concerns about the amount of radioactive waste and SNF that would be generated. Concerns were also expressed about the impacts of plutonium fuel use and temporary storage at INL and the Savannah River Site (SRS).

DOE Response

DOE appreciates and acknowledges the commenters' preferences regarding the VTR project and the alternatives for locating the VTR and the reactor driver fuel production capabilities. There were a variety of preferences expressed, some generally in favor of the VTR project, some opposed to the project, and some stating preferences for where project facilities should or should not be located. DOE (or any Federal agency) considers every comment equally in the environmental impact statement (EIS) process regardless of the number of comments received for or against a project. DOE reiterates the Council on Environmental Quality (CEQ) statement that "Commenting is not a form of 'voting' on an alternative" (CEQ 2007). The number of comments received for or against a particular alternative does not dictate the action that a Federal agency must take.

In accordance with the National Environmental Policy Act (NEPA) and CEQ and DOE NEPA implementing regulations, this EIS evaluates a No Action Alternative and reasonable action alternatives for implementing the VTR project. DOE evaluates two alternatives for siting the VTR, the INL VTR Alternative and the ORNL VTR Alternative. DOE also evaluates two options for the location of each phase of VTR reactor fuel production (feedstock preparation and fuel fabrication), the INL Site and SRS. (Under the VTR No Action Alternative, neither fuel production option would be selected.) The purpose of evaluating a set of reasonable alternatives under NEPA is to provide comparative and objective information for consideration by the public and the decision-maker about the potential environmental impacts of alternative approaches to accomplishing the Federal government's proposed action. In developing these alternatives, DOE considered comments received during scoping and an analysis performed by DOE that investigated multiple alternatives for meeting the VTR mission purpose and need (as summarized in Chapter 1, Section 1.3 of this VTR EIS; and discussed further in Section 2.2, "Purpose and Need," of this CRD). Evaluating a range of reasonable alternatives provides information to the public and decision-makers about the relative environmental impacts of the alternatives. Chapter 2 of this EIS includes a description of the alternatives and options evaluated and a summary of the associated potential environmental impacts.

DOE considered all of the comments received on the Draft VTR EIS in the development of this Final EIS. In stating their preference for or against the VTR alternatives, many commenters identified issues in support of their preference. Five of the issues identified by commenters in opposition to the VTR were raised by multiple commenters or involved complex technical issues. These issues are individually addressed in separate topics in this section of the CRD: Purpose and Need; Nonproliferation; Radioactive Waste and Spent Nuclear Fuel Management and Disposal; the Snake River Plain Aquifer; and VTR Facility Accidents. Readers are referred to those topics for detailed discussions of the issues. Other issues raised by the commenters are discussed here.

Chapter 2, Section 2.7 discusses the alternatives considered and dismissed from detailed analysis. These alternatives include the options to modify existing thermal-neutron-spectrum test reactors and to restart FFTF. The supporting information for the dismissal of these two alternatives is contained primarily in two references: The first, the *Analysis of Alternatives, Versatile Test Reactor* (DOE 2019) addressed the modification of the High Flux Isotope Reactor (HFIR) and the Advanced Test Reactor (ATR) and the restart of the FFTF. For the reasons summarized in this VTR EIS, Section 2.7.1, modification of the two thermal-neutron-spectrum test reactors (e.g., HFIR and ATR) was not considered for further detailed study. As stated in this VTR EIS, modification of these reactors to support fast-neutron testing capabilities would impact the ability of these reactors to perform their intended function (testing of materials in thermal neutron environments) and would not be able to supply the full range of fast-neutron testing identified in the purpose and need for a fast-neutron test reactor. The Analysis of Alternatives did rate restarting the FFTF as slightly lower than the construction of a new test facility. DOE decided that due to its evaluation score a reexamination of the feasibility of restarting the FFTF was warranted. This re-examination included a facility walk-down of FFTF conducted in October 2019 by a team composed of the VTR Program Director, DOE Richland Assistant Manager, VTR Project Manager, and industry experts. Based on the facility walk-down, extensive pre- and post-tour discussions and a review of a study by the Columbia Basin Consulting Group (CBCG 2007), the team had significant concerns about the viability of restarting FFTF. Because of these concerns, summarized in VTR EIS Chapter 2, Section 2.7.1, FFTF was dismissed from further analysis.

In statements expressing opposition to the VTR project, commenters made general reference to environmental concerns. Chapter 4 of the Final VTR EIS addresses the environmental impacts associated with the VTR alternatives and reactor fuel production options. In addition to the general concerns expressed, these commenters often provided additional more specific concerns, e.g., identifying a specific resource concern. For these specific environmental concerns, the commenter is referred to the individual comment response provided in this CRD.

While cost will be a major consideration in DOE's decision on whether to pursue construction and operation of the VTR, cost is not one of the resource areas addressed in an EIS. DOE shares many commenters' concern that the cost for the VTR project could increase. However, the current estimate does represent DOE's best estimate using DOE cost estimate guidelines, which include an uncertainty band. If the project continues, DOE will monitor project costs and estimates are required to be reevaluated at each stage of the project. Several commenters indicated a preference for spending the money on other programs, particularly on renewable energy. This is a decision that the VTR project does not make. The U.S. Congress and the Administration develop national budget priorities among the various Federal agencies and programs based on many considerations related to national interests and security.

The final budget reflects compromises and tradeoffs made when all factors and programs are considered from the broadest perspective.

In Chapter 2, Section 2.8, of the Final VTR EIS, DOE addresses its preferences regarding the VTR alternative and the options for the VTR fuel production. The preferred alternative and options reflect DOE's position at the time the Final EIS is issued; however, it does not reflect the final decision by DOE. DOE will announce its decision regarding the VTR and the VTR fuel production in one or more Record(s) of Decision (RODs) issued no sooner than 30 days after publication in the *Federal Register* of the U.S. Environmental Protection Agency (EPA) Notice of Availability for this Final VTR EIS. The potential environmental impacts presented in this EIS, along with public input, cost, policy, and other factors, will be considered by the DOE decision-makers in selecting a VTR alternative or No Action Alternative and the VTR reactor fuel production options. The ROD(s) will present DOE's decisions regarding the VTR project; describe the alternative and options selected for implementation; explain how environmental impacts will be mitigated, if necessary; and describe the factors considered in making those decisions.

2.2 Purpose and Need

Comments Summary

Some commenters made statements supportive of the purpose and need for the VTR project. Other commenters questioned the need for the VTR and asserted that the purpose and need were self-created by DOE. Those supporting the need for the VTR cited a number of reasons, including implementing the congressional mandate contained in the Nuclear Energy Innovation Capabilities Act (NEICA) (Pub. L. [Public Law] 115–248), maintaining U.S. leadership in deployment of nuclear energy, and supporting materials testing in support of the U.S. Navy. These commenters noted that research and development conducted at the VTR would have the benefits of making the power grid more resilient, allowing development of new fuels and reactor technologies to sustain nuclear energy as part of a green and sustainable energy future, and providing reliable baseload power sources that could be used for multiple purposes.

Some commenters questioned the need for the VTR based on their belief that nuclear energy is "old school" and expensive. They further indicated that just because the technology and resources exist to create electricity from nuclear energy does not mean it should be pursued and that DOE should quit trying to revitalize the nuclear industry. Commenters also expressed that there are safer and cheaper means of energy production and that pursuing nuclear energy is a misguided approach to addressing the climate crisis. Many of these commenters indicated that public funds should not be used to develop new forms of nuclear energy and that funds should be used for research, development, and widespread implementation of renewable energy sources and making renewable energy more reliable.

One commenter asserted that DOE funded a variety of startups and nuclear companies to design fast-neutron reactors in order to justify the construction of the VTR and said there is an absence of substance in this Draft VTR EIS, Chapter 1, Section 1.3, "Purpose and Need for Agency Action." The commenter further states that support cited in the Nuclear Energy Advisory Committee report, Assessment of Missions and Requirements for a New U.S. Test Reactor, was only from recipients of Office of Nuclear Energy funding for design studies and experiments relating to fast-neutron reactors and from the proposed contractors for the construction of the VTR. The commenter noted paucity of private funding for developing fast-neutron reactors, stating that there have been 50 years of failed efforts worldwide to commercialize sodium-cooled fast-neutron power reactors in competition with the light-water reactors that dominate the current global power-reactor fleet. This commenter suggested that DOE should abandon the VTR and instead, the Office of Nuclear Energy should focus on more-constructive efforts to assure the safe and economical operation of the existing fleet of U.S. nuclear-power reactors and on reducing the costs of new power reactors operating on a "once-through" fuel cycle not involving plutonium separation from the spent fuel.

One commenter noted that the need for the VTR is ill defined and rests primarily on DOE assertions, stating that DOE claims to need a fast-neutron reactor for experimentation, but the need is merely asserted, not demonstrated. The commenter further states that DOE suggests the only way to satisfy the unproven need is to construct and operate this particular reactor. This commenter continues that if DOE ever establishes a need, an alternative would be to modify existing facilities – not build new ones.

One commenter asserted that "new nuclear research" had to do with the aging of the United States nuclear arsenal and the development of new weaponry.

DOE Response

Consistent with congressional direction and as indicated in this VTR EIS, Chapter 1, Section 1.3, the purpose of DOE's action is to establish a versatile, reactor-based, fast-neutron source to meet the need for testing capabilities for next-generation nuclear reactors. As noted by commenters supporting the need for such a VTR, multiple potential benefits may derive from having such a testing capability. The VTR would establish a long-absent, domestic fast-neutron testing capability that would allow research and development that would contribute to advances in nuclear technology such as better understanding of materials performance and materials degradation, verification and validation of computer simulations, and testing and demonstration of new sensors and instruments. Those advances could contribute to nuclear energy that produces electricity without creating substantial amounts of greenhouse gases, increases the reliability of baseload electrical generation, and improves power grid resilience. The versatility of the proposed VTR would allow the testing of a broad range of nuclear fuels, materials, sensors, and instrumentation for use in advanced reactors. The test environment would also be used for testing materials in support of the existing fleet of light-water reactors and various other users (e.g., the U.S. Navy).

DOE acknowledges that funds and research is needed for other renewable energy sources such as solar and wind as evidenced by the February 2021 announcement of funding for transformative clean energy technology research and development (DOE 2021a). Whereas some commenters believe that nuclear is old technology and should not be pursued, DOE is executing congressional direction to "carry out programs of civilian nuclear research, development, demonstration, and commercial application" and provide "research infrastructure to promote scientific progress" (Pub. L. 115–248). Advances and improvements are possible in nuclear technology and it should be part of the overall mix of energy sources in the United States. The VTR would provide the capability to conduct research and development necessary to make those advances. DOE notes that the Office of Nuclear Energy is proposing the VTR as a research facility for nuclear energy development. It should be emphasized that the proposed reactor would not be operated for development of nuclear weapons.

One of the criticisms of the DOE effort and the preparation of this VTR EIS was that DOE had created the purpose and need by providing funding to companies with an interest in advanced reactors. DOE has provided funding for advanced reactor development, but notes that there has been significant investment, more than $1.3 billion, in private capital in the development of advanced reactors (Third Way 2018). As discussed in Chapter 1, Section 1.2, DOE's mission includes advancing the energy, environmental, and nuclear security of the United States and promoting scientific and technological innovation in support of that mission. That section further notes, that in support of DOE's mission, the Office of Nuclear Energy has established research objectives intended to provide research, development, and demonstration activities that enable development of an advanced reactor pipeline. It is entirely in keeping with DOE's mission and the Office of Nuclear Energy's responsibilities to promote the development of advanced reactor technology. Just because companies pursuing advanced reactor technologies have received DOE funding does not mean that the needed testing capabilities they have identified are not valid. Subsequent to issuance of the Draft VTR EIS, the American Nuclear Society issued a report, The *U.S Nuclear R&D Imperative* (ANS 2021) that further supports the need for a fast-neutron testing capability. It should also be noted, as indicated in Chapter 1, accelerated testing capabilities would also benefit the current generation of light-water reactors in the areas of improved performance, understanding material properties, qualifying improved materials and fuels, evaluating reliability, and ensuring safety.

DOE asserts that a need for a VTR has been demonstrated. As discussed in Chapter 1, in accordance with the Nuclear Energy Innovation Capabilities Act (Pub. L. 115–248), DOE assessed and determined that there is a mission need for a versatile reactor-based fast-neutron source. As discussed in that chapter, the United States currently lacks a facility able to produce a prototypic, fast-neutron-spectrum irradiation environment with a high neutron flux. As has been documented in *Assessment of Missions and Requirements for a New U.S. Test Reactor* (NEAC 2017), Advanced Demonstration and Test Reactor Options Study (INL 2017), and the above-mentioned ANS report, such a capability is needed to support development of advanced reactor technologies. Effective testing and development of advanced reactor technologies requires the use of fast neutrons comparable to those that would occur in actual advanced reactors. The high flux of fast neutrons allows accelerated testing that would contribute to the development of materials and fuels for advanced reactors and generate data allowing advanced reactor developers, researchers, DOE, and regulatory agencies to improve performance, understand material properties, qualify improved materials and fuels, evaluate reliability, and ensure safety.

With regard to the suggestion that an alternative to the VTR would be to modify existing facilities – not build new ones – as discussed in this VTR EIS Chapter 2, Section 2.7, DOE did consider existing test reactors, both operating and deactivated. The operating test reactors do not meet the performance criteria identified for the VTR and have existing missions and commitments that would be disrupted if they were modified to meet the VTR mission need. The deactivated FFTF at the Hanford Site was considered but ultimately dismissed from further analysis because of the level of effort necessary to upgrade the facility to meet current performance and safety standards and the associated large degree of schedule and cost uncertainty (see additional discussion under 2.1, Support and Opposition).

2.3 Nonproliferation[2]

Comments Summary

A number of commenters expressed concerns about the relationship of the VTR to the proliferation of nuclear materials. Commenters noted that the VTR driver fuel would use plutonium, as well as uranium enriched in the isotope uranium-235 to levels higher than currently used in commercial nuclear reactors. They state that plutonium is a key component of nuclear bombs, and as such, contributes to or promotes the proliferation of nuclear materials and weapons.

Other commenters stated that the VTR EIS ignores the issue of proliferation. They asserted that use of plutonium sets a dangerous precedent for the nuclear industry in the future. One commenter implied that the United States was promoting plutonium as fuel and therefore, the concept of a "plutonium economy." Additionally, they noted that the United States has discouraged other countries from performing research and development with fast-neutron reactors and their associated plutonium separation, storage, transport, and fabrication.

A commenter also expressed the opinion that the VTR project would have the impact of weakening domestic and international standards for securing nuclear materials. The commenter referred to the possible import of plutonium from foreign sources, transport within the United States, and a weakening

[2] Nuclear proliferation is the spread of nuclear weapons, nuclear weapons technology, or fissile material to countries that do not already possess them. Therefore, in this context, nonproliferation is limiting or preventing nuclear proliferation.

of security restrictions for materials at commercial or envisioned Department of Defense nuclear power plants. The commenter asserted that if fast reactors or other reactor designs become more prevalent, the costs, for shipping containers, transport escorts, and plant security, would provoke cost-cutting measures.

DOE Response

If DOE moves forward with construction and operation of the VTR, DOE will prepare a Nuclear Proliferation Assessment Statement (NPAS) to identify and mitigate any proliferation concerns for the management and use of plutonium in VTR fuel. The NPAS is the appropriate vehicle to address and discuss the more in-depth discussions related to important nonproliferation issues. Preparation of an NPAS is outside the scope of this VTR EIS. It would be speculative and outside the scope of this VTR EIS to address the potential proliferation (and other) impacts of future nuclear reactor designs that may use elements of the VTR design or results of VTR testing in their development.

As discussed in Chapter 2, Section 2.6, the proposed VTR driver fuel, which is the fuel that powers the VTR, would be composed of a uranium, plutonium and zirconium (U/Pu/Zr) metal alloy. This metal fuel composition is designed to maximize neutron production over the desired test volume while minimizing the size of the reactor. DOE previously used uranium-plutonium fuels in the Experimental Breeder Reactor (EBR)-II and FFTF, as noted in the *Versatile Test Reactor Driver Fuel Selection* (INL 2020a). Initially, the U/Pu/Zr fuel would be 70 percent uranium (enriched to 5 percent uranium-235), 20 percent plutonium, and 10 percent zirconium. VTR driver fuel used in later operations could consist of these elements in different ratios and could use plutonium with uranium of varying enrichments, including depleted uranium or uranium enriched above 5 percent—a concentration higher than typical in a commercial nuclear reactor, but lower than 20 percent—the lower threshold for defining highly enriched uranium.

The VTR would be a one-of-a-kind test reactor to be located at a DOE site and is not intended or designed for export. The VTR would only use plutonium from existing stockpiles, about 0.5 metric tons per year, and would not involve reprocessing, neither to create new supplies of plutonium nor to recover plutonium from spent VTR fuel. VTR would be designed and operated as a plutonium burner, effectively reducing existing stockpiles of plutonium. VTR would also be designed and operated so that the resulting spent fuel discharged from the reactor will contain fission products and an undesirable mix of plutonium isotopes.

As commenters noted, there was a focus in the past on the concept of a closed fuel cycle in which reactors created plutonium that would be recovered and used as fuel in a reactor. However, it is not correct or appropriate to ascribe those past proposals to the action proposed in this EIS. The VTR is not a breeder reactor and would not be used to produce plutonium. The VTR fissile material conversion ratio, which is the amount of uranium-235, plutonium-239, and plutonium-241 produced divided by the amount burned, is 0.48. Even when considering only plutonium-239, the conversion ratio is 0.58. This means the VTR would use more fissile material than it would create. Furthermore, VTR spent fuel would not be reprocessed to recover plutonium or uranium and therefore, VTR's use of existing plutonium would not be an implementation of a "plutonium economy" as implied by the commenter. DOE's purpose in establishing the VTR is to provide a testing capability to allow large-scale and accelerated testing of advanced nuclear fuels, materials, instrumentation, and sensors so the United States can modernize its nuclear energy infrastructure and develop transformational nuclear energy technologies that re-establish the United States as a world leader in nuclear technology commercialization. As indicated above, no recycling of the VTR spent fuel would be performed (that is, no plutonium or uranium would be recovered from the spent fuel as would be done in a plutonium economy).

Security and safeguards would be employed at all facilities used by the VTR project to handle nuclear materials in quantities that require safeguards protections in accordance with DOE Order 470.4B, "Safeguards and Security Program." Among other items, this would include physical protection of material (as discussed in this VTR EIS Chapter 2, fuel fabrication activities, the VTR, and certain SNF management activities would be performed within a Perimeter Intrusion Detection and Assessment System), access controls, guards, nuclear material accountability, and personnel training. The safeguards and security program would protect assets and activities against the consequences of attempted theft, diversion, terrorist attack, sabotage, unauthorized access, and other acts that may have adverse impacts on national security or the environment or that may pose significant danger to the health and safety of workers or the public. Transportation of special nuclear materials (plutonium) and unirradiated fuel within the United States would be by DOE/NNSA Secure Transportation Assets. Features of secure transportation activities are discussed in this VTR EIS Appendix E, "Evaluation of Human Health Impacts from Transportation." If there were international shipments of plutonium, as discussed in Appendix F, they would be conducted in accordance with a security plan and threat assessment developed for each shipment. Shipments would comply with international requirements for safeguards and security.

2.4 Plutonium Use and Disposition

Comments Summary

Commenters expressed concern about 34 metric tons of plutonium being transferred to INL or SRS for VTR fuel production and the possibility that it could become stranded in Idaho or South Carolina if the project were halted. A commenter suggested that DOE should guarantee that no additional plutonium will be stranded in the State of South Carolina. Another commenter was concerned that importing additional plutonium from abroad could increase the amount of surplus plutonium requiring storage and ultimately, disposal in the United States, should the VTR project be terminated.

DOE Response

DOE would only ship plutonium feed materials to the VTR fuel production facilities on an as-needed basis. Therefore, situations where a substantial amount of plutonium feedstock for VTR driver fuel would be stranded at a site are unlikely. VTR fuel production would require about 0.5 metric tons per year of plutonium feedstock. Because the plutonium shipments would occur annually (or bi-annually if plutonium were procured from overseas), if the VTR project were cancelled unexpectedly, the amount of plutonium in storage could be between 0.5 and 1 metric tons. DOE would then need to determine a disposition pathway. This could include returning the plutonium to where it originated, repurposing for another use, or disposal. Management of plutonium at INL and SRS would be in compliance with applicable laws, regulations, and agreements.

If SRS were selected for VTR fuel production, plutonium feedstock would be taken from stored material at SRS or shipped to SRS (from domestic or international locations) when required to produce driver fuel. All plutonium associated with the VTR fuel production would have a pathway out of South Carolina, as the fuel feedstock is processed and completed fuel assemblies are shipped to INL or ORNL. If INL were selected for VTR fuel production, plutonium feedstock would be taken from stored material at INL or shipped to INL (from domestic locations) when required to produce driver fuel. All plutonium associated with the VTR fuel production would have a pathway out of INL, as the fuel feedstock is processed and completed fuel assemblies are used in the VTR at INL or shipped to the VTR at ORNL. The VTR SNF would eventually be shipped to an interim storage facility or geologic repository (see CRD Section 2.5 below). TRU waste or greater-than-Class C (GTCC)-like waste containing plutonium would be managed along with other similar waste. See CRD Section 2.5 below, for a discussion of TRU waste and GTCC-like waste management.

2.5 Radioactive Waste and Spent Nuclear Fuel Management and Disposal

Comments Summary

Commenters expressed concern about generating more radioactive waste, and SNF, their storage and disposal on site, and the lack of long-term solutions for the management and disposal of radioactive waste and SNF. Some commenters were concerned about the potential for SNF to be stranded at the site. Other commenters were concerned that DOE has not met existing agreements to remove SNF from the site.

DOE Response

Current radioactive waste and SNF management for the INL, ORNL, and SRS sites are described in Chapter 3, Sections 3.1.9, 3.2.9, and 3.3.9 of this VTR EIS, respectively. The potential waste management and SNF management environmental consequences associated with the VTR alternatives and reactor fuel production options are described in Chapter 4, Section 4.9 of this VTR EIS. Low-level radioactive waste (LLW), mixed low-level radioactive waste (MLLW), and TRU and/or GTCC-like wastes could be generated under the combined INL VTR Alternative and INL Reactor Fuel Production Options. High-level radioactive waste would not be generated under any VTR alternative or reactor fuel production option. Regardless of the VTR alternative or reactor fuel production option, all LLW, MLLW, and TRU (or GTCC-like) waste would be managed (e.g., handled, treated, packaged, stored, transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. All waste would meet the receiving facilities waste acceptance criteria. In recent years, the INL, ORNL, and SRS sites have disposed LLW and MLLW at the DOE Nevada National Security Site (NNSS) or the commercial facilities, Waste Control Specialists Facility in Andrews, Texas and the Energy*Solutions* Site in Clive, Utah. The DOE disposal sites at Hanford are currently not receiving offsite waste for disposal consistent with the ROD for the *Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* (DOE/EIS-0391), issued on December 6, 2013 and the Hanford Site is not considered in this EIS. INL, ORNL, and SRS's onsite LLW and MLLW facilities have restrictions on the wastes that can be disposed and the Radioactive Waste Management Complex at the INL Site stopped receiving any low-level waste in April 2021. This site will be closed in accordance with the *Record of Decision for Radioactive Waste Management Complex Operable Unit 7-13/14* (DOE-ID/EPA/IDEQ 2008).

TRU wastes generated from atomic energy defense activities would be managed (e.g., handled, treated, packaged, stored, transported, and disposed) in compliance with regulatory and permit requirements and shipped off site to WIPP in New Mexico. If the DOE defense plutonium were used to produce VTR driver fuel, the TRU waste generated as part of the reactor fuel production options could meet the criterion of being defense related. The WIPP LWA (Pub. L. 102-579 as amended by Pub. L. 104-201) and the WIPP Permit allow for disposal of defense TRU waste in the WIPP facility as long as the waste stream is determined to be TRU waste by "acceptable knowledge and non-destructive assay." The waste stream must comply with the WIPP Waste Acceptance Criteria and the WIPP Permit Waste Analysis Plan by passing a TRU waste certification audit, an inspection by the EPA, and New Mexico Environment Division (NMED) approval of the final audit. The WIPP LWA stipulates that the TRU waste capacity of the WIPP facility is a total TRU waste volume capacity limit of 175,600 cubic meters (6.2 million cubic feet). As of April 3, 2021, the WIPP facility has disposed of 70,115 cubic meters of TRU waste. The April 3, 2021, TRU waste disposal volume is about 40 percent of the total TRU waste volume allowed by Pub. L. 102-579 as amended. DOE is conducting preliminary planning to evaluate options to be able to continue uninterrupted TRU waste disposal operations up to the total TRU waste volume capacity limit. Additional TRU waste disposal panels that would provide capacity to dispose of TRU waste up to the WIPP LWA total TRU waste volume capacity limit may be authorized under a future permit modification. The WIPP Permit, consistent with the RCRA regulations at 40 CFR 270.42, can be modified by submittal of a Permit

Modification Request to the NMED for approval. Both Class 2 and Class 3 Permit Modification Requests include a public comment period as a step in the regulatory process.

If foreign sources of plutonium were used to produce VTR driver fuel, the TRU waste generated as part of the reactor fuel production options would not meet the criterion of being defense related and would be managed as GTCC-like waste. All GTCC-like wastes would be managed (e.g., handled, treated, packaged, store, transported, and disposed) in compliance with regulatory and permit requirements and agreements. GTCC-like wastes would be stored on site and be managed along with other GTCC-like wastes at the site until they are transported to an interim storage facility or for permanent disposal. In February 2016, DOE publicly issued the *Final Environmental Impact Statement for the Disposal of GTCC Low-Level Radioactive Waste and GTCC-Like Waste* (DOE/EIS-0375) (Final GTCC EIS) (DOE 2016a) to evaluate the potential environmental impacts associated with the proposed development, operation, and long-term management of a disposal facility or facilities for GTCC and GTCC-like waste (DOE 2016a). The Final GTCC EIS evaluated five alternatives including a No Action Alternative, geologic repository at WIPP, intermediate-depth borehole, enhanced near-surface trench, and above-grade vault facilities. The Final GTCC EIS evaluates the Hanford Site, INL, Los Alamos National Laboratory (LANL), NNSS, SRS, WIPP, and the WIPP vicinity. The Final EIS also evaluates generic commercial disposal sites in four regions of the United States. The preferred alternative for the disposal of GTCC and GTCC-like waste in the Final GTCC EIS is the WIPP geologic repository and/or land disposal at generic commercial facilities. DOE has determined that the preferred alternative would satisfy its needs for the disposal of GTCC-like wastes. However, the Final GTCC EIS is not a decision document. In accordance with the Energy Policy Act of 2005, in 2017 DOE issued a *Report to Congress on Alternatives for the Disposal of GTCC LLW and GTCC-Like Waste* (DOE 2017), which provided an overview of the disposal alternatives. In 2018, the DOE Office of Environmental Management issued an *Environmental Assessment for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste at Waste Control Specialists, Andrews County, Texas*, (DOE/EA-2082) (DOE 2018), which analyzed disposal of GTCC LLW and GTCC-like waste at Waste Control Specialists. However, this Environmental Assessment is not a decision document. In accordance with the Energy Policy Act of 2005, the Office of Environmental Management is continuing to work with Congress on the path forward for GTCC LLW disposal.

SNF would be generated under the VTR alternatives and managed (e.g., handled, treated, packaged, stored, transported) in compliance with regulatory and permit requirements and agreements. The SNF assemblies would be stored within the VTR reactor vessel until decay heat generation is reduced (generally about 1 year) to a level that would allow the fuel to be transferred and stored in casks on a concrete storage pad. The fuel would be stored in casks on a concrete pad for at least 3 years before it is sent to the fuel treatment facility. As discussed in Chapter 2, Section 2.2.3, following treatment (conditioning) and removal of sodium from the spent fuel (melting and sodium distillation is proposed), the plutonium content in the SNF would be reduced to less than 10 weight percent by melting the SNF with the drive fuel assembly hardware and cast into ingots. The ingots would be placed into canisters ready for future disposal, which would then be placed in dry cask storage at an onsite storage pad in compliance with all regulatory requirements and agreements. This VTR SNF would be managed along with other SNF at the site until it is transported off site to an interim storage facility or a permanent repository. As described in this EIS, the operational life of the proposed VTR, and as a result, its production of SNF, will extend beyond January 1, 2035. This is specifically germane to the preferred alternative of locating the VTR at the INL Site. Prior to issuing a Record of Decision selecting an alternative, DOE would explore potential approaches with the State of Idaho to clarify and, as appropriate, address potential issues concerning the management of VTR SNF beyond January 1, 2035.

Conditioned SNF is expected to be compatible with the acceptance criteria for any interim storage facility or permanent repository. Although a national repository for SNF and HLW is not yet licensed, DOE remains committed to meeting its obligations to safely dispose of SNF and HLW. However, this commitment is beyond the scope of the VTR EIS.

2.6 Snake River Plain Aquifer

Comments Summary

Commenters expressed concern about impacts of the VTR on the Snake River Plain Aquifer (SRPA). This included the impacts from normal VTR operations (i.e., discharges to air and water); accidents; and waste and SNF treatment, storage, and disposal.

DOE Response

Chapter 3, Section 3.1.3.2 of this VTR EIS describes the local INL Site hydrology, including the SRPA. That section describes the established site groundwater monitoring program and discusses the performance of analyses and studies of the SPRA under and adjacent to the site. The analyses indicate that localized areas of radiochemical and chemical contamination are present in the SRPA beneath the INL Site. These areas, or plumes, are considered to be the result of past disposal practices. The groundwater monitoring has generally shown long-term trends of decreasing concentrations for these radionuclides and current concentrations are near or below the EPA maximum concentration limits (MCLs) for drinking water (DOE-ID 2018). The decreases in concentrations are attributed to discontinued disposal above the aquifer, radioactive decay, and dilution within the aquifer.

As indicated above, INL has established programs and procedures in place for identifying the potential for impacts on the environment and implementing best management practices and mitigations, as warranted, to minimize potential impacts including to water resources and, specifically, to the SRPA. During planning and design activities (before work and operations begin) and throughout the life of a project, when there are changes in circumstances, a checklist would be completed for all proposed activities and changes to existing activities to identify any potential for impacts on the environment. This checklist includes the potential for impacts on water resources and, specifically, to the SRPA. If the activity has the potential to impact water resources, an evaluation is performed and best management practices and mitigations, if warranted, are identified, developed, and implemented to prevent impacts and monitored to ensure they are effective.

The VTR EIS evaluations did not identify any construction or operation characteristics with the potential to directly or indirectly impact the SRPA. There are no radiological or hazardous liquid discharges with the potential to impact the SRPA. Atmospheric releases of radiological constituents are well below regulatory limits and there were no mechanisms or pathways identified that would result in the potential for impacts on the SRPA. As discussed in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, LLW, MLLW, and TRU (or GTCC-like) wastes, could be generated under the VTR alternatives and reactor fuel production options. All wastes would be shipped off site for treatment and disposal. Therefore, the potential for any impacts on the SRPA would be negligible.

SNF would be generated under the VTR Alternatives. The SNF assemblies would be stored within the VTR reactor vessel for approximately 1 year to until decay heat generation is reduced to a level that would allow fuel transfer and storage of the fuel assemblies with passive cooling. The SNF would then be stored for at least 3 years in casks located near the VTR before being transferred to a fuel treatment facility. As discussed above in Section 2.5, following treatment, the SNF would be placed in dry storage casks and stored on site in compliance with all regulatory requirements and agreements until it is transported to an offsite, interim storage facility or a permanent repository. The potential for any impacts on the SRPA would be negligible.

2.7 VTR Facility Accidents

Comments Summary

Comments related to human health and safety in terms of accidents involved both positive and negative comments. Some commenters discussed accidents in earlier sodium-cooled fast reactors. Comments included those related to sodium-cooled fast reactor accident history and issues related to sodium as a coolant. One commenter mentioned the 2011 MONJU Nuclear Power Plant accident in Japan and the experimental SL-1 (Stationary Low-Power Reactor Number One) accident west of Idaho Falls, Idaho, and other accidents at the INL Site.

Comments also addressed VTR project risks. One commenter questioned the assertion in the VTR EIS that the VTR would be safer than conventional nuclear reactors. Comments related to accident risks, riskier reactors, accidents devastating southeast Idaho, total curies of radioactivity, and outdoor storage of SNF were also received.

Several commenters noted that the VTR would be cooled with liquid sodium and that liquid sodium is a highly volatile liquid that burns when exposed to air and explodes when exposed to water. As such, it is a high risk to health and safety. Commenters stated that use of liquid sodium as a reactor coolant could lead to potentially devastating mishaps, but provided no technical basis for the assertion.

Comments related to DOE failing to provide adequate analysis were also received. Comments were received relating to the material at risk (MAR) and radiation health effects. A commenter stated that the amount of radiological MAR could be significantly larger than assumed but provided no technical basis for the assertion. Another commenter indicated that the negative health impacts from radiation in general and from the INL Site specifically have not been addressed in the VTR EIS.

Comments were received relating to the accident event frequency. A commenter stated that the story that the VTR EIS emphasizes is that the DOE's estimated accident likelihoods are so low that there is no need to worry. The commenter also indicated that while the DOE asserts that a VTR accident is so unlikely as to be less than 1 chance in a million per year, it is only a biased assertion and not an estimate based on data.

Comments were received relating to the long-term impacts of the VTR project. A commenter stated that the VTR EIS does include a long-term estimate of impacts but appears to do so incorrectly by neglecting the widespread impact of contaminated food and future generations of people living in the long-lived radioactive contamination. Comments stated, without supporting evidence, that the economic impact of an accident at the VTR is grossly understated in the VTR EIS and that the EIS must address decades of non-use of farmland, worthless real estate, and long-term evacuation of residents and elevated levels of health harm, not limited to cancer.

DOE Response

Worker and public safety are DOE's highest priority, and workers at DOE sites are highly trained in performing their jobs. Education and training, including safety and radiation protection, requirements are commensurate with job functions. The purpose of this EIS is to assess the environmental impacts of the proposed action. DOE prepared the EIS and included all information necessary to determine the potential for significant environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using state-of the computer programs approved for use by DOE and the U.S. Nuclear Regulatory Commission (NRC). DOE prepared the EIS and included all information necessary to determine the potential for significant environmental impact.

The impacts of accidents evaluated in the VTR EIS are calculated to estimate potential environmental impacts and allow a fair comparison between alternatives and options. One aspect of evaluating the impacts is to have a common MAR when evaluating the impacts from the VTR alternatives and the reactor fuel production options. In all cases, MAR is consistent when evaluating the alternatives and options. Release fractions are applied to MAR to determine the source term for each event evaluated in the EIS. Since one purpose of the accident analysis is to provide a means for comparing the consequences between alternatives and options, the release fractions are applied consistently in the events for the VTR alternatives and the reactor fuel production options.

DOE takes its responsibility for the safety and health of the workers and the public seriously. The Experimental Breeder Reactor (EBR)-II in Idaho and FFTF in Washington State demonstrated safe operation with sodium as the coolant. Using past reactor operating experience and knowledge gained from extensive inherent safety testing at EBR-II and FFTF, along with advanced analysis tools, the VTR is being designed to safely operate with sodium as the coolant. This VTR EIS, Appendix D, Section 3.3.1 reviews the history of sodium-cooled reactor accidents and operations. Sodium-cooled reactors have been operated for a number of years. The discussion in Appendix D considers events and tests at EBR-I, Fermi-I, Phénix and SuperPhénix (both French reactors), MONJU, FFTF, and EBR-II. The discussion provided in Appendix D acknowledges the events mentioned in the comments and other information related to tests in FFTF and EBR-II.

DOE disagrees with the statement that the event frequency estimate is a biased assertion and not an estimate based on data. DOE prepared the EIS and included all information necessary to determine the potential for significant environmental impact. The hypothetical, beyond-design-basis reactor accident is considered during the VTR design process to ensure that design features and controls are in place to prevent the accident from occurring. Such an event would not occur because a large number of independent failures would have to happen before an accident could occur. DOE would have multiple engineered and administrative controls in place to prevent these failures. The estimated frequencies of events with potential environmental impact consider the probability of failure of these engineering features.

For the hypothetical, beyond-design-basis reactor accident release, the MACCS2 computer program can calculate the contribution to the doses from a range of pathways. Although the accident is hypothetical, such information is still important to the designers, the decision-makers, and the public to ensure that sufficient effort is made during the design of the reactor to prevent the accident from occurring.

An emergency preparedness program is in place so that if an accident were to occur, there would be adequate warning to the offsite public about harvesting and ingesting foods that could be contaminated as a result of a radiological release. The MACCS2 computer program projected economic costs, including population-dependent costs, farm dependent costs, decontamination costs, interdiction costs, emergency phase costs, and milk and crop disposal costs.

DOE acknowledges that many different perceptions are represented in the comments received, but no comments were received that indicate any of the impact data presented in the VTR EIS should be reconsidered based on technical or scientific reasons.

2.8 Intentional Destructive Acts

Comments Summary

Some commenters were concerned that implementation of the VTR project could put the public at risk for terrorist attacks. They are concerned about the quality-of-life impacts of a terrorist attack on this proposed project and what possible scenarios of mitigation have been developed to both protect this project from a terrorist attack as well as respond to one should it occur. They questioned if DOE has other examples to draw upon and how do those examples differ from this one. They asked who would be affected and what can be done to make those affected whole.

Some commenters expressed concern about the potential for cyberattacks that could result in worst-case scenario accidents. They indicated that the VTR EIS does not indicate that the DOE conducted an analysis of potential accidents that could result from cyberattacks. They indicated that while potential cyberattack-driven accidents leading to environmental impacts have not been analyzed in other EISs from DOE, recent widespread cyberattacks in the United States and abroad—including malicious attacks on nuclear power plants and water-treatment facilities—indicate that DOE should have addressed cyberattacks in their NEPA analyses.

DOE Response

An analysis of physical or cyber vulnerabilities and defenses is a security function that would be performed independent of this EIS. These analyses would be performed throughout the design and construction phases to ensure that after the VTR is operational, preventative and mitigation security features would be present. Some details of the intentional destructive act or terrorism analysis are not available to the public for security reasons. Since the reactor protection system will not be accessible remotely, the risks from cyberattacks should be reduced.

DOE constantly assesses and prepares for intentional acts of destruction. Security forces are constantly training to thwart intentional destructive acts. All of the VTR-related facilities would have a very high level of physical security designed to stop credible threats. The passive safety approach of the VTR makes it robust against multiple intentional destructive events, including those disabling the heat rejection systems or the electrical systems. Furthermore, the form of materials associated with the VTR serves to inhibit consequences from an intentional destructive act. The VTR fuel would be stored in robust containers designed to provide sufficient shielding to protect nearby personnel. This type of construction renders the SNF well protected from external threats, including both man-made and natural events. Similarly, VTR radioactive waste is packaged in containers designed to withstand a wide variety of severe transportation accidents.

The radiological impacts of a terrorist cyber or physical attack at the VTR facility would be bounded by the impacts of the most severe accident evaluated in the VTR EIS. The EIS-evaluated severe accident is hypothesized to have been initiated by an earthquake so severe that it led to wide-scale structural damage and collapse of well-constructed buildings.

Appendix D, Section D.4.9.8, of the VTR EIS presents the economic costs, as modeled using the standard NRC reactor consequence code, MACCS, for the most severe accident postulated: the unmitigated, hypothetical beyond-design-basis reactor accident with loss of cooling. No other reactor or non-reactor accidents would result in higher impacts. This accident bounds the potential impacts, including economic costs, of any accident. No terrorist, operational accident, or natural phenomena-initiated accident would be more severe. The economic costs developed in the model include population-dependent costs, farm dependent costs, decontamination costs, interdiction costs, emergency phase costs, and milk and crop disposal costs.

Appendix F, Section F.6, of the VTR EIS, discusses the potential for intentional destructive acts associated with the transport of plutonium to be used in fabricating VTR fuel and steps DOE would take to prevent or mitigate such threats.

The VTR and supporting facilities would be designed with a high level of physical and cyber security to protect staff, property, and the public from a range of potential security threats. Cyber security is one of many factors that would be considered in the design of the control systems for the VTR and the supporting activities. DOE does consider cyberattacks a major threat and adequate prevention systems would be in place. The implementation of control systems for a new reactor allow cyber security to be a key design consideration to warn and preclude such actions and to make the likelihood of attacks that lead to significant radiological releases remote (negligibly small).

2.9 Transportation

Comments Summary

Some commenters were concerned about the risk to public safety from the transportation of radioactive wastes and nuclear fuel materials (uranium and plutonium). They indicated that if the fuel were sourced domestically, thousands of miles of overland transportation would be required to deliver it to either SRS or INL for fabrication, and (if produced at SRS) from there to the VTR site at INL. Others added that if plutonium were sourced internationally, there would the added risk from transition and transport.

DOE Response

The transportation of nuclear materials to the reactor fuel fabrication and operational facilities and transportation of the LLW and TRU wastes to the disposal facilities would result in low overall human health risks. These activities are conducted in a safe manner, based on compliance with comprehensive Federal and State regulatory requirements.

The primary radiological transportation risk to the public for any alternative is from the low level of radiation emanating from the transport vehicle. The analyses in this EIS show that such risks are small. As discussed in Chapter 4, Section 4.12, the collective population risk is a measure of the total risk posed to society as a whole. A comparison of the collective population risk allows for a meaningful evaluation of the relative risks between alternative actions and disposal locations, as provided in Chapter 4, Table 4–58 of this VTR EIS. The magnitude of the collective population risk is primarily determined by the number of routes, the length of each route, the number of shipments along each route, the external dose rate of each shipment, and the population density along a given route. The primary differences among alternatives from the standpoint of transportation are the lengths of the routes as determined by the location of the disposal sites (destination of the shipments). Thus, higher collective population risks are associated with alternatives that require transportation over longer distances. Only truck transports of radioactive materials and wastes are considered.

All alternatives involve routes that have similar characteristics, with no significant differences for comparison among alternatives. All require transportation through a range of rural and urban areas. In addition, the analyzed routes used in the analysis are considered representative routes (as discussed in Appendix E, Section E.5.1, because the actual routes used would be determined in the future). For each destination (facility or disposal site), the routes most affected would be the interstate highways that are closest to the site. Also, the route selection for all of the nuclear and radioactive wastes would meet the requirement of a highway-route-control-quantities transportation route for radioactive material as prescribed in 49 CFR Part 397. The objectives of the regulations are to reduce the impacts from transporting radioactive materials, establish consistent and uniform requirements for route selection, and identify the role of State and local governments in routing radioactive materials. The regulations attempt to reduce potential hazards by prescribing that populous areas be avoided and that travel times be minimized. In addition, the regulations require the carrier of radioactive materials to ensure (1) that the vehicle is operated on routes that minimize radiological risks and (2) that accident rates, transit times, population density and activity, time of day, and day of week are considered in determining risk.

Transportation of nuclear materials and the disposition of the LLW and TRU wastes would be handled in a manner that is protective of human health and the environment and in compliance with applicable requirements and regulations. The primary regulatory approach to promote safety from radiological exposure is the specification of standards for the packaging of radioactive materials. Transportation packaging for radioactive materials are designed, constructed, and maintained to contain and shield its contents during normal transport conditions. Specific requirements for these packages are detailed in 49 CFR Part 173, Subpart I, “Class 7 (Radioactive) Materials.” Doses to workers and the public would be minimized to the extent practical. The methodology used in this EIS to estimate the radiological human health impacts is based on standard practices used for estimating the effects of radiation on humans. The same methodology is used in the evaluation of all alternatives. Thus, any modification of this methodology would not affect the comparisons among alternatives and the identification of the preferred alternative and is unlikely to alter the finding that the absolute risks would be small.

The transportation of the fuel (plutonium, uranium, and VTR fuel) would be carried out by the DOE Office of Secure Transportation (OST). OST is responsible for the safe and secure transport of government-owned nuclear materials in the contiguous United States. Even though the EIS identifies representative routes for transportation of fuel, specific information on the routes and dates of material movement are classified to ensure operational security. These materials would be transported in highly modified secure tractor-trailers and escorted by armed Federal agents in accompanying vehicles for additional security, as needed. Appendix E, Section E.2.4 describes the key elements of the secure transportation asset, which emphasizes the various aspects of the transportation. As indicated in the EIS, the overall risks of transporting these materials are very small.

If the plutonium is sourced from a foreign nation (e.g., France or United Kingdom), these materials would be transported in specially built vessels that have been used for transport of similar materials internationally with sufficient security and safeguards in place during their transports. The shipments in vessels are carried out in a carefully managed and well-conceived manner. There are a series of independent barriers between the radioactive material and the outside environment. This system of "safety in depth" encompasses the material being transported, special packages in which the fuel is transported and the protection provided by the ships with their reinforced double hulls. The vessel safety system provides much greater protection than typically exists for other hazardous cargoes (such as chemicals, petroleum products), which are shipped much more frequently. It also removes reliance on the availability of emergency assistance from countries adjacent to shipping routes. Additionally, the vessels are routed away from areas of international instability and do not travel through seas that are considered vulnerable to acts of piracy. These considerations and inherent safety and security of the packaging and vessel greatly reduce or preclude the potential for any intentional damage and destruction. In over 40 years of transporting radioactive materials, there has never been a single incident resulting in the release of radioactivity (PNTL 2020). Appendix F of this EIS describes the environmental consequences from ship transport of plutonium from foreign countries to a U.S. port of entry, including impacts under incident-free and accident conditions. Transports of these materials within the United States would be carried out by the OST, as discussed above.

2.10 Ongoing INL Site Cleanup

Comments Summary

Commenters were concerned that the generation of additional contamination and waste would conflict with ongoing cleanup of the site.

DOE Response

All INL Site activities are planned and budgeted in coordination with all the other INL Site activities including those which are focused on site clean-up/remediation. However, the VTR EIS evaluations did not identify any construction or operation characteristics with the potential to directly or through any pathways result in any measurable contamination at the INL Site. Additionally, while LLW, MLLW, and TRU (or GTCC/GTCC-like) wastes could be generated under the INL VTR Alternative and INL Reactor Fuel Production Options, all generated wastes would be shipped off site for treatment and disposal. LLW and MLLW disposal capabilities will not exist at the INL Site during the proposed action. The Radioactive Waste Management Complex at the INL Site stopped receiving LLW in April 2021. All activities at the Waste Management Complex will focus on Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) closure activities beginning in January 2022. This site will be closed in accordance with the *Record of Decision for Radioactive Waste Management Complex Operable Unit 7-13/14* (DOE-ID/EPA/IDEQ 2008). This would minimize or eliminate the potential for conflicts with ongoing cleanup of the INL site.

SNF would be generated under the proposed action. The SNF assemblies would be stored within the VTR reactor vessel for approximately 1 year to allow decay heat to be reduced. The SNF would then be stored for at least 3 years in casks located near the VTR before being transferred to a fuel treatment facility. As discussed in Section 2.5 above, following treatment, the SNF would be placed in dry storage casks and stored on site in compliance with applicable regulatory requirements and agreements until it is transported off site to an interim storage facility or a permanent repository. This would minimize or eliminate the potential for conflicts with ongoing cleanup.

2.11 High-Efficiency Particulate Air Filter Performance

Comments Summary

One commenter provided comments and concerns on the performance of high-efficiency particulate air (HEPA) filters.

The commenter stated that DOE significantly underestimates releases of plutonium from both normal operations and from accidents at DOE facilities. The commenter also stated that the particles that "tunnel" through the HEPA filters will be nanoparticles and potentially more harmful than DOE assumes in radiological impact evaluations.

The commenter requested that DOE address the "fatal flaw" of plutonium and uranium moving through the HEPA filters due to alpha recoil.

The commenter cited studies from the National Institute for Occupational Safety and Health (NIOSH) and the Office of Scientific and Technical Information (OSTI). The commenter stated that the OSTI study (ORNL 2005) supports the conclusion that alpha recoil from plutonium-238 decay results in continuous size reduction to create nanoparticles of plutonium-238 that can move through HEPA filters and that the NIOSH nanotechnology studies say the nanoparticles are much more toxic. The commenter cited studies by ORNL (McDowell 1976) and stated that DOE continues to claim that four filters in a row work better and the smaller particles are filtered better while the commenter feels the studies show the exact opposite.

The commenter asserted that the alpha recoil results in smaller and smaller particles, declaring that nanoparticles come out the downstream side of the filters and that these particles are more toxic.

DOE Response

DOE acknowledges the commenter's quoted phrases from DOE reports that appear to support the alpha recoil effects. However, the commenter's statement about plutonium-238 penetrating the HEPA filters does not include the actual amount that the DOE reports indicate penetrates the HEPA filters. Nor does the commenter say how that amount compares to the amount assumed in DOE safety and NEPA documents. Recognizing that this is a recurring theme and similar comments have been made on previous DOE/National Nuclear Security Administration NEPA documents, the following discussion presents a scientifically based discussion to address the issues raised in the comment.

In this VTR EIS, Appendix G, DOE summarized the commenter's scoping comments as follows:

> A commenter requested DOE address the "fatal flaw" of plutonium and uranium moving through high-efficiency particulate air (HEPA) filters due to "alpha recoil."

DOE responded:

> The real-world performance of multiple stages of HEPA filters has been well demonstrated and experimental testing confirms the performance of HEPA filters for uranium and plutonium particles. The independent Defense Nuclear Facilities Safety Board thoroughly evaluated the use of HEPA filters by DOE and has issued multiple reports on the performance of HEPA filters within the DOE complex. HEPA filters used in support of the VTR activities would conform to the latest version of DOE Standard "Specifications for HEPA Filters Used by DOE Contractors," DOE-STD 3020-2015. Performance testing required by this standard for all HEPA filters credited for safety would ensure that the filters meet or exceed the performance requirements assumed in safety evaluations.

The EIS scoping comment summary noted the commenter's questions about alpha recoil and the inability of HEPA filters to retain plutonium but did not fully address the contention that four HEPA filters in a row cannot contain plutonium. Consequently, similar comments were made as part of the Draft VTR EIS public comment process.

The commenter's assertions about HEPA filters and plutonium-238 alpha recoil, nanoparticles, and HEPA filter performance are based on interpretations of certain phrases in NIOSH and OSTI studies. It appears that the phrases cited by the commenter from the NIOSH and the OSTI studies were taken out of context. The cited reports, along with many others, support DOE's use of HEPA filters for confinement of plutonium.

The following summarizes factual information about alpha recoil, nanoparticles, and HEPA filter performance in plutonium facilities:

The DOE has been studying the phenomena associated with the confinement of plutonium, and especially plutonium-238, with HEPA filters for decades. DOE has used the understanding of those phenomena and successfully implemented strategies for protection of workers, the public, and the environment.

<u>HEPA filters and plutonium-238 alpha recoil.</u> Confinement of very fine plutonium-238 powders presents special challenges as illustrated in the DOE experience with the plutonium-238 oxide operations in Building 235-F at SRS (SRNL 2009). That building, which was constructed in the early 1950s and operated into the early 1980s, contained operations that generated very fine, ball-milled plutonium-238 oxide. Significant operational problems were found in the confinement of the oxide in Building 235-F. Those operations were transferred to the more modern plutonium facility at LANL where the lessons learned for confinement of plutonium-238 oxides were implemented in a new plutonium-238 process line. The operational issues found in Building 235-F have not occurred at the LANL plutonium facility. The OSTI report cited by the commenter is an abstract of a report that detailed the operational problems in Building 235-F at SRS and provided an explanation of some of the causes of the issues observed (SRNL 2009). Alpha recoil associated with the decay of plutonium-238 is one of the causes of the operational issues found at Building 235-F. The SRNL report provided the technical basis for the plutonium-238 oxide safety systems implemented for those operations at LANL to ensure the confinement of the oxides.

In addition to the limited quotes from the OSTI abstract of the SRNL report cited by the commenter on HEPA filters and plutonium-238 and alpha recoil, the 2009 SRNL reports concludes (page 15 of 21):

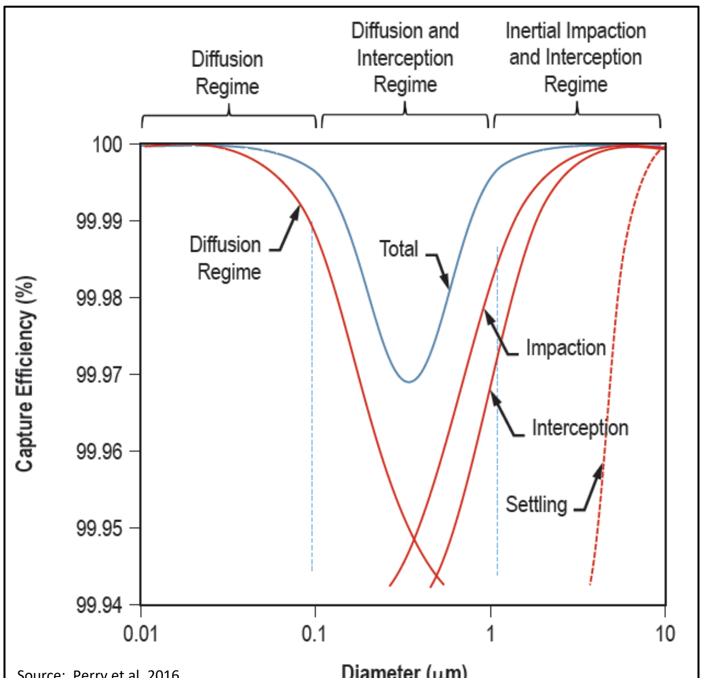
> *Aggregate recoil particles, which are produced from larger particles, are re-entrained into the airflow and deposited deeper into the filter, or onto a subsequent filter in the series. However, it is still believed that <u>sub-micron sized particles will eventually be entrained in the filter due to Brownian motion collisions with the filter media and the adsorbed water layer</u>, which enhances adhesion with the filter. One HEPA filter is obviously not sufficient to capture all particles and subsequently ejected particles due to alpha recoil. It is also necessary to change filters*

> *frequently so that particles ejected from the last filter layer cannot become re-entrained into the air.* (Emphasis added)

Based on the experiences and lessons learned from past plutonium-238 operations involving very fine oxide powders, DOE now manages plutonium-238 operations, as well as other plutonium operations, with a better understanding of the precautions necessary to ensure confinement of plutonium. Confinement is provided through multiple stages of HEPA filters, control of air flow, pre-filters and fire protection, and other techniques. Alpha recoil is one of many factors considered in designing the total confinement systems for plutonium facilities, and especially plutonium-238 facilities. Because VTR facilities would use plutonium with only a small fraction of plutonium-238, alpha recoil is not the major design consideration for glovebox, room, and building confinement.

HEPA filters and nanoparticles. For decades, HEPA filters have been demonstrated to be effective at capturing nanoparticles. HEPA filters are least efficient at capturing particles in the size range of about 0.3 microns. Both larger and smaller particles are captured with much greater efficiency. Hence, national and international standards (for example, DOE-STD-3020-2015) require HEPA filters be tested with particles about 0.3 microns to demonstrate particle capture efficiency of at least 99.97 percent.

Inertial impaction onto HEPA filter fibers is the dominant capturing mechanism for larger particles. For particles below about 0.3 microns, the random Brownian motion (or diffusion) of the particles is the dominant mechanism that leads to impacts with the fibers in the HEPA filters. Once a larger particle impacts a fiber, it is usually bound there. For small particles (less than 10 microns), adhesion forces (Van der Waals, electrostatic, and capillary) result in these very small or nanoparticles sticking to the fibers. These mechanisms that explain how HEPA filters work have been understood since the 1950s and are explained in detail in Section 3.2 of the *DOE Nuclear Air Cleaning Handbook* (DOE 2003). A more detailed technical report on the capture efficiency of HEPA filters is presented in the 2016 NASA technical report (Perry et al. 2016). **Figure 2–1** illustrates effects of the various capture mechanisms and the HEPA filter efficiency as a function of particle size. This figure indicates that the capture efficiency of HEPA filters is greater than 99.99 percent for particles with a diameter of less than 0.1 micron, and for particles greater than 1 micron. HEPA filters are least efficient for particles of about 0.3 microns.



Source: Perry et al. 2016.

Figure 2–1. Capture Mechanisms and the HEPA Filter Efficiency

Toxicity of plutonium-238 nanoparticles. The commenter asserts that the alpha recoil results in smaller and smaller particles, declaring that nanoparticles come out the downstream side of the filters and that these particles are more toxic. The commenter adds that NIOSH nanotechnology studies say the nanoparticles are much more toxic. DOE acknowledges that the inhaled nanoparticles do present a health problem as the commenter cites from NIOSH, but that a properly designed and operated multi-stage HEPA filtration system would not result in emissions as envisioned by the commenter. As indicated earlier, HEPA filters are effective at filtering very small particles, including nanoparticles. The amount of penetration of nanoparticles through a typical DOE multi-stage HEPA filter system is minuscule, and well within the design requirements for such systems.

HEPA filter performance with plutonium-238. The performance of HEPA filters for confinement of plutonium-238 powder used in the preparation of heat sources has been well known since the 1970s when a multi-year study of HEPA filter performance with plutonium-238 powder was conducted at LANL (Gonzales et al. 1976). The study demonstrated the actual performance of multiple stages of HEPA filters (filters in series) and indicated the strategy's successful containment of plutonium. That study and others, including the ones cited by the commenter, reflect efforts by DOE to understand the phenomena that make HEPA filters less effective for some radioactive materials (especially those with relatively high energy and short half-life alpha decay, such as plutonium-238) than for other similarly sized radioisotope particulates or inert materials. Although measured performance of a single HEPA filter with some radioactive materials, such as plutonium-238, is less than with inert materials, it is still high. When multiple HEPA filters are used in series, air flow is controlled and HEPA filters are replaced at regular intervals, the overall confinement system provides excellent protection and confinement under normal operating conditions and during severe accident conditions. For plutonium processing facilities, the building confinement system, including the HEPA filters, would be expected to survive natural disasters and would only be expected to fail during a major earthquake that causes wide-scale structural failures throughout the region.

HEPA filters and the DOE. DOE safety strategies for protection of workers, the public, and the environment reflect a good understanding of the use of HEPA filters at plutonium processing facilities to provide that protection. Glovebox and building confinement strategies incorporate lessons learned from previous plutonium facility operations and consider, where appropriate, factors that affect the movement of particulates due to alpha recoil and airflow. In typical plutonium gloveboxes, airflow directly into and out of the gloveboxes passes through HEPA filters at the glovebox to ensure that workers, the public, and the environment are protected. The room and building exhaust would then pass through multiple banks of tested HEPA filters before release to the atmosphere to further protect workers, the public, and the environment. DOE requirements to ensure the safe confinement of plutonium and other radioactive materials are extensive. The actual performance requirements include in-place testing of HEPA filters that are relied upon in the documented safety analyses for safety. Safety requirements reflect the understanding that the real-world performance of HEPA filters is process- and design-specific. Factors such as airflow, humidity, fire-protection demands, and radioactive materials that might be involved are considered. Additional HEPA filters may be used to provide defense-in-depth as needed.

HEPA filters and the VTR project and EIS. Use of HEPA filters would be a key part of the overall safety strategy for implementation of the VTR project at the INL Site, ORNL, and/or SRS. Although the proposed VTR activities do not involve plutonium-238 powders, some use of weapons- or reactor-grade plutonium would be needed in the VTR fuel feedstock preparation process. As indicated in Appendix D, Table D–1 of this VTR EIS, potential VTR plutonium feed materials would contain less than 2.1 percent plutonium-238 with the bounding reactor-grade mix, and less than 0.03 percent plutonium-238 for weapons-grade plutonium feed. As such, any plutonium-238 HEPA filter and alpha recoil concerns would be reduced proportionally.

The facilities supporting these fuel feedstock preparation processes at INL or SRS would use existing, upgraded, or new safety systems that include multiple stages of HEPA filters. These systems would be required to meet DOE safety standards for performance. Each of these facilities would have a documented safety analyses prepared in accordance with DOE standards.

As discussed in the VTR EIS, estimated releases from routine operations at the existing facilities in the MFC complex do not rely on theoretical performance of HEPA filters. Routine releases are based on known values from operating facilities that are reported to the EPA to demonstrate compliance with the Clean Air Act (40 CFR Part 61). These are not based on an assumed performance of HEPA filters, but rather on measured releases from the stacks, which are typically close to zero and at the limits of detection. For VTR-related facilities, doses from these releases would be significantly smaller (about 3 orders of magnitude or more) than the EPA dose limit (see Chapter 4, Section 4.10 of this VTR EIS).

Estimated releases from accidents also do not rely on theoretical performance of HEPA filters. Typical DOE accident modeling practices do not assume theoretical or measured performance of HEPA filters but rather assume severely degraded performance under accident conditions. In fact, only one of the VTR accident scenarios involving plutonium assumes a functioning HEPA filter in estimating the radioactive material release. As indicated in Appendix D, Table D–2, of this VTR EIS, the accident scenario “D.3.1.7 Aqueous/Electrorefining Fuel Preparation” assumes only one-stage of functioning HEPA filters with a leak path factor of 0.005, for reactor grade plutonium containing a small amount of plutonium-238. In reality, there would be at least two sequential HEPA filters with appropriate protection features to ensure they meet safety requirements in all design-basis accidents.

All of the other accidents scenarios involving plutonium are assumed to be so severe (i.e., beyond-design-basis accidents) that the multiple stages of HEPA filters are severely damaged in the accident and that the filters do not exist when estimating the amount of radioactive material released from the building. The accident scenarios evaluated in the VTR EIS are not expected to occur in the lifetime of the VTR. Many assume a severe earthquake that would cause major structural damage not only to the Materials and Fuels Complex facilities at INL, but major damage throughout the region. Based on the information presented in this section, HEPA filters in VTR facilities would serve to protect the workers, the public, and the environment.

SECTION 3
PUBLIC COMMENTS AND DOE RESPONSES

3.0 PUBLIC COMMENTS AND DOE RESPONSES

This section presents a side-by-side display of the comments received by the U.S. Department of Energy (DOE) during the public comment period on the *Draft Versatile Test Reactor Environmental Impact Statement* (Draft VTR EIS*)* and DOE's response to each comment. To find a specific commenter or comment in the following pages, refer to the "List of Commenters" immediately following the Table of Contents. This list is organized alphabetically by commenter name and shows the corresponding page number(s) where commenters can find their comment(s).

If commenters provided written comment documents that are essentially the same, these comment documents may be treated as a campaign. Commenters submitting documents as part of a campaign are referred to a copy of that comment document. This section only contains one representative copy of each campaign.

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Commenter No. 1: Carl Kasper

From: [redacted]
Sent: Monday, December 21, 2020 5:28:16 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] VTR EIS

Our country desperately needs this program to succeed. It could transform the American power grid making it more resilient. It's about time we got back to designing salt reactors. *1-1*

Carl Kasper

1-1 DOE notes the commenter's support of the VTR program and, in particular, salt reactors. The VTR itself would not directly affect the power grid; however, as discussed in Section 2.2, "Purpose and Need," of this CRD, the research performed at the VTR could lead to advanced reactors, including molten salt reactors, that could enhance the U.S. power grid.

Commenter No. 2: Tom Clements, Savannah River Site Watch

Thank you for your response. And, for adding me to the VTR email list.

This morning, I kept checking the links to the draft EIS and saw that they were finally activated.

On top of the 11.5 metric tons of plutonium already stored in the old K-Reactor, with the VTR project, plutonium pit production and plutonium disposition, SRS could receive well over 50 metric tons of plutonium! Rather than there projects being addressed in isolation, a full review is needed of planned plutonium shipments to SRS and processing at SRS. ***2-1***

Tom Clements
SRS Watch
Columbia, SC

-----Original Message-----
From: [redacted]
To: [redacted]
Cc: [redacted]
Sent: Mon, Dec 21, 2020 12:36 pm
Subject: RE: [EXTERNAL] Where is draft EIS on VTR posted?

Mr. Clements,

We are sorry that you had trouble accessing the draft VTR EIS through the links in the Federal Register. It is possible that you tried them before they were activated this morning. We have checked and they are functioning properly at this time. For your convenience, you can access the draft EIS through either of the following links:

https://www.energy.gov/nepa or
https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor.

Regards,

VTR EIS
From: VTR.EIS <vtr.eis@nuclear.energy.gov>
Sent: Monday, December 21, 2020 7:31 AM
To: VTR_EIS_mailbox [redacted]
Subject: EXTERNAL: FW: [EXTERNAL] Where is draft EIS on VTR posted?

From: Tom Clements
Sent: Monday, December 21, 2020 12:30:18 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Where is draft EIS on VTR posted?
Hello Mr. Lovejoy,

The links in today's Federal Register notice concerning the draft EIS on the VTR do not lead me to the draft EIS.

Where is the draft EIS public ly posted? If it's not posted, why not?

Please send me the draft EIS and be sure it's publicly posted.

Sincerely,

Tom Clements
Savannah River Site Watch
Columbia, SC
[redacted]

2-1 The impacts of ongoing plutonium storage and disposition activities at K-Area at SRS are included in the impacts described in the annual environmental surveillance reports (SRNS 2020). The impacts of surplus plutonium storage and disposition were evaluated in a number of documents, including the *Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (DOE 2015), and will be updated and re-evaluated in the Surplus Plutonium Disposition Program EIS (85 FR 81460). The impacts of plutonium management for future pit production are evaluated in the *Final Environmental Impact Statement for Plutonium Pit Production at the Savannah River Site in South Carolina* (DOE 2020a). Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). A comprehensive evaluation of the management of plutonium across all programs is outside the scope of this VTR EIS or the EISs for other projects because each project has a separate purpose and need and may proceed independent of the others. While the potential environmental impacts of other projects are evaluated in their respective National Environmental Policy Act analyses, to the extent data are available, impacts of other projects are considered in Chapter 5, "Cumulative Impacts," of this VTR EIS.

Commenter No. 3: Doug Muir

From: Doug Muir
Sent: Monday, December 21, 2020 8:27:51 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] New VTR Reactor

I think this new reactor is fantastic for the INL. I think the VTR Reactor should be put at TRA to test nuclear materials for the NAVY in getting new reactors for their ships. I worked for 35 years at NRF and saw first hand the metals testing for the NAVY's nuclear reactors. This is a good thing keeping our NAVY the leaders of nuclear reactor design. This is what I think. ***3-1*** ***3-2***

Doug

Sent from my iPad

3-1 DOE acknowledges your preference for the INL VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

3-2 DOE notes the commenter's support of the VTR and the Navy nuclear propulsion program, but notes that the proposed location of the VTR is adjacent to the Materials and Fuels Complex (MFC) in order to facilitate use of existing MFC facilities. Also, the VTR is not specifically intended to test materials for the Navy; however, as discussed in Chapter 1, Section 1.2, of this VTR EIS, the VTR would support effective evaluation of nuclear fuels, materials, sensors, and instrumentation. Such a research and testing capability could benefit the development of advanced reactors, the current reactor fleet, and Navy reactors.

Commenter No. 4: James Sprinkle

From: James Sprinkle
Sent: Thursday, December 24, 2020 3:04:06 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] support proceeding

I support the conclusion of the Draft VTR EIS identifying the construction and operation of the VTR at the INL Site as DOE's Preferred Alternative. To the extent possible, existing facilities (modified as necessary) should be used for the VTR support facilities. *4-1*

Best of luck in making rapid progress on this important initiative.

James Sprinkle
Los Alamos (retired)

4-1 DOE acknowledges your preference for the INL VTR Alternative and the use of existing facilities to the extent possible. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

Commenter No. 5: Bruce Bleak

From: bruce bleak
Sent: Thursday, December 24, 2020 2:33:42 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] public comments

Thank you for the opportunity to comment, nuclear power is now more important than ever and idaho is the best place to build a reactor. I am all for a new reactor here! ***5-1***

5-1 DOE acknowledges your preference for the INL VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

Commenter No. 6: Daniel Hawley

From: Daniel Hawley
Sent: Wednesday, January 6, 2021 11:37:00 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Draft EIS for Versatile Test Reactor

Mr. James Lovejoy,

I am strongly opposed to the proposed Versatile Test Reactor. 6-1

This dangerous and extremely toxic type of reactor proposed for construction over a major freshwater aquifer. 6-2

The budget for this project is estimated to be $3-6 billion. If history is any indication, the actual costs will end up well beyond that projection. This Taxpayer money should be invested in the development of safer and cleaner renewable energy resources instead of keeping a dying nuclear energy industry on life support. 6-3

This reactor would also use uranium enriched at higher levels than are currently used in nuclear reactors.

This type of reactor requires plutonium for fuel, which is a key component in nuclear bombs and thus poses a nuclear proliferation threat at a time when 191 countries other than the USA have signed the Treaty on Nonproliferation of Nuclear Weapons. 6-4

The DOE has proposed that this type of reactor could operate for 60 years, meaning that one VTR at INL could produce 30 metric tons of spent nuclear fuel over its lifetime. Creating more dangerous radioactive waste with no viable and safe long term waste solution places an enormous threat on the future of Idaho's environmental and human health. 6-5

The proposed reactors would be cooled with liquid sodium. Liquid sodium is a highly volatile liquid which burns when exposed to air, and explodes when exposed to water. 6-6

Sincerely,

Daniel Hawley
[redacted]
Ketchum, Idaho 83340

[redacted]

6-1 DOE acknowledges your opposition to the VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

6-2 Please refer to Section 2.6, "Snake River Plain Aquifer," of this CRD for a discussion of this topic and DOE's response.

6-3 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost. Support and funding for nuclear energy versus renewable energy technologies is outside the scope of this VTR EIS.

6-4 DOE acknowledges your concern regarding nuclear proliferation. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic. As noted in that section, the current plans are to use uranium enriched up to 5 percent, a concentration commonly used in commercial reactors. The proposed fuels for VTR are not an infringement of the Treaty on the Non-Proliferation of Nuclear Weapons.

6-5 The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as spent nuclear fuel (SNF) annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of this VTR EIS. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers

Commenter No. 6 (cont'd): Daniel Hawley

to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

6-6 DOE takes its responsibility for the safety and health of the workers and the public seriously. The Experimental Breeder Reactor (EBR)-II and the Fast Flux Test Facility (FFTF) demonstrated safe operation with sodium as the coolant. Using past reactor operating experience and knowledge gained from extensive inherent safety testing at EBR-II and FFTF, along with advanced analysis tools, the VTR is being designed to safely operate with sodium as the coolant. Appendix D, Section D.3.3.1, of this VTR EIS reviews the history of sodium-cooled reactor operations and accidents. Sodium-cooled reactors have been operated for a number of years. The discussion in Appendix D considers events and tests at EBR-I, Fermi-I, Phenix, SuperPhenix, MONJU, FFTF, and EBR-II. The discussion provided in Appendix D acknowledges the concerns mentioned in the comments as well as other information related to tests in FFTF and EBR-II. Evaluating past performance and tests provide valuable information that is considered in the design of the VTR. Appendix D, Section D.3.3.2, discusses safety analyses that have been performed for the VTR. Appendix D discusses how the VTR is being designed to ensure safety throughout proposed operating conditions. The VTR design is also resilient under potential accident or upset conditions. DOE guidance for design of the VTR focuses on reducing or eliminating hazards, with a bias toward preventive, as opposed to mitigative, design features and a preference for passive over active safety systems. This general approach creates a design, which is reliable, resilient to upset, and has low potential consequences of accidents. Safe operation of the VTR is ensured by reliable systems design to ensure preservation of the key reactor safety functions. These key safety functions are (1) reactivity control, (2) fission- and decay-heat removal, (3) protection of engineered fission product boundaries, and (4) shielding.

Commenter No. 7: Jerry James

From: Jerry James
Sent: Thursday, February 11, 2021 5:11:11 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Test Reactor Oposition

Dear Office of Nuclear Energy Administrator,

Until rock solid means of managing nuclear waste is established all nuclear energy and reactors should be closed and new facilities should be disallowed. *7-1*

Sincerely,

Jerry James
[redacted]
Boise, Idaho
83702

7-1 DOE acknowledges your opposition to the VTR alternatives and your concerns regarding nuclear waste. As discussed in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR spent nuclear fuel (SNF) would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The contention that nuclear reactors should be closed and new facilities disallowed is beyond the scope of this EIS.

Commenter No. 8: Ted Stout

From: Ted Stout
Sent: Thursday, January 7, 2021 5:17:36 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Citizen comment

Mr. Lovejoy,

I am opposed to the development of this new reactor because of the dangerous materials proposed for use and the equally dangerous materials that will be produced by the proposed reactor. Liquid sodium is highly reactive and plutonium is a key component of nuclear bombs. Neither of these materials has any place over top of one of the most productive aquifers in North America. **8-1** The waste produced by the reactor would linger for countless generations, with no secure plans regarding what to do with it, along with all of the other waste already produced at the INL during past and current operations. **8-2**

This is an expensive and dangerous proposal which would likely create more problems than it solves... **8-1 cont'd**

Ted Stout
[redacted]
Bellevue, ID 83313

8-1 DOE acknowledges your opposition to the VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition"; Section 2.3, "Nonproliferation"; Section 2.6, "Snake River Plain Aquifer"; and Section 2.7, "VTR Facility Accidents," of this CRD for additional information.

8-2 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR spent nuclear fuel (SNF) would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository.

Commenter No. 9: Mark E. Weadick

From: Mark Weadick
Sent: Thursday, January 7, 2021 7:26:55 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Versatile Test Reactor Proposed Project

I am opposed to this and other nuclear reactor experiments and projects because all of these projects generate radioactive **nuclear waste** that poses a **chronic** and **cumulative** environmental hazard that lasts for thousands of years. None of the states want this **toxic waste** stored in their backyards. *9-1*

The State of Idaho negotiated an agreement with the Federal Government that **all nuclear waste would be removed from Idaho by 2035**. As of this date, the Federal Government is behind schedule for this nuclear waste removal. *9-2* Nuclear power in NOT environmentally clean energy. *9-1 cont'd*

Respectively submitted,
Mark E. Weadick

9-1 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR spent nuclear fuel (SNF) would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. A discussion of the benefits or drawbacks of nuclear power is beyond the scope of this EIS.

9-2 All Idaho National Laboratory (INL) Site activities are planned, budgeted, and executed, including those focused on site cleanup and remediation, in compliance with regulatory requirements and agreements. The status of these activities is reported in various site documents including the Annual Site Environmental Reports. While low-level radioactive waste (LLW), mixed LLW (MLLW), and transuranic (TRU) (or greater-than-Class-C-like) wastes could be generated under the VTR Alternatives and Reactor Fuel Production Options, all wastes would be shipped off site for treatment and disposal. LLW and MLLW disposal capabilities would not exist at the INL Site during the proposed action. The Radioactive Waste Management Complex (RWMC) at the INL Site stopped receiving LLW in April 2021. All activities at RWMC will focus on Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) closure activities beginning in January 2022. The RWMC will be closed in accordance with the Record of Decision for Radioactive Waste Management Complex Operable Unit 7-13/14 (DOE-ID/EPA/IDEQ 2008). This would minimize or eliminate the potential for conflicts with ongoing cleanup of the INL Site. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and spent nuclear fuel management programs, the inventories that are estimated to be generated as a result of the VTR Alternatives and Reactor Fuel Production Options, and the management and/or disposal of those inventories. Also, see Section 2.10, "Ongoing INL Site Cleanup."

Commenter No. 10: Anne Stites Hausrath

From: Anne Hausrath
Sent: Thursday, January 7, 2021 8:31:19 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Versatile Test Reactor

I object strongly to the development of the VTR. Our tax dollars should be invested in truly renewable energy sources. **10-1** The VTR would generate nuclear waste which lasts for thousands of years--there is no current plan to deal with this waste. **10-2**

Plutonium could be used for weapons. As a practicing Christian I abhor any materials that could be used for nuclear weapons. **10-3** The VTR is a bad idea and should not be developed. **10-1 cont'd** Thank you for the opportunity to comment. Sincerely, Anne Hausrath

--
Anne Stites Hausrath
[redacted]

10-1 DOE acknowledges your opposition to the VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. DOE notes that the proposed VTR is a test reactor, not a power plant. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

10-2 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR spent nuclear fuel (SNF) would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository.

10-3 DOE acknowledges your concern regarding nuclear proliferation. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic.

Commenter No. 11: Michael Haseltine

From: Michael Haseltine
Sent: Friday, January 8, 2021 1:01:38 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Versatile Test Reactor

Oh, my!

Going after nuclear power again, what a waste. It's already more expensive than renewable sources and you want to invest more into a technology that has no solution for its waste product. Don't be ridiculous. Give up already! *11-1*

Michael

11-1 The VTR would be a research reactor and would not generate electricity. Support and funding for nuclear energy versus renewable energy technologies is outside the scope of this VTR EIS. For information on spent fuel storage and disposal, please see Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

Commenter No. 12: Joseph Schueler

From: Joey Schueler
Sent: Saturday, January 9, 2021 1:09:35 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Draft VTR EIS - Idaho

To Mr. James Lovejoy,

I have lived in Boise and explored the beauty of Idaho and all it has to offer since 2002. I moved here to peacefully live, work, and raise a family as well as serve my community as a nonprofit professional every one of these past eighteen years, in service to youth. In that time, I've watched numerous attempts to bring irradiated nuclear waste into our beautiful state many times, even as the past governors had signed legally binding agreement with the U.S. government to cease nuclear waste transport into our state and also to agree to clean up the already disastrous, leeched nuclear waste that to this day still sits above our state's Snake River water aquifer. I drink water from the Snake River Aquifer. So do all those I love and care about in Idaho as do most who live here. **12-1**

I would like to know why Idaho is being chosen for this versatile test reactor. If it is population density, I'd like to know, as was told to me by the nuclear reactor commission that responded to my questions back in the early part of the 21st Century, why those I live near and love are less valuable than, say, those in New York City, just because we have less people here? This, to me, is no reason to locate volatile chemical or nuclear waste here, much like the Nevada tests in the desert, from which the down winders of Idaho and Montana and Wyoming still suffer. INL itself was targeted here for the same reason. The government cannot just decide that life is more valuable if less are killed over time by the impacts of nuclear waste or if attacked by enemies of the nation. The impacts are the same to our population as to any other and its impacts on our quality of life here, much less the impacts on the air, soil, and water on which we depend. I'm sure those in Fukushima, Japan felt similar feelings in 2011 just before their nightmare began. Take this waste and "test" reactor and its waste back to where it came from because I and most of Idaho want no part of it, if it were fully presented to the public. The allure of a few jobs is not worth the true cost of such a long term ailment on our society and economy as we grapple to still clean up the last mess you left. **12-2**

In addition to the above honest communication I have to share, I'd also like careful study to be conducted on the following impacts of this decision:

1. How will the proposed project pose risk to the populations surrounding this area? **12-3**
2. How will the proposed project pose risk to all those impacted by the Snake River Aquifer and how will the negative impacts be mitigated, by whom, and who pays, and on what timeline? **12-4**
3. How will the proposed project pose risk to the local economy should there be a problem both in the area of impact of new construction as well as the tertiary areas that surround construction in terms of viability, valuation of land and real property, to include those areas dependent on the ground water of the Snake River Aquifer as well as those water, air, and soil sources surrounding the location of this project? **12-5**
4. How will the proposed project pose risk to local flora and fauna as it pertains to hunting, grazing, mining, fisheries, and farming not just in the immediate vicinity, but in all areas affected by the Snake River Aquifer upon which this land sits? **12-6**
5. What are the economic impacts of a terrorist attack on this proposed project and what possible scenarios of mitigation have been developed to both protect this project from a terrorist attack as well as respond to one should it occur? Do we have other examples to draw upon and how do those examples differ from this one? **12-7**

12-1 Chapter 3 of the EIS discusses ongoing site cleanup and monitoring activities. The scope and status of the ongoing site cleanup is outside of the scope of the VTR EIS. Low-level radioactive waste (LLW), mixed LLW (MLLW), and transuranic (TRU) (or greater-than-Class-C-like) wastes could be generated under the VTR alternatives and reactor fuel production options. All wastes would be shipped off site for treatment and disposal. Therefore, the potential for any impacts on the Snake River Plain Aquifer (SRPA) would be negligible. Spent nuclear fuel (SNF) would be generated under the VTR alternatives. The SNF assemblies would be stored within the VTR reactor vessel until decay heat generation is reduced to a level that would allow fuel transfer and storage of the fuel assemblies with passive cooling. After allowing time for additional radioactive decay, the SNF would be transferred to a fuel treatment facility. Following treatment, the SNF would be placed in dry storage casks and stored on site in compliance with all regulatory requirements and agreements until it is transported to an offsite interim storage facility or a permanent repository. The potential for any impacts on the SRPA would be negligible. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," which provides a detailed discussion of the sites' current radioactive waste and SNF management programs, the inventories that are estimated to be generated as a result of the VTR Alternatives and Reactor Fuel Production Options, and the management and/or disposal of those inventories. Also, please refer to Section 2.10, "Ongoing INL Site Cleanup."

12-2 DOE takes its responsibilities and commitments for the safety of all members of the public, no matter where located, seriously. The design of the VTR incorporates several inherent and passive safety features. Operated under DOE orders and standards, the VTR would be operated in a manner that protects the health and safety of the public. The same emphasis on safety would be applied to the operation of the VTR no matter where it was located. The Idaho National Laboratory (INL) is proposed as a site for the VTR for a number of reasons. Foremost among the reasons are available facilities and technologies and knowledge and experience of INL staff. The capabilities at INL, both in physical facilities and personnel, are a result and function of the history of the site. Since 1949, the site now called the Idaho National Laboratory (INL) has served as a national asset for performing a wide range of research activities. Although other research activities have been performed at INL, one of its principal missions has been research, development, and testing of nuclear technologies. The INL Site comprises 890 square miles of land with limited public access. One factor in establishing the INL Site as a location for performing nuclear research was the ability to construct and operate facilities away from population centers. The distance from INL facilities to the site border and population centers provides a buffer in the unlikely event that there is

Commenter No. 12 (cont'd): Joseph Schueler

6. What are the quality of life impacts to human life of a terrorist attack on this proposed project and what possible scenarios of mitigation have been developed to both protect this project from a terrorist attack as well as respond to one should it occur? Do we have other examples to draw upon and how do those examples differ from this one? Who would be affected and what can be done to make those affected whole? 12-8
7. How is real estate and statewide assessment of valuation for land, real property, and capital assets affected by this project? 12-9
8. How is real estate and statewide assessment of valuation for land, real property, and capital assets affected by this project should an accident occur resulting in a critical incident? 12-10
9. What happens to the byproducts of the versatile test reactor and will it be stored on site, nearby, or within the state once used? Who pays for the ongoing costs to store, transport, and/or clean up the byproducts if stored in state? 12-11

I would like careful study of the aforementioned unevaluated aspects of the proposed project to be thoroughly vetted and then presented to the Idaho public before any determination of risk, value, or cost vs. benefit is considered by any public body or commission or before determining whether or not this is right for our state. 12-12

Respectfully,

Joseph Schueler
Boise, ID 83702
[redacted]

an accident or event that causes an unexpected release of radioactive materials. The people and natural resources of Idaho would be protected during normal operations of the VTR. As evaluated in Chapter 4 of the EIS, construction and operations of the VTR and associated facilities would have minimal impacts (also refer to the Summary of Impacts in the Summary, Section S.9). No more than 100 acres of onsite natural habitat would be disturbed during construction. The VTR is a sodium-cooled reactor with sodium-to-air heat exchangers. Consequently, there would be no discharges of cooling water that could potentially impact the aquifer. Construction and normal operations emissions would be well below regulatory limits for radiological and nonradiological emissions. Waste generated by the VTR and associated facilities would be disposed of at offsite locations. And SNF generated by the VTR would be processed and packaged for dry storage until it can be transported to an approved offsite facility. DOE, the reactor designer, and the site contractor place a very high value on building safety into the VTR and the supporting facilities. As designed, the VTR has inherent safety features such as the ability to passively manage decay heat in the event of a loss of power. As discussed in Chapter 4 and presented in detail in Appendix D, the risks and consequences of accidents are low, except for a beyond-extremely-unlikely, hypothetical accident, for which a credible initiating event has not been identified. The decision regarding the VTR will not impact cleanup at the INL Site. Regardless of the decision, DOE will continue to implement the cleanup decisions in accordance with applicable agreements.

12-3 The topics listed in the comment have been carefully studied in the EIS. This and the following responses summarize the assessments and point out the specific sections in the EIS that are relevant to the specific topics.

The environmental impacts of the VTR alternatives and the fuel production options are presented in Chapter 4 of the EIS and summarized in Chapter 2, Section 2.9. Human health risks (to both the public and INL workers) are discussed in Sections 4.10 and 4.11. The results of the analysis show that impact of calculated radiological releases from the normal operation of the VTR and fuel production facilities are a fraction of the impacts from existing operations and, even when combined, are well below all regulatory limits. Additionally, accident risks from VTR operation are compared to commercial nuclear power plant risks and to the DOE and NRC safety goals in Appendix D, Sections D.4.9.6 and D.4.9.7. This comparison shows that risks from VTR accidents easily meet the safety goals of both the NRC and DOE.

12-4 Please refer to Section 2.6, "Snake River Plain Aquifer," of this CRD for a discussion of this topic and DOE's response. In the very unlikely event that water or food stocks

Commenter No. 12 (cont'd): Joseph Schueler

become contaminated following an accident, then clean water and food would be provided to affected citizens until cleanup is complete.

12-5 The proposed project would primarily result in an increase in jobs and income that would be considered an overall beneficial impact on the local and regional economy. The largest annual impacts would be expected to result from construction activities and expenditures. Property values could go up during construction, depending on the size of the in-migrating workforce and the available housing at that time, but the worker influx is expected to be relatively small.

Accidents that could arise during construction are described in Chapter 4, Section 4.11.1.1, and the potential for any construction-related accidents and resultant impacts would be restricted to the INL Site. DOE does not anticipate any accident scenarios to occur during construction that would impact the surrounding region, to include economic impacts; therefore, socioeconomic impacts from accidents arising during construction are not analyzed in this EIS. Regarding accidents that could arise during operations, Appendix D, Section D.4.9.8, of this EIS includes estimates of the economic impacts of the hypothetical beyond-design-basis reactor accident with loss of cooling, for an area within 50 miles of the VTR location at the INL Site. This is the most severe accident postulated that could occur from any of the proposed action alternatives, and represents an "upper bound" of potential economic impacts that could occur from an accident scenario. The total projected economic impact includes population-dependent costs, farm dependent costs, decontamination costs, interdiction costs, emergency phase costs, and milk and crop disposal costs. Economic impacts from other, less severe scenarios would likely be similar in nature, but of less magnitude than that described in Section D.4.9.8.

DOE acknowledges that certain environmental contamination issues (e.g., air, water, soil), such as from an accident during project operation, could impact both real estate values and general livability conditions, and that real estate can quickly lose value if exposed to certain types of environmental contamination. However, economic impacts from accident scenarios are highly speculative, and the probability of an accidental release from project operation that would result in environmental contamination would be very, very low (less than one in 10,000 per year), as described in Chapter 4, Section 4.11, and throughout Appendix D. (Please note, accident scenarios described in these sections consider potential human exposure through various pathways, such as air and ingestion of contaminated groundwater and food). Specifically, each of the proposed VTR alternatives addressed in the EIS would be designed and operated with sufficient safety controls in place to reduce

Commenter No. 12 (cont'd): Joseph Schueler

the likelihood of an accident or contamination event. Given such a low probability of an accident, adverse economic impacts from an accident scenario, to include depreciation of land value or loss of land viability, are highly unlikely. In the highly improbable event of an accident, corrective action, interdiction, or remediation/cleanup actions would be implemented that would protect public health and environment, and limit regional economic impacts. Further, it should be noted that the analysis identified no pathways or mechanisms to release potential contaminants to soils or groundwater during normal operations. For example, all waste would be shipped off site and SNF would be stored in aboveground casks that would provide safe storage with minimal chance of release. No adverse impacts would be expected on the local economy, including property values, during normal operations.

12-6 As stated in the VTR EIS Chapter 4, Section 4.5, "Ecological Resources," operational and administrative control measures would be evaluated and measures would be implemented to reduce adverse effects to flora and fauna (i.e., plant and wildlife species). The nearby areas used for hunting, grazing, mining, fisheries, and farming would not be significantly impacted. Prior to any construction or land-clearing activities, additional species-specific surveys would be completed to adequately determine the extent and severity of effects to plants and wildlife. Furthermore, sagebrush and native habitats would be surveyed and appropriate mitigation would offset impacts. Per DOE's policy, revegetation efforts would be implemented that include planting amounts equal to that disturbed, especially in areas beneficial to sage-grouse. Revegetation would also occur in accordance with the INL Site Revegetation Assessment program practices. Invasive species management would also continue, which would assist in minimizing impacts on the INL Site and surrounding areas. Impacts on wildlife would be minimized and avoided through controls that include (but are not limited to) seasonal timing of project activities, enforcing low speed limits, ultrasonic warning whistles to flush wildlife, hazing animals from the road, and preemptive awareness programs for construction crews. Administrative controls would include the posting of speed limit signs, and roping off sensitive areas (such as snake hibernacula and the pygmy rabbit burrow area). All water being used for the project is compliant and within the permitted limits for the INL Site. Impacts on the Snake River aquifer would not be significant and as described in the VTR EIS Chapter 4, Section 4.3, "Water Resources," the total water demand for the project during the entire construction period (about 51 months) is about 128 million gallons and for ongoing operations is about 4.4 million gallons per year. The INL currently withdraws approximately 6.6 percent of the reserved water right. Existing operations combined with the proposed VTR and cumulative projects

Commenter No. 12 (cont'd): Joseph Schueler

discussed in Chapter 5 would require a groundwater total volume of approximately 7.6 percent of the established water right (11.4 billion gallons per year), under INL's Federal Reserved Water Right permit. Idaho has an extremely strong water rights administration process for groundwater and surface water. In 2015, there was a legal settlement designed to stop ongoing drop in the Eastern Snake Plain aquifer as well as rebuild the aquifer (see Inside the Ambitious Plan to Replenish a Depleted Aquifer, available at https://psmag.com/environment/recharging-a-depleted-aquifiersettlement). The program has been successful and monitoring the aquifer level indicates the volume of water stored increased about 350,000 acre-feet in the last year and 2.2 million acre-feet in the past five years (see Snake River Aquifer Continues Upward Trend, available at https://www.capitalpress.com/ag_sectors/water/snake-aquifer-level-continues-upward-trend/article_1f378648-d695-11ea-bf1c-9f21aea30f53.html). Furthermore, to ensure impacts on water resources are minimized, the INL Site has an extensive groundwater quality monitoring network. Ongoing groundwater monitoring, analyses and studies of the Snake River Plain Aquifer under and adjacent to the INL Site is performed by the USGS INL Project Office and INL contractors. Groundwater monitoring is also required by a variety of permits. Surface water locations outside of the INLs Site's boundaries are sampled quarterly and when the Big Lost River is flowing, locations within the INL Site are sampled. Overall, with minimization measures to protect ecological and water resources, including ongoing water sampling at the INL Site and nearby vicinity, the VTR project risk to local flora and fauna as it pertains to hunting, grazing, mining, fisheries, and farming would be minimal.

12-7 DOE takes intentional destructive acts quite seriously. Security forces are constantly training to thwart intentional destructive acts. Furthermore, the form of materials associated with the VTR serves to inhibit consequences from an intentional act of destruction. The VTR fuel and the VTR radioactive waste by their very nature are not susceptible to an intentional act of destruction. The MACCS2 projected economic impacts are based on best-estimate engineering models as the current state of knowledge is ever changing. The MACCS2 computer program projected economic costs, including population-dependent costs, farm dependent costs, decontamination costs, interdiction costs, emergency phase costs, and milk and crop disposal costs based on local land use and economic conditions. The models projected economic costs within 50 miles for the severe accidents at INL and ORNL (See Appendix D, Section D.4.9.8). The models' projected economic costs for the ORNL regions are much higher than for INL primarily due to the higher population density and the more varied land use. In any case, the long-term impacts are applied consistently

Commenter No. 12 (cont'd): Joseph Schueler

between VTR alternatives and the feedstock preparation alternatives to allow a fair comparison. Some details of the intentional destructive acts analysis are not available to the public for security reasons. The economic analysis for the VTR is based on design-specific characteristics of this reactor and local land use and economic conditions. Economic impacts of accidents involving reactors of other designs, power levels, and regions with differing economic factors are not directly comparable to the consequences of the events modeled for the VTR.

12-8 Quality of life impacts would be expected to be minimal. DOE takes intentional destructive acts quite seriously. Security forces are constantly training to thwart intentional destructive acts. Furthermore, the form of materials associated with the VTR serves to inhibit consequences from an intentional act of destruction. The VTR fuel and the VTR radioactive waste by their very nature are not susceptible to an intentional act of destruction. Some details of the intentional destructive acts analysis are not available to the public for security reasons.

12-9 Please refer to the response to comment 12-5.

12-10 Please refer to the response to comment 12-5.

12-11 As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR SNF would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. DOE has the responsibility for the management of all aspects of this project and as such would also be responsible for any associated costs.

12-12 As indicated in the responses above, DOE has included evaluation of the identified subjects as appropriate for a National Environmental Policy Act (NEPA) analysis. The potential environmental impacts as presented in this VTR EIS are one factor that DOE will consider in making a decision regarding construction and operation of the VTR and associated facilities. Among other items, DOE will also consider comments received on the Draft EIS, mission and programmatic need, technical capabilities, work force, security, and cost. DOE's decision pursuant to the analysis in this Final EIS will be announced in a Record of Decision(s) (ROD[s]) that will be issued no sooner than 30 days after the U.S. Environmental Protection Agency Notice of Availability of this Final EIS is published in the Federal Register.

Commenter No. 13: R.B. Provencher

From: Richard Provencher
Sent: Friday, January 15, 2021 1:16:37 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Comment on Draft VTR DEIS

13-1 I think DOE NE and INL effectively evaluated and bounded the environmental impacts related to the proposed action. They also effectively implemented the mission need mandate defined by Congress in the NEICA act to evaluate and pursue a fast neutron testing capability in the U.S by 2025. The breakthrough design being proposed for VTR parallels the unique design of the Advanced Test Reactor which was built in the 1960's and continues to be the premier test reactor in the world today. I commend NE and INL for making this design the product of a collaboration of the best minds across the DOE complex and industry that build on the successes of the EBR-2 reactor and many years of effort. This capability will allow the U.S. to improve national security and depend less on unreliable international sources. The future advanced reactor designs that will be enabled by VTR research will help the U.S. and the world reduce carbon emissions through safe, clean and reliable baseload power sources that can also be used to manufacture clean fuel sources like hydrogen and clean fresh water through desalination.

13-2 Locating the VTR and the fuel fabrication at INL makes the most sense as the Idaho site is the best location built for purpose in the U.S. to conduct nuclear research and results in the lowest potential impact to the environment and the public due to its large size and remote location. INL is also best prepared to perform the post operations sodium removal on the fuel and perform post irradiation examination with existing facilities and capability.

R.B. Provencher, Idaho Falls

Sent using Good

13-1 Thank you for your comment.

13-2 DOE acknowledges your preference for the INL VTR Alternative and the INL fuel fabrication option. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

Commenter No. 14: Joanie Fauci

From: joanie fauci
Sent: Sunday, January 17, 2021 3:14:47 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Comments on Versatile Test Reactor Draft EIS

Dear Mr Lovejoy,

I am writing to express my opposition to this project. **14-1**

I am opposed to any nuclear project until we have a safe method of nuclear waste disposal.

I have been to the INL site. I have seen pits where waste was dumped. I have seen storage facilities that have been years in cleanup and are still not cleaned up. We have no place to store the waste. We have no way to transition the waste. **14-2**

What is the purpose of this project and why are we even considering it? We have much safer and cheaper means of energy production anymore. Nuclear power is old school, expensive, dangerous. There is no reason to go there. Stop wasting our time and money! **14-3**

Regards,
Joanie Fauci
[redacted]
Boise ID 83702

14-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

14-2 DOE acknowledges the commenter's concerns regarding nuclear waste. No wastes generated under the VTR alternatives or reactor fuel productions options would be disposed at the Idaho National Laboratory (INL) Site. The proposed action includes construction of a storage facility for dry cask storage of spent nuclear fuel pending offsite shipment to an interim storage facility or repository. The evaluation of the INL Site Cleanup activities are beyond the scope of the VTR EIS; however, all VTR alternatives and reactor fuel production options activities are coordinated with all other INL Site activities. Please see Section 2.5, "Radioactive Waste and Spent Fuel Management and Disposal;" Section 2.6, "Snake River Plain Aquifer;" and Section 2.10, "Ongoing INL Site Cleanup," of this CRD for more detailed discussions on these topics.

14-3 Information about lack of a domestic fast-neutron testing capability and the purpose and need for a VTR is discussed in Chapter 1 of this VTR EIS. DOE is pursuing the VTR to provide a test capability that supports the fulfillment of its mission of advancing the energy, environmental, and nuclear security of the United States and promoting scientific and technological innovation in support of that mission. The VTR would not generate electricity. Refer to Section 2.2 of this CRD for additional discussion of the purpose and need for the VTR.

Commenter No. 15: David Phillips

From: Phillips, David
Sent: Monday, January 18, 2021 7:58:13 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Draft VTR.EIS

YES…YES…YES!

Build it now, Our country Needs sustainable Nuclear power for our safety and security. *15-1*

David Phillips
Brandon, MS

15-1 DOE acknowledges your preference for the VTR project. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

Commenter No. 16: Ellen Jones

From: Ellen Jones
Sent: Wednesday, January 20, 2021 4:28:38 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Versatile Test Reactor

I am writing to object to the proposed Versatile Test Reactor at Idaho National Laboratory. **16-1**

I do not want this expensive and dangerous reactor to be built and operated atop the Snake River Aquifer, the primary water source for all of Southern Idaho. **16-2**

Anything that creates more radioactive waste is a step in the wrong direction. **16-3**

Please do not approve this proposed project. **16-1 cont'd**

Sincerely,

Ellen Jones
Boise, Idaho

16-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support Opposition," of this CRD for additional information.

16-2 Please refer to Section 2.6, "Snake River Plain Aquifer," of this CRD for a discussion of this topic and DOE's response.

16-3 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR SNF would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository.

Commenter No. 17: Susan Hyde

From: Susan Hyde
Sent: Thursday, January 21, 2021 8:22:57 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] We support nuclear power

We want and support nuclear power. It is time for safe nuclear power. **17-1**

Sent from my iPhone.
Thanks

17-1 DOE acknowledges your preference for the VTR project. Considering public comments on the Draft EIS is an important step in the EIS process. Please see Section 2.1, "Support and Opposition," of this CRD for additional information.

Commenter No. 18: Kathy O'Brien

From: Kathy O'Brien
Sent: Saturday, January 23, 2021 6:43:50 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] oppose Versatile Test Reactor

Dear Mr. Lovejoy:

I would like to express concerns about the Versatile Test Reactor proposed to be built at the INL. **18-1** First, it is dangerous. It uses plutonium, which is also used for nuclear bombs. This could cause proliferation problems. It also uses uranium that is enriched at high levels. **18-2** It would produce 30 metric tons of spent fuel over its lifetime. I oppose any additions at INL that would add to the stockpile of dangerous radioactive waste in Idaho. There simply is no place to safely store this waste and I don't want it here in Idaho to threaten our health and environment. **18-3** Also, these reactors would be cooled with liquid sodium. Liquid sodium is a highly volatile liquid which burns when exposed to air, and explodes when exposed to water. I don't want that in our environment. **18-4** Finally, the project is way too expensive. The budget is estimated to be $3-6 billion. It likely will end up being much more. Just think what we could do if that money was invested in developing safer, cleaner renewable energy resources **18-5** For these reasons, I completely oppose the Versatile Test Reactor being built anywhere and especially not in Idaho. **18-1 cont'd**

Sincerely,
Kathy O'Brien

18-1 DOE acknowledges your opposition to the VTR project and the Idaho National Laboratory (INL) VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

18-2 DOE acknowledges your concern regarding nuclear proliferation. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic. As noted in that section, the current plans are to use uranium enriched up to 5 percent, a concentration commonly used in commercial reactors.

18-3 The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as spent nuclear fuel (SNF) annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

18-4 DOE takes its responsibility for the safety and health of the workers and the public seriously. The Experimental Breeder Reactor (EBR)-II and the Fast Flux Test Facility (FFTF) demonstrated safe operation with sodium as the coolant. Using past reactor operating experience and knowledge gained from extensive inherent safety testing at EBR-II and FFTF, along with advanced analysis tools, the VTR is being designed to safely operate with sodium as the coolant. Appendix D, Section D.3.3.1, reviews the history of sodium-cooled reactor operations and accidents. Sodium-cooled reactors have been operated for a number of years. The discussion in Appendix D considers events and tests at EBR-I, Fermi-I, Phenix, SuperPhenix, MONJU, FFTF, and EBR-II. The discussion provided in Appendix D acknowledges the concerns mentioned

Commenter No. 18 (cont'd): Kathy O'Brien

in the comments as well as other information related to tests in FFTF and EBR-II. Evaluating past performance and tests provides valuable information that is considered in the design of the VTR. Appendix D, Section D.3.3.2, discusses safety analyses that have been performed for the VTR. Appendix D discusses how the VTR is being designed to ensure safety throughout proposed operating conditions. The VTR design is also resilient under potential accident or upset conditions. DOE guidance for design of the VTR focuses on reducing or eliminating hazards, with a bias toward preventive, as opposed to mitigative, design features and a preference for passive over active safety systems. This general approach creates a design, which is reliable, resilient to upset, and has low potential consequences of accidents. Safe operation of the VTR is ensured by reliable systems design to ensure preservation of the key reactor safety functions. These key safety functions are (1) reactivity control, (2) fission- and decay-heat removal, (3) protection of engineered fission product boundaries, and (4) shielding.

18-5 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost. Support and funding for nuclear energy versus renewable energy technologies is outside the scope of this VTR EIS.

Commenter No. 19: Jeremy Gneiting

From: Jeremy Gneiting
Sent: Thursday, February 11, 2021 9:39:21 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Feedback from local citizen

Hello,

I am a systems engineer with an undergraduate degree in electrical engineering and a graduate degree in business administration. I grew up in Rigby, Idaho and have recently moved back to this area of southeastern Idaho. I love it here and am well aware of the climate change that needs to happen to lower carbon emissions and I have a keen understanding of the "bigger picture". I think that Nuclear power is a MUST when it comes to planning for future energy needs.

19-1 I just wanted to say how much I appreciate the government putting forth research in this area. The Versatile Test Reactor is a great idea!!! Everyone talks about "Going Green" and they bring up unreliable technology like wind and solar. These inferior technologies are NOT what has made our nation great, nor are they that "Green". They are intermittent, unreliable and costly with their own forms of waste disposal issues. All one needs to do is look at the rolling brownout issues across California to understand the unreliable nature of these technologies. Systems engineers know to look at the bigger picture and understand risks and tradeoffs. We want proven technology. Nuclear power has been around for decades and continues to provide safe, reliable and carbon free energy. **19-2** This continued research into Nuclear power generation will create needed jobs for the area, will increase the safety of Nuclear power generation and demonstrates technological superiority of the United States of America. Advancing this technology empowers unlimited potential for future generations. **19-1 cont'd** I have no issues with the EIS and hope that you are able to use Idaho National Labs to further these goals. I appreciate all the information you have provided online and the thorough explanations. I wish you success in getting the VTR completed.

Thanks,

Jeremy Gneiting

19-1 DOE acknowledges your preference for the Idaho National Laboratory (INL) VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

19-2 DOE acknowledges your support of the proposed project and acknowledgement of the beneficial economic impacts it is expected to have on the region and State of Idaho.

Commenter No. 20: Peter Rickards

From: Peter Rickards
Sent: Monday, January 25, 2021 8:19:10 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Official comment: VTR draft ignores the HEPA filter's fatal flaw of leaking plutonium via "alpha recoil" & ignores "more toxic" nanoparticles, AGAIN! Draft EIS comments #1

Hi DOE,
This is the news release I just sent out, focusing on just 2 of the 13 issues you criminally have covered up in your draft EIS.
It is treason for public health officials to ignore and lie about serious health threats, yet you continue to do it.
As I predicted, the expensive VTR EIS for INL has again refused to detail the actual amount of plutonium and uranium that WILL be released during both "normal" and accidents.
I had asked detailed scientific scoping questions using official DOE documents, hidden in archives, or needing legal action via The Freedom Of Information Act, to reveal the hidden deadly truth.
So why spend millions to whitewash the real and deadly IMPACTS of the nuclear cluster aimed at Idaho?
Why is our paid DEQ oversight and Attorney General silent, except for praising these nuclear experiments as "safe"?
For example: They can NOT make nuclear fuel without spewing plutonium and uranium particles through multiple HEPA filters because the hot particles KNOCK THEMSELVES OFF THE FILTERS via "alpha recoil"! This is NOT supposed to happen!
Here is where the draft EIS simply dismisses their OWN documentation I reveal. The DOE simply ignores the 100% contradictory alpha recoil flaw and says "standard testing" claims the HEPA filters work well, so they will stick to that claim, despite this fatal flaw.
DOE simply says " HEPA filters used in support of the VTR activities would conform to the latest version of DOE Standard "Specifications for HEPA Filters Used by DOE Contractors."
Contrast that with the truth from the OSTI archive url below on alpha recoil problems. " This process results in the continuous size reduction and transport of particles containing Pu-238 atoms, thus explaining movement of contamination along surfaces and through HEPA filters." DOE knows it goes through even 4 filters in a row since the 1970's Oak Ridge experiments McDowell did, that I provided!
Contrast that with the government worker protectors doctors at NIOSH I submitted to blind eyes:
This is a quote from NIOSH but I found it on the Canadian Health Dept url at https://www.ccohs.ca/oshanswers/chemicals/how_do.html on these very small fragments from alpha recoil.

Nanoparticles are those particles that range in size from 1 to 100 nanometres (nm).
At this size, materials begin to exhibit unique properties that affect physical, chemical, and biological behavior. ... **Studies have indicated that low solubility nanoparticles are more toxic than larger particles on a mass for mass basis**. There are strong indications that particle surface area and surface chemistry are responsible for observed responses in cell cultures and animals. Studies suggests that some nanoparticles can move from the respiratory system to other organs.

20-1

20-1 DOE is aware of the reported phenomenon and has studied the performance of HEPA filters to ensure they meet their intended function. Refer to the discussion in Section 2.11, "High-Efficiency Particulate Air (HEPA) Filter Performance," in this CRD.

Commenter No. 20 (cont'd): Peter Rickards

Nanomaterials that can be inhaled, ingested or can penetrate skin indicate a potential for exposure and present the possibility of potential health effects. **Processes that lead to airborne nanometer-diameter particles, respirable nanostructured particles (typically smaller than 4 micrometers) and respirable droplets of nanomaterial suspensions, solutions and slurries are of particular concern for potential inhalation exposures.**

Results from experimental animal studies with engineered nanomaterials have provided evidence that some **nanoparticle exposures can result in serious health effects** involving pulmonary and cardiovascular systems and possibly other organ systems.
From: NIOSH (2017) Nanotechnology

DEQ never mentions alpha recoil on their website, despite me documenting this fatal flaw since my 3rd year of doing their job, in 1991. Silence is golden but plutonium is NOT good to inhale!
This is just the simple version of my official draft comments, of one of the 13 issues I submitted in my scoping questions. All 13 were ignorantly dismissed by DOE. Sincerely ...
Peter Rickards

Here is the DOE dismissal url and one of my correcting OSTI url below:

file:///C:/Users/1stun/AppData/Local/Temp/Temp1_EIS_0542__Summary.zip/EIS-0542_AppendixG_ScopingCommentSummary.pdf

On Webpage 13/17
Comment Summary: A commenter requested DOE address the "fatal flaw" of plutonium and uranium moving through high-efficiency particulate air (HEPA) filters due to "alpha recoil."
DOE Response: The real-world performance of multiple stages of HEPA filters has been well demonstrated and experimental testing confirms the performance of HEPA filters for uranium and plutonium particles. The independent Defense Nuclear Facilities Safety Board (DNFSB) thoroughly evaluated the use of HEPA filters by DOE) and has issued multiple reports on the performance of HEPA filters within the DOE complex. HEPA filters used in support of the VTR activities would conform to the latest version of DOE Standard "Specifications for HEPA Filters Used by DOE Contractors," DOE-STD 3020-2015. Performance testing required by this standard for all HEPA filters credited for safety would ensure that the filters meet or exceed the performance requirements assumed in safety evaluations.

http://www.osti.gov/energycitations/product.biblio.jsp?query_id=0&page=0&osti_id=969795
Consequently, the entire particle of which that Pu-238 atom is a constituent experiences a movement similar to the recoil of a gun when a bullet is ejected. Furthermore, the particle often fractures in response to Pu-238 atom disintegration (yielding an alpha particle), with a small particle fragment also being ejected in order to conserve momentum. **This process results in the continuous size reduction and transport of particles containing Pu-238 atoms, thus explaining movement of contamination along surfaces and through HEPA filters.**

20-1 cont'd

Response side of this page intentionally left blank.

Commenter No. 21: Julie Hoefnagels

From: julie
Sent: Thursday, February 11, 2021 8:02:55 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] VTR Comments

To whom it may concern:

I understand that the deadline is upon us for offering comments regarding the new Versatile Test Reactor (VTR) proposed for construction at the Idaho Nuclear Laboratory.

I am a longtime Idaho resident, and I am against such a project coming to the INL for the following reasons: **21-1**

1. The VTR uses liquid sodium for coolant. Liquid sodium is a highly volatile substance, which can explode or become flammable when it comes in contact with either air or water. As such, it is a high risk to health and safety. **21-2**

2. The cost of building such a reactor is prohibitive, and would be borne by the Idaho taxpayer. These projects are always "over" on timeline and budget, and I do not feel it is a good investment of taxpayer dollars, especially given its many risks. **21-3**

3. I uses plutonium as a fuel, which is a substance that can potentially contribute to proliferation of nuclear materials and weapons. **21-4**

4. Finally, my largest objection, is that there is not yet, anywhere in the United States, a longterm repository for nuclear waste. **21-5** I do not want MORE nuclear waste lying above the Snake River Plain Aquifer, posing a longterm threat to this source of drinking water and irrigation for nearly half the population of the state. Future generations will judge us for not being more far-sighted. **21-6**

Thank you for your consideration,

Julie Hoefnagels
Boise, ID

21-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

21-2 DOE takes its responsibility for the safety and health of the workers and the public seriously. The Experimental Breeder Reactor (EBR)-II and the Fast Flux Test Facility (FFTF) demonstrated safe operation with sodium as the coolant. Using past reactor operating experience and knowledge gained from extensive inherent safety testing at EBR-II and FFTF, along with advanced analysis tools, the VTR is being designed to safely operate with sodium as the coolant. Appendix D, Section D.3.3.1, reviews the history of sodium-cooled reactor operations and accidents. Sodium-cooled reactors have been operated for a number of years. The discussion in Appendix D considers events and tests at EBR-I, Fermi-I, Phenix, SuperPhenix, MONJU, FFTF, and EBR-II. The discussion provided in Appendix D acknowledges the concerns mentioned in the comments as well as other information related to tests in FFTF and EBR-II. Evaluating past performance and tests provides valuable information that is considered in the design of the VTR. Appendix D, Section D.3.3.2, discusses safety analyses that have been performed for the VTR. Appendix D discusses how the VTR is being designed to ensure safety throughout proposed operating conditions. The VTR design is also resilient under potential accident or upset conditions. DOE guidance for design of the VTR focuses on reducing or eliminating hazards, with a bias towards preventive, as opposed to mitigative, design features and a preference for passive over active safety systems. This general approach creates a design, which is reliable, resilient to upset, and has low potential consequences of accidents. Safe operation of the VTR is ensured by reliable systems design to ensure preservation of the key reactor safety functions. These key safety functions are (1) reactivity control, (2) fission- and decay-heat removal, (3) protection of engineered fission product boundaries, and (4) shielding.

21-3 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS,

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and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost. The U.S. Government would provide funding collected from all U.S. taxpayers for the VTR and associated facilities through congressional appropriation. The 2021 Energy and Water Development and Related Agencies appropriations bill (R46384), directed DOE to give the Appropriations Committees "a plan for executing the Versatile Test Reactor project via a public-private partnership with an option for a payment-for-milestones approach." The bill also included the Energy Act of 2020, which, in Section 2003, further directed DOE to proceed with the design and construction of VTR and authorized its funding. DOE plans to continue to work with private sector and foreign governments to establish needed collaborations and partnerships to successfully complete the project. Congressional appropriations and funding priorities are outside the scope of this VTR EIS.

21-4 DOE acknowledges your concern regarding nuclear proliferation. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic.

21-5 The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as spent nuclear fuel (SNF) annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

21-6 Please refer to Section 2.6, "Snake River Plain Aquifer," of this CRD for a discussion of this topic and DOE's response.

Commenter No. 22: Sheri Seljaas

From: Sheri Seljaas
Sent: Thursday, January 28, 2021 3:47:33 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Reactor

Build the reactor, we need it! ***22-1***

Sheri Seljaas

Sent from my iPhone

22-1 DOE acknowledges your preference for the VTR project. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

Commenter No. 23: Tami Thatcher

Public Comment Submittal on the U.S. Department of Energy's Versatile Test Reactor Draft Environmental Impact Statement (VTR EIS) (DOE/EIS-0542)

Comment submittal by Tami Thatcher, February 11, 2021.

Comments Due: February 16, 2021. Sent by email to VTR.EIS@Nuclear.Energy.gov

BACKGROUND

The draft Environmental Impact Statement for the Versatile Test Reactor (VTR) considers the potential environmental impacts for the construction and operation a new Department of Energy regulated test reactor, and associated facilities for post-irradiation evaluation of fuels and other materials, VTR driver fuel production (fuel feedstock and fuel fabrication), and the managing of its spent nuclear fuel. The VTR would be a 300 megawatt (thermal) fast neutron reactor that does not generate electricity and is only used for high neutron bombardment of fuels and other materials. The VTR is a pool-type, sodium-cooled reactor with a fast-neutron spectrum and will use a uranium-plutonium-zirconium metal fuel.

GE Hitachi Nuclear Energy is working with the Idaho National Laboratory on the VTR conceptual design based on its PRISM reactor, which was based on the Experimental Breeder II reactor. [1] The EBR II which was operated by Argonne National Laboratory – West at the Idaho site which is now the Materials and Fuels Complex (MFC) at the INL, although the EBR II has been dismantled. The 60-year-old pyroprocessing facility at MFC, the Fuel Conditioning Facility (FCF) remains at the former EBR II complex.

SUMMARY OF VTR EIS INADEQUACY

23-1 I disapprove of the DOE's preferred alternative, to construct the VTR at either proposed location, the Idaho National Laboratory or the Oak Ridge National Laboratory because of cost, accident risk and nuclear weapons proliferation concerns.

I disapprove of the DOE's extensive plutonium fuels feedstock and fabrication processes, either at the INL or the Savannah River Site, also because of cost, accident risk and nuclear weapons proliferation concerns.

23-2 The Department of Energy's Federal Register notice that is in Appendix A of the VTR EIS – actually quotes DOE as having an objective of the VTR to lead to **reduced nonproliferation concerns**. Translated this means DOE's stated goal is to *increase the proliferation concerns* – Which may be an error by the DOE, but it is exactly the opposite of what we all want – which is to reduce proliferation concerns and keep nuclear weapons material like plutonium-239 out of nuclear weapons.

[1] Press Release, GE Hitachi, "GE Hitachi and PRISM Selected for U.S. Department of Energy's Versatile Test Reactor Program," November 13, 2018. https://www.ge.com/news/press-releases/ge-hitachi-and-prism-selected-us-department-energys-versatile-test-reactor-program

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23-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition"; Section 2.3, "Nonproliferation"; and Section 2.7, "VTR Facility Accidents," of this CRD for additional information.

23-2 As implied by the commenter, the intended message regarding nuclear proliferation was incorrectly stated. This language, which was also used elsewhere in Draft VTR EIS, has been corrected in Chapter 1 and the Summary of the Final VTR EIS. Because Appendix A is a copy of a previously issued Federal Register notice, that text was not changed. The commenter refers to pyroprocessing; it should be noted that the VTR EIS does not propose use of pyroprocessing on fuel that is removed from the reactor or any other existing spent fuel. No nuclear materials (e.g., plutonium)

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The VTR project creates added nuclear weapons proliferation risks, above and beyond the pyroprocessing technology, capable of separating plutonium from the spent nuclear fuel. The INL has already sold the pyroprocessing technology to South Korea, purportedly for waste reduction, although neither the U.S. nor the VTR project use pyroprocessing for that purpose. The VTR's extensive use of plutonium in its fuel, 20 percent by weight, will create many opportunities for diverting weapons-usable plutonium in a form that is not coupled with high levels of gamma radiation from fission products that are present in spent nuclear fuel.

The Department of Energy's plutonium disposition programs, including the failed MOX plant have had the effect of weakening both domestic and international standards for securing nuclear material. The VTR program will clearly have the impact of weakening such standards, especially as it seeks to import nuclear materials from abroad, transport them around the U.S., and weaken security restrictions for materials at commercial nuclear power plants or envisioned Department of Defense nuclear power suppliers. The cost of shipping containers, of shipping escorts and at plant security for storage will provoke cost-cutting measures, should fast reactors and other reactor designs become more prevalent in the U.S. or in other countries that customers are being sought. **23-2 cont'd**

The VTR EIS is ambiguous as to what specific U.S. surplus plutonium is actually feasible and cost effective to use for creating the VTR metal fuel. In fact, it appears that the 34 metric tons of plutonium (24 MT for VTR fuel and 10 MT of scrap from making the VTR fuel) is likely to come from the Europe, either the UK or France rather than from U.S. excess weapons plutonium. The VTR EIS must acknowledge the impact of increasing U.S. plutonium inventory from importing additional plutonium from abroad. And should the VTR program be terminated due to cost or an accident, the imported plutonium will have significantly increased, rather than decreased the amount of surplus plutonium requiring storage and ultimately, disposal in the U.S. **23-3**

The VTR EIS needs to include the amount of plutonium that will be used in experiment fuels and materials. The VTR EIS needs to provide a bounding estimate of the irradiated fuels and materials (other than VTR fuel) that DOE will have as waste, and must identify the individual radionuclides and their curie amounts and where these wastes will be disposed of. It is unacceptable for the DOE to deem irradiated fuels as not being spent nuclear fuel when used in research or as experiments, in order to bury over the Snake River Plain aquifer at the INL. **23-4**

The routine radiological emissions from VTR fuel and its fueled and non-fueled experiments and the isotopes program pose unacceptable continuing and escalating harm to the public, above the radiological releases the public is already emersed in from the INL. The VTR EIS has failed to acknowledge the past and ongoing radiological releases from the INL and has failed to acknowledge the harm that is clearly seen in Idaho cancer incidence statistics. **23-5**

The VTR EIS has failed to come to grips with the inadequate environmental surveillance program that gives the Department of Energy the ability to not give data to the U.S. Environmental Protection Agency as well as gives the DOE the ability to hide unfavorable environmental monitoring results and allows incorrect attribution as to the source of elevated levels of radionuclides in air, water or soil. The VTR EIS must address the gaps and errors in the Department of Energy's environmental surveillance program, currently at idahoeser.com. **23-6**

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would be recovered from the spent nuclear fuel (SNF). Following treatment, SNF would be packaged for disposal. See Section 2.3, "Nonproliferation," of this CRD for DOE's response to comments regarding proliferation. DOE disagrees that the VTR program would negatively impact standards for securing nuclear material.

23-3 DOE's potential sources of plutonium for use as feedstock to VTR fuel production are presented in Chapter 2, Section 2.6, of this EIS. DOE expects to use DOE plutonium in the VTR. As indicated in Section 2.6, most of the foreign material is reactor-grade plutonium and acceptable, though not preferable, for VTR fuel. Transport and management of plutonium from foreign countries is discussed in Appendix F of this VTR EIS. If foreign sources of plutonium were used, transfer of materials for VTR fuel would not be expected until the VTR construction is proceeding. Refer to Section 2.4, "Plutonium Use and Disposition," of this CRD regarding the quantity of foreign plutonium that may be in DOE's possession if the VTR were cancelled. The specific components of experiments is not known at this time and would be formulated as the VTR nears operation.

23-4 The operational lifetime of the VTR is projected to be 60 years. It is not possible to provide a definitive estimate of the entire set of tests performed and quantities of test materials (including test fuel elements) used over that lifetime. The various wastes that would be generated from the VTR operation, and its support facilities, including the post-irradiation examination operations, are estimated in *Versatile Test Reactor Wastes and Material Data for Environmental Impact Statement* (INL 2020c). This Idaho National Laboratory (INL) report provides the estimated volumes of different wastes from each facility operation, along with the expected radionuclide inventories for each type of waste from each facility. At this early stage of the project, the quantities of those materials for post-irradiation examination operations (including test fuel assemblies) are not definitively known and are best estimates. In this VTR EIS, waste quantities are presented in Appendix B, Chapter 4, and in the summary of environmental consequence tables in Chapter 2 and the Summary. As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities, not "buried over the SNP aquifer." The test and experimental irradiated fuels would be managed in accordance with applicable laws, regulations, and DOE orders, based on their radioactivity contents.

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Construction of the VTR at the Idaho National Laboratory's Materials and Fuels Complex enables and requires the use of seismically inadequate facilities including the already 60-yer-old Fuel Conditioning Facility (FCF) and other hot cells. 23-7

The VTR if built at the MFC escalates the routine radiological emissions and accident risks to communities near the INL, including Blackfoot, Idaho Falls and Rexburg. 23-5 cont'd

The VTR costs for construction are grossly underestimated as are the life cycle costs. The U.S. taxpayer will be on the hook for billions of dollars in the effort to construct the VTR. Inadequate completion of the design prior to beginning construction has failed in previous Department of Energy projects, notably the Department of Energy's Savannah River Site's cancelled MOX plant.

DOE's goal is private profits at taxpayer expense — and then to leave the taxpayer on the hook for the long-term radiological waste management of spent nuclear fuel, high-level waste and other radioactive waste, if all goes well, and extensive radiological cleanup if sometimes it doesn't. 23-8

The groups or companies that want experiments in a materials' testing reactor will typically only pay for the cost of fabricating and installing the experiment. The needed safety evaluations may or may not be paid for by the experimenters. But in no case have I seen the experimenters pay any substantial portion of the material test reactor's construction or operating costs. The extent to which, again, the profits will be privatized while the tax payer pays for this high-risk gamble must be included in the VTR EIS.

The VTR EIS has relied on the inadequate and deeply flawed DOE EISs for spent nuclear fuel management and disposal. The Department of Energy has no disposal program. The Department of Energy has not admitted how many trillions of dollars it may spend in trying to find a way to safely dispose of the nation's spent nuclear fuel and high-level waste. Whether or not it is feasible for a repository to actually safely contain the waste must be revisited.

The Department of Energy has long argued that the disposal of commercial spent nuclear fuel was paid for by the fee collected from electricity generated by commercial nuclear reactors, the $0.001/kWh fee authorized by the Nuclear Waste Fund. That fee is no longer being collected because a court found that the Department of Energy has no spent nuclear fuel disposal program, and the DOE has no appropriate cost estimate of what the SNF disposal program will cost. The collected fee has been implied to cover the cost of spent nuclear fuel disposal but the $30 or so billion that has been collected would be consumed by repackaging or packaging the SNF into disposable containers. 23-9

The Department of Energy has failed to estimate the costs of spent nuclear fuel and high-level waste disposal, although it has revealed that those costs may be many trillions of dollars, that have not been allocated to address the waste disposition. This places a tremendous burden on future generations and the VTR EIS must not ignore it.

The cost of the spent nuclear fuel disposition of the VTR fuel, the scrap from fuel fabrication, the experiment fuel, and the spent fuel to be created as the result of research in the VTR must be addressed. The cost of continued repackaging of the spent nuclear fuel and what technology and

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23-5 Radiological release information is readily available to the public in the INL Annual Site Environmental Reports (ASERs), six of which are referenced in Chapter 3, Section 3.1.10, of the Final EIS. (All six identify the quantity of americium released from the INL Site each year.) Since the EIS evaluates human health impacts in terms of dose and latent cancer fatalities, the offsite dose information provided in those same ASERs are reproduced in the EIS. It is not necessary to reproduce the radiological release data. This EIS provided information on the cancer rates in the area of interest around the INL Site (see Chapter 3, Section 3.1.10). The overall cancer rate for the surrounding counties is lower than that for Idaho and for the U.S. in general. It is not the purpose of this EIS to establish a cause for any of these cancer rates. Cancer is caused by both external factors (e.g., tobacco, infectious organisms, chemicals, and radiation) and internal factors (inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). Risk factors for cancer include age, alcohol, cancer-causing substances, chronic inflammation, diet, hormones, immunosuppression, infectious agents, obesity, radiation, sunlight, and tobacco use. Therefore, to determine the cause of any incidence of cancer can be very difficult as there are many confounding factors. Potential impacts from the operation of the VTR are presented in Chapter 4; impacts on human health are presented in Section 4.10. As stated there, no additional cancer fatalities would be expected among the general population.

23-6 The INL Site environmental surveillance programs collect and analyze samples or direct measurements of air, water, soil, biota, and agricultural products from the INL Site and offsite locations in accordance with DOE Order 458.1, "Radiation Protection of the Public and the Environment"; DOE-HDBK-1216-2015, "Environmental Radiological Effluent Monitoring and Environmental Surveillance"; and DOE-STD-1196-2011, "Derived Concentration Technical Standard." The purpose of DOE Order 458.1 is to establish requirements to protect the public and the environment against undue risk from radiation associated with radiological activities conducted under the control of DOE pursuant to the Atomic Energy Act of 1954, as amended. Monitoring activities are performed to generate measurement-based estimates of the amounts or concentrations of contaminants in the environment. Measurements are performed by sampling and laboratory analysis or by "in place" measurement of contaminants in environmental media. The programs meet or exceed requirements within these governing documents and have been determined through technical review to effectively characterize the levels and extent of radiological constituents in the environment and distinguish INL Site-related contributions from those typically found in the environment at background levels. The Annual Site facilities must be available to repackage the VTR fuel must be explained. The VTR EIS must explain how VTR spent nuclear fuel will be dealt with if the aging FCF facility is not available for removal of the sodium and making the spent fuel ingots.

The unique VTR fuel, treated and untreated, creates new unanalyzed problems for repository disposal and the VTR EIS must address when and how this will be addressed and who will bear the costs.

The DOE's EISs for spent nuclear fuel management are inadequate. And spent nuclear fuel management is unsustainable from a growing cost liability point of view that places an enormous burden on future generations to continue to try to isolate the waste from air, soil and water by repeatedly repackaging the waste and/or by continuing to seek a repository to adequately confine the waste.

The VTR EIS must acknowledge that the DOE has already exceeded its allotted limit of spent nuclear fuel and HLW in Yucca Mountain. The VTR EIS must explain how after decades of promising to open a repository but failing to, that the DOE, with no repository program since 2010, is going to obtain a repository.

23-9 cont'd

The VTR EIS downplays the accident risks without technical basis and greatly increases the risk of radiological accidents that may be devastating for SE Idaho.

It downplays the isotope production role of the VTR and it is almost as if the Department of Energy sought to create the most expensive, least reliable, most electricity-use intensive, most accident-prone way of irradiating isotopes by selecting the VTR.

VTR accident release fractions underestimate the radiological impacts and as always, the idealized wind dispersion uniformly spreads the radiation around so that no one in particular is terribly harmed, except if you were near to the accident or it was a beyond-design-basis accident, which, world-wide, nuclear reactors tend to have every decade or so.

23-10

The VTR may leave citizens uncompensated for transportation accidents and facility accidents. The Price-Anderson Act is designed to undercompensate citizens and may not compensate citizens for certain contamination events such as transportation accidents.

23-11

DOE oversight is notoriously inadequate and often fails to protect workers, the public and the environment. This draft VTR EIS is pretending that Department of Energy regulatory oversight of the VTR will mean prudent, effective oversight but the history of the Department of Energy nuclear oversight proves otherwise. See the 2014 accidents at the Waste Isolation Pilot Plant (WIPP) and the 2011 plutonium inhalation event at the Idaho National Laboratory's Materials and Fuels Complex, which were both found to illuminate the fact that both DOE operations had multiple failed safety programs and failed to implement DOE regulations.

23-12

Department of Energy nuclear facilities, including its reactors, are notorious for the practice of lacking as-built drawings and of failure to maintain facility drawings as design changes are made. This alone increases the likelihood of an accident at a DOE-regulated facility. But there are other reasons for the increased accidents risks because of DOE's ability to keep plant

23-13

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Environmental Report (ASER) describes the quality assurance program to ensure validity of results from the environmental surveillance programs. Quality assurance is an integral part of every aspect of an environmental monitoring program, from the reliability of sample collection through sample transport, storage, processing, and measurement, to calculating results and formulating the report. Monitoring performed by the INL Management and Operations (M&O) contractor; the Idaho Cleanup Project Core contractor; the INL Environmental Surveillance, Education, and Research (ESER) Program contractor (independent from the M&O contractor); and the Idaho Department of Environmental Quality (DEQ) INL Oversight Program demonstrate that impacts from the INL are low and consistent with the emissions reported in annual INL radionuclide National Emission Standards for Hazardous Air Pollutants (NESHAP) reports. DOE contractors' ambient air monitoring data are reported annually in the ASER which are available at http://idahoeser.com/Publications.html. DEQ's INL Oversight Program Annual Reports are available at DEQ's INL Oversight Monitoring Program website (https://www.deq.idaho.gov/idaho-national-laboratory-oversight/inl-oversight-program/).

23-7 DOE takes its responsibility for the safety and health of the workers and the public seriously. DOE is dedicated to maintaining records of facility configuration and maintaining transparency in operations. Facilities are operated in accordance with their approved safety basis authorization and maintained to reduce the likelihood and consequences of an accident. This EIS evaluates the impacts of seismically initiated accidents at MFC facilities (including FCF) that could be used by the VTR project.

23-8 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost. The U.S. Government would provide funding for the VTR and associated facilities through congressional appropriation. The 2021 Energy and Water Development and Related Agencies appropriations bill (R46384), directed DOE to give the Appropriations Committees "a plan for executing the Versatile Test Reactor project via a public-private partnership with an option

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problems secret in order to avoid public scrutiny and DOE's loose way of ignoring existing requirements. **23-13 cont'd**

DOE is ignoring state and federal laws regarding protections for the State of Nevada where the Yucca Mountain repository was to be sited, the State of New Mexico where the Waste Isolation Pilot Plant (WIPP) is located, and many states as DOE proclaimed that it could reclassify high-level waste to low-level waste, at whim. And the DOE is ignoring its legal settlement with the State of Idaho to remove the spent nuclear fuel stored at the Idaho National Laboratory. The Department of Energy has sought to unravel the Idaho Settlement Agreement, rather than do the work to comply with it. **23-14**

DOE's failure to adequately design facilities for and inspect those facilities and the spent nuclear fuel they hold is long standing and has required state and federal intervention to get DOE to begin to address its problems. EBR II spent nuclear fuel corroded in an INL spent fuel pool while the DOE had not inspected the fuel or taken timely actions to address the deteriorating fuel, even as the strontium levels workers were exposed to were recognized. DOE's messes often require federal and state intervention, but by then, the messes are so large that that little cleanup is accomplished even with billions of dollars of cleanup money annually, for the INL, Hanford, Savannah River Site and others. **23-15**

Reliance on institutional controls to forever repackage spent nuclear fuel in Idaho violates NEPA. There is no repository despite winks and hints that Yucca Mountain would be opening soon. The consequences of spent nuclear fuel blowing in the wind are devastating, cannot be remediated and the importance of our land and our lives is frequently diminished because we live in the "low population zone." **23-16**

DOE's past isotope production has been far more polluting than DOE admits and it will be far worse placed closer to Idaho Falls and in a riskier reactor.

The VTR EIS needs to present the total plutonium-241 and amercicium-241 releases from the INL and the VTR operations including isotope production and include the Pu-2341 and Am-241 releases. The VTR EIS needs to present the historical plutonium and americium releases because the environmental surveillance reports for the INL through the years have been inconsistent in whether or not plutonium and americium was reported. These actinides decay through a series of radioactive decays and persist in the environment. Plutonium-241 decays to americium-241. Americium-241 is an alpha emitter but also has a gamma ray that penetrates into tissue by 1 centimeter. **23-17**

The Department of Energy knows very well the extremely large increases in the predicted thyroid cancer incidence from americium-241 and other radionuclides and must present this information in the EIS.[2] The VTR EIS cannot simply focus on the deaths from cancer, it must include cancer incidence, particularly from radionuclides with now recognized far higher thyroid cancer incidence risk per rem. The VTR EIS also must not ignore the elevated rates of cancer

[2] T.R. Hay and J.P. Rishel, Pacific Northwest National Laboratory, Department of Energy, *Revision of the APGEMS Dose Conversion Factor File Using Revised Factor from Federal Guidance Report 12 and 13*, PNNL-22827, September 2013. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22827.pdf

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for a payment-for-milestones approach." The bill also included the Energy Act of 2020, which, in Section 2003, further directed DOE to proceed with the design and construction of VTR and authorized its funding. The DOE Office of Nuclear Energy (NE) mission is to advance nuclear energy science and technology to meet U.S. energy, environmental, and economic needs. Within this mission, a goal of DOE-NE is to enable the development of advance nuclear reactors, which requires DOE-NE to provide unique facilities and capabilities not available in the private sector. DOE plans to continue to work with private sector and foreign governments to establish needed collaborations and partnerships to successfully complete the project. Congressional appropriations and funding priorities are outside the scope of this VTR EIS. Once operational, the VTR would be designated as an Office of Nuclear Energy, Nuclear Science User Facilities (NSUF) partner facility. Through NSUF, access would be available to universities, DOE national laboratories, and industry through competitive peer-reviewed processes. In addition to access through NSUF, users can also gain access to the VTR on a pay-for-access basis. There is the potential for cost sharing with industry and other governments, but at this time, no such arrangements have been made. DOE would be the owner and operator of the VTR and would assume all risks and responsibilities associated with its operation. Requests for access would be evaluated for technical feasibility, safety, and capability of resources requested to perform the proposed work. The specific details of how experiments would be funded is outside the scope of this VTR EIS. For information on spent fuel storage and disposal, please see Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

23-9 DOE acknowledges the commenter's concerns regarding the lack of a permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of this VTR EIS. In addition, the costs to manage this SNF and HLW, are also outside the scope of this VTR EIS. The VTR Alternatives and Reactor Fuel Production Options include upgrades to the FCF facility as part of the proposed actions and include an evaluation of those upgrades as part of the overall National Environmental Policy Act (NEPA) analyses. The FCF upgrades are an integral part of the proposed actions and therefore would be available should the decision be made to proceed with the INL VTR Alternative and Reactor Fuel Production Option. The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as SNF annually. If the VTR operated

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incidence and death in children and younger adults, which we also see in communities surrounding the INL. **23-17 cont'd**

DOE's environmental monitoring program is inadequate and the program is designed more around hiding the INL's contamination than revealing it. **23-6 cont'd**

Cancer rates in counties surrounding the INL are elevated, particularly for the incidence of thyroid cancer. The VTR EIS has failed to address the continuing radiological releases of Pu-241 and Am-241 from the INL. The VTR EIS has selected 2018 environmental surveillance, while ignoring far higher annual releases during the last 20 years. The DOE's environmental surveillance reporting has unexplained gaps, omissions and technically unsupportable explanations that deny radionuclides are from the INL. The DOE's environmental surveillance reports have routinely explained the Am-241 as being from past nuclear weapons testing, when in fact, numerous CERCLA cleanup reports have found extensive at-facility radiological contamination, including Am-241, that cannot be attributed to past weapons testing. **23-17 cont'd**

DOE ignores scientific evidence, the diverse compelling human epidemiology of more health harm from radiation so that it can avoid costs and inconvenience of tighter worker and public radiological protection

Workers harmed by the Department of Energy's operations are often denied illness compensation by the Energy Employee Occupational Illness Compensation Program while the program slowly conducts investigations into the inadequacies of the INL radiological protection programs. **23-18**

VTR worsens radioactive waste disposal issues for LLW and GTCC as does the Department of Energy's High-Level Waste Reclassification effort. Spent nuclear fuel deemed "experimental" can be buried over the Snake River Plain aquifer on the Department of Energy site. **23-19**

VTR and associated research will in no way work to reduce energy poverty in developing countries, but it may produce energy poverty and poverty in general, in the U.S. **23-20**

The VTR EIS must discuss the problems associated with weapons proliferation, spent nuclear fuel management, radioactive waste (other than spent fuel), routine radiological releases, and the actual health and financial harm to citizens from the routine and accident radiological emissions.

The VTR EIS must provide more transparency overall and must provide a comprehensive explanation of the costs that will plague future generations of people from routine emissions, from accidents and from spent nuclear fuel management and other radioactive waste disposal. **23-21**

The VTR EIS as written white washes the radioactive waste problems and ignores the financial burdens. The VTR project will have devastating effects wherever it is built because of the ongoing emissions and the damage to human health for people working at the project and people living anywhere near it.

I don't think I can possibly convey how terrifying the VTR project is, because I've seen through the years the reality of family, friends, coworkers, and other people in southeast Idaho **23-22**

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continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

23-10 DOE takes its responsibility for the safety and health of the workers and the public seriously. DOE prepared this EIS and included all information necessary to determine the potential for substantial environmental impact. DOE disagrees with the assertion that the accident risks for the VTR are being downplayed. The accident analysis was conducted using the MELCOR Accident Consequence Code System, Generation 2 (MACCS2) computer program/code (WinMACCS, Version 3.11.2) to model accident conditions. MACCS2 was used to calculate radiation doses and health risks to the noninvolved worker, the maximally exposed offsite individual, and the population within 50 miles of the release point. The standard MACCS2 dose library was used. This library is based on *Cancer Risk Coefficients for Environmental Exposure to Radionuclides: Federal Guidance Report 13* (EPA 1999) inhalation dose conversion factors. The comment incorrectly asserts that idealized wind dispersion that uniformly spreads the "radiation around" is used. As presented in Section D.1.4.1 of this VTR EIS, site-specific meteorological monitoring data in the form of hourly readings for wind speed, wind direction, stability class, and accumulated precipitation were used for the impact calculations.

23-11 The Price-Anderson Act, as amended, ensures the public that prompt and equitable compensation will be available in the event of a nuclear incident or precautionary evacuation. The Price-Anderson Act would compensate members of the public following a transportation accident involving DOE radioactive materials.

23-12 DOE takes its responsibility for the safety and health of the workers and the public seriously. DOE would require safety analysis of configurations, tests, and experiments associated with the VTR to show that the VTR would continue to operate safely under the new conditions and in compliance with the documented safety analysis. Safe operation of the VTR and support facilities is paramount. DOE is committed to maintaining the safety basis for the VTR and all fuel production and support facilities in compliance with 10 CFR Part 830.

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whose lives have been shortened by the radiological releases from the Idaho National Laboratory. **23-22 cont'd**

VTR Creates Added Weapons Proliferation Risks

Fast reactors fission plutonium-239 more efficiently, yet the VTR with its uranium-238, uranium-235, and plutonium (and zirconium) fuel actually result in only a slight reduction in the plutonium-239, about 10 percent less in the spent fuel than in the fresh fuel. The presence of uranium-238 in a fissioning reactor produces plutonium-239 by neutron capture. **23-23**

Manufacture, storage and transportation of the 20 percent by weight plutonium fuel for the VTR creates a significant nuclear weapons proliferation risk. And because of the large stocks of weapons-usable plutonium-239 for the VTR fuel, the VTR and associated reactor research will promote nuclear weapons material proliferation.

The atomic bomb dropped on Nagasaki during WWII contained 6.2 kg Pu-239. The VTR will use 400 kg of Pu-239 annually. **The VTR increases the risk of nuclear weapons material proliferation.** **23-24**

The Department of Energy's Federal Register notice that is in Appendix A of the VTR EIS – actually quotes DOE as having an objective of the VTR to lead to **reduced nonproliferation concerns**. Translated this means DOE's goal is to *increase the proliferation concerns* – Which may be an error by the DOE, but it is exactly the opposite of what we all want – which is to reduce proliferation concerns and keep nuclear weapons material like plutonium-239 out of nuclear weapons.

The VTR Costs for Construction Are Grossly Underestimated, As Are the Life Cycle Costs

The Versatile Test Reactor cost estimates are likely to double several more times during design and construction.

The completion of the VTR can be reasonably expected to have years of schedule delays. This means that the VTR and projects that would test nuclear materials for new reactor designs will be too late to address climate concerns, a touted reason for the research VTR reactor.

The Department of Energy's project for far less complex conversion of 34 metric tons of surplus plutonium to mixed oxide fuel at the now cancelled Savannah River Site Mixed-Oxide Fuel Fabrication Facility was originally estimated to cost $1.4 billion to construct and be operating in 2004. By 2016, it was estimated to cost $17.2 billion and be completed by 2048.[3 4] The Department of Energy sunk almost $8 billion into the MOX facility which was cancelled in 2018. The U.S. Government Accountability Office reports that the approaches for managing or disposal of Department of Energy's roughly 57 metric tons (MT) of surplus plutonium has gyrated considerably over the last 20 years, and remains uncertain. **23-25**

[3] Douglas Birch and R. Jeffrey Smith, *Center for Public Integrity*, "Nuclear Waste: A $1 Billion Energy Department Project Overshoots Its Budget by 600 Percent," June 25, 2013. https://publicintegrity.org/national-security/nuclear-waste-a-1-billion-energy-department-project-overshoots-its-budget-by-600-percent/

[4] U.S. Government Accountability Office, Surplus Plutonium Disposition, GAO-20-166, October 2019. https://www.gao.gov/assets/710/702239.pdf

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23-13 DOE is dedicated to maintaining records of facility configuration and maintaining transparency in operations. The use of digital engineering methods would ensure the availability of "as-built" documentation. Facilities are operated in accordance with their approved safety basis authorization and maintained to reduce the likelihood and consequences of an accident.

23-14 Management of radioactive waste and SNF generated by the operation of the VTR would comply with applicable laws, regulations, permits, DOE orders and agreements. DOE undertook a structured process to address its interpretation of the definition of high-level radioactive waste (HLW) as announced in a series of *Federal Register* notices (83 FR 50909, 84 FR 26835, and 86 FR 5173). Comments related to the HLW interpretation are outside the scope of the VTR EIS.

23-15 The specifics of the comment relative to assertions regarding previous activities and situations at the INL Site, or other DOE sites, are outside the scope of this VTR EIS.

23-16 DOE is currently safely managing various spent nuclear fuels in wet and dry storage conditions at INL. The VTR SNF would be placed in dry cask storage and managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of this VTR EIS.

23-17 For information on risks associated with the operation of the VTR, please see Section 2.7, "VTR Facility Accidents," of this CRD. While the comment refers to impacts of past isotope production, please note the VTR is a test reactor, not an isotope production reactor. Information on INL radiological releases from existing operations (including isotope production) are readily available to the public in the INL Annual Site Environmental Reports (ASERs), six of which are referenced in Chapter 3, Section 3.1.10, of the Final EIS. (All six identify the quantity of americium released from the INL Site each year.) Since the EIS evaluates human health impacts in terms of dose and latent cancer fatalities, the offsite dose information provided in those same ASERs are not reproduced in the EIS. It is not necessary to reproduce the radiological release data. As stated above, this EIS (as is common practice in DOE EISs that include alternatives with potential radiological impacts) uses population and maximally exposed individual dose and latent cancer fatality as the measure of

The disposal of surplus plutonium by "dilute and dispose" is estimated to cost only half what the cancelled MOX project would cost. But it relies on having a place to dispose of the plutonium. There is no licensed facility, no facility under construction and no facility on the horizon for disposal of the surplus plutonium. The state law and federal laws intended to protect New Mexico are not respected by the Department of Energy, which tends to see the Waste Isolation Pilot Plant (WIPP) as the solution to all of its waste problems.

The Department of Energy had high hopes and a lot of hype for the failed MOX plant at the Savannah River Site. DOE hoped that the MOX fuel, a mixture of uranium and plutonium oxide, would find U.S. electrical utilities wanting to burn the MOX fuel in their nuclear reactors but DOE couldn't even give the fuel away. And with the Department of Energy's inability to control costs, quality, scheduled delivery of MOX fuel, or expected MOX fuel performance, the MOX facility at Savannah River Site was cancelled after spending almost $8 billion.

For the VTR project, the DOE now says it wants to fabricate over 24 MT over 60 years, of U-20Pu-10Zr metal fuel for the Versatile Test Reactor, build a nuclear reactor, manage the spent nuclear fuel, and all for less money than the failed Savannah River MOX plant. The MOX plant used existing technology for compressing the MOX powder into pellets, baking in furnaces and machining to a precise size needed to fit inside nuclear fuel rods. [5]

The Experimental Breeder Reactor II (EBR II) was a sodium-cooled, pool-type fast reactor. Yet, the EBR II primarily used uranium-zirconium metal fuel, not the 20 percent plutonium fuel, the uranium-plutonium-zirconium metal fuel that the DOE is planning to use for the VTR. The proposed fuel for the VTR is experimental, and poses significant cost, schedule and safety risks.

The Versatile Test Reactor cost estimates are likely to double several more times during construction. The construction costs are only a portion of the life cycle costs. And the ultimate costs of spent nuclear fuel and nuclear waste management are unknown.

23-25 cont'd

Private Profits at Taxpayer Expense

This VTR project is intended to promote private company profits at tax payer expense. For this reason, Department of Energy fails to acknowledge the full extent of economic costs of spent nuclear fuel (and high-level waste) disposal. This EIS fails to disclose the full cost of continued storage of spent nuclear fuel (and high-lever waste) as waste requires repackaging facilities and requires security.

No one in the U.S. or in other countries has wanted a PRISM sodium-cooled, fast reactor. For decades, PRISM has been available for the commercial sector to build. The push for sodium-cooled reactors and for fast reactors in general needs to be assessed honestly for what it is – simply a way to funnel money to a few individuals who are seeking tax payer money to fund research and nuclear projects.

23-8 cont'd

The groups or companies that want experiments in a materials' testing reactor will typically only pay for the cost of fabricating and installing the experiment. The needed safety evaluations

23-25 cont'd

[5] Douglas Birch and R. Jeffrey Smith, *Center for Public Integrity*, "Nuclear Waste: A $1 Billion Energy Department Project Overshoots Its Budget by 600 Percent," June 25, 2013. https://publicintegrity.org/national-security/nuclear-waste-a-1-billion-energy-department-project-overshoots-its-budget-by-600-percent/

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health impacts on the public. DOE recognizes that these are not the only potential impacts from radiation exposure. As the commenter notes, cancer incidence is also an impact, and the morbidity rate is higher than the mortality rate. The mortality rate used by DOE when making estimates of risk uses a conversion factor of 6×10^{-4} (the conversion factor used in this EIS), while the morbidity conversion factor suggested for use is 8×10^{-4}. Consistent use of the cancer mortality rates across all alternatives and fuel production options allows for an assessment of the differences in impacts between the alternatives. Adding the morbidity rate to the assessment would not add to the ability to differentiate between alternative impacts. The commenter is correct in noting that the relationship between the mortality rate and morbidity (occurrence) rate for thyroid cancers is lower than that associated with cancers in general (that is, the survival rate for thyroid cancer is higher than that for many other cancers); Federal Guidance Report 13 (EPA 1999) shows a mortality to morbidity ratio of 0.1. However at the low doses predicted from the radiological releases from VTR-related activities, including VTR fuel production (see Chapter 4, Section 4.1.10), no additional fatalities or instances of thyroid cancer would be expected. As noted by the commenter, there are elevated levels of thyroid cancer in the counties surrounding the INL Site. However, the overall cancer rate for the surrounding counties is lower than that for Idaho and for the U.S. in general. This EIS provided information on the cancer rates in the area of interest around the INL Site (Chapter 3, Section 3.1.10). It is not the purpose of this EIS to establish a cause for any of these cancer rates. Cancer is caused by both external factors (e.g., tobacco, infectious organisms, chemicals, and radiation) and internal factors (inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). Risk factors for cancer include age, alcohol, cancer-causing substances, chronic inflammation, diet, hormones, immunosuppression, infectious agents, obesity, radiation, sunlight, and tobacco use. Therefore, to determine the cause of any incidence of cancer can be very difficult as there are many confounding factors.

23-18 DOE does not ignore scientific evidence for the health effects from radiation. As needed, DOE updates its radiological protection requirements to implement requirements consistent with the latest approved information from the International Committee on Radiation Protection (ICRP) and the U.S. Environmental Protection Agency (EPA) (e.g., use of Federal Guidance Report [FGR] 13 [EPA 1999] data and models). For the public and environment, these requirements flow to several DOE orders and standards (e.g., DOE Order 458.1, "Radiological Protection of the Public and the Environment"). For workers, DOE provides multiple levels

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may or may not be paid for by the experimenters. But in no case have I seen the experimenters pay any substantial portion of the material test reactor's construction or operating costs. The extent to which, again, the profits will be privatized while the tax payer pays for this high-risk gamble must be included in the VTR EIS. **23-8 cont'd**

Nuclear Energy Will Not Solve Energy Poverty

The VTR takes the U.S. in the wrong direction of failed spent nuclear fuel disposal and subsequent nuclear reactors, like TerraPower's reactors, will proliferate nuclear weapons material wherever these reactors are operated or wherever their fresh or spent fuel is stored or transported. **23-26** TerraPower and others are seeking to sell nuclear reactors outside the U.S. using loans orchestrated to help solve "energy poverty." Where will the spent nuclear fuel from those reactors end up? And who will pay for the continued storage and the hoped-for disposal of that spent nuclear fuel? **23-27**

This VTR project, opens flood gates of federal funding for plutonium fast breeder reactors, as well as other reactor designs. Existing light-water reactors for electricity generation in the U.S. already generate plutonium and higher actinides in extensive amounts. The higher enrichment fuels and the higher plutonium fuels create even more challenging pre-disposal and post-disposal containment and criticality issues. **23-28**

The U.S. utilities are not enthusiastic about buying nuclear reactors. And for this reason, the nuclear reactor promoters are seeking financial loans for countries outside the U.S. The purported rationale is to address "energy poverty." Can you imagine? **23-27 cont'd** The most expensive way of generating electricity, and fast reactors are double the construction cost of conventional slow neutron "thermal neutron spectra" reactors that our pressurized water and boiling water reactors are. The U.S. nuclear electricity generating plants want the Department of Energy to take their spent fuel, pay for the packaging that's been performed, pay for security where the fuel is stored, and pay for repackaging the fuel for disposal. The U.S. Department of Energy has no idea how many trillions of dollars it will ultimately cost to continue seeking a permanent solution to isolate the radio-toxic material for millennia. **23-29** And the nuclear industry wants to put these higher enriched, higher burnup fuels, highly attraction terrorist targets, highly accident-prone reactors — in countries with *energy poverty*? **23-27 cont'd**

Because U.S. utilities and investors don't want the added liability and cost of new nuclear reactors, the Department of Defense is being conned into thinking that moving truck-load sized nuclear reactors to medical or other military or non-military installations would be a dandy idea. Very likely to have very little in the way of environmental monitoring. And who cares if there is no place to dispose of the spent nuclear fuel. We'll just leave it here, there, and everywhere. **23-30**

The VTR EIS Has Relied on Inadequate and Deeply Flawed EISs for Spent Nuclear Fuel Management and Disposal

The draft VTR EIS relies on out-of-date, inappropriate, now known to be inadequate Department of Energy spent nuclear fuel disposal environmental impact statements. The draft VTR EIS relies on the deeply flawed assumptions in other Department of Energy EISs for the management of the spent nuclear fuel (and high-level waste). **23-9 cont'd**

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of progressively more restrictive dose limits in its requirements and orders, from the 5-rem-per-year limit imposed under 10 CFR Part 835, to the 2-rem-per-year administrative limit in DOE-STD-1098-2017, *DOE Standard: Radiological Control Technical Standard*, to lower individual site restrictions. The Energy Employee Occupation Illness Compensation Program (EEOICP) is administered by the Department of Labor (DOL) with DOE and the Department of Health and Human Services (HHS), specifically HHS's National Institute for Occupational Safety and Health (NIOSH). DOL has the primary responsibility to administer the program. Dose reconstruction is the responsibility of NIOSH. The DOE role in the program is informative. DOE responds to requests for facility and worker records (DOE responds to over 15,000 such requests per year; requests may cover worker information from multiple facilities), requests for site characterization and research (DOE typically is responding to four or five such requests at any one time), and requests about issues for specific facilities (over 300 facilities are covered, many are private company facilities, these are considered large-scale requests that could involve researching information for multiple facilities over multiple decades). DOE has an extensive staff assigned to support the EEOICP who work in a transparent manner. DOE strives to provide timely and accurate responses to the DOL and NIOSH requests for information.

23-19 DOE acknowledges the commenter's concerns regarding nuclear waste. No radioactive waste or SNF generated under the VTR alternative or reactor fuel production options would be disposed at the INL Site. As discussed Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR SNF would be placed in dry cask storage and stored on site until it is transported off site to an interim storage facility or a permanent repository. See also the response to comment 23-14.

23-20 DOE acknowledges your comment, but believes it is premature to draw conclusions about what might result from the research and testing that would be supported at the VTR. Refer to Section 2.2 of this CRD for additional discussion of the purpose and need for the VTR.

23-21 An Environmental Impact Statement (EIS) is a document prepared in accordance with NEPA regulations to disclose and compare the environmental impacts of alternatives for accomplishing a proposed action. If available, cost information

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The Versatile Test Reactor is expected to use 24 MT of plutonium over 60 years and based on the tables in the EIS while generating short-lived and long-lived fission products and other actinides at tremendous expense, the VTR will only burnup 10 percent of the plutonium. The VTR, while not designed as a breeder to make more plutonium, still leaves about as much plutonium to dispose of, and now additional fission products which complicate disposal, for disposal in a repository that does not exist and for which the DOE has no program to obtain.

Burning plutonium in fast reactors could shuffle the spent nuclear fuel problem a bit, but according to the Blue Ribbon Commission report from 2012, it doesn't solve the problem. It does not alleviate the need for long term disposal in a geologic repository. [6]

23-31

The fact is that the Department of Energy **has no spent nuclear fuel disposal program** for either its DOE-owned spent fuel or for the spent nuclear fuel from commercial nuclear power plants. Consolidated interim storage is not a substitute for a permanent solution.

The fact is that the Nuclear Waste Fund that collected fees from electricity generated by nuclear power plants has been discontinued and the $30 billion or so that it collected is not even enough money to package commercial spent nuclear fuel in disposal containers, let alone to license and construct a repository.

The many trillions of dollars that this will cost the U.S. taxpayer to continue to seek a repository is not being opening and honestly presented, as the Idaho National Laboratory conducts propaganda sessions for TerraPower and others hoping to create profits from the VTR at the taxpayer's expense.

The Department of Energy is pretending it must comply with the recent legislation to seek the VTR with low-balled cost estimates, yet the DOE habitually ignores state and federal laws. For example, the amount of spent nuclear fuel and HLW allocated to the DOE for the failed Yucca Mountain repository effort is limited and the DOE already has exceeded its lawful allotment. The Nuclear Waste Policy Act remains the law; it limits the quantity of spent nuclear fuel from commercial nuclear power plants to 63,000 metric tons heavy metal (MTHM), 2,333 MTHM for DOE SNF and 4,667 MTHM for HLW. The quantity of commercial SNF, DOE SNF, and DOE-managed HWL are each greater than DOE's allotment for the first repository. [7] But DOE hasn't obtained its first repository, which by law, would be at Yucca Mountain.

The Department of Energy promised to begin disposal of spent nuclear fuel by 1998. Then came other promised dates that have come and gone. The U.S. Nuclear Regulatory Commission believed those empty promises from the Department of Energy, expecting to disposal by 1998, then 2008, and then by the first quarter of this century. [8] The Department of Energy's rapidly evolving waste emplacement concepts continued to evolve as every assumption about how the repository would contain the waste didn't hold up. No utility has packaged its spent nuclear fuel

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[6] Blue Ribbon Commission of America's Nuclear Future. 2012. (It uses 2010 estimates for spent fuel quantities) www.brc.gov

[7] U.S. Nuclear Waste Technical Review Board (NWTRB), Management and Disposal of U.S. Department of Energy Spent Nuclear Fuel. Arlington, December 2017. See p. 15.

[8] Nuclear Regulatory Commission, 10 CFR 51, Waste Confidence-Continued Storage of Spent Nuclear Fuel, Federal Register, Vol. 78, No. 178, September 13, 2013.

23-31 cont'd

23-32 cont'd

may be included in an EIS, but an EIS is not a document to determine the costs of an activity. As described in Chapter 4 and summarized in Section 2.9 of this VTR EIS, a review of the impacts shows that construction and operation of the proposed VTR and associated facilities do not pose a substantial threat to health, property, or livelihood. Appendix D, Section D.4.9.8, of the EIS includes estimates of the economic impacts of the hypothetical beyond-design-basis reactor accident with loss of cooling, for an area within 50 miles of the VTR location at the INL Site. This is the most severe accident postulated that could occur from any of the proposed action alternatives, and represents an "upper bound" of potential economic impacts that could occur from an accident scenario. The total projected economic impact includes population-dependent costs, farm dependent costs, decontamination costs, interdiction costs, emergency phase costs, and milk and crop disposal costs. Economic impacts from other, less severe scenarios would likely be similar in nature, but of less magnitude than that described in Section D.4.9.8. For information on spent fuel storage and disposal, please see Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

23-22 DOE is sympathetic with those who have chronic illnesses or cancer or who have lost family or friends to disease. Cancer has a major impact not only on family and friends but also on society at large in the United States. This EIS provided information on the cancer rates in the area of interest around the INL Site (Chapter 3, Section 3.1.10). As can be seen from that data, the cancer incidence rate in the surrounding counties is no larger than that for both the State of Idaho and the entire U.S. It is not the purpose of this EIS to establish a cause for the cancer rates. Cancer is caused by both external factors (e.g., tobacco, infectious organisms, chemicals, and radiation) and internal factors (inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). Risk factors for cancer include age, alcohol, cancer-causing substances, chronic inflammation, diet, hormones, immunosuppression, infectious agents, obesity, radiation, sunlight, and tobacco use. Therefore, to determine the cause of any incidence of cancer can be very difficult as there are many confounding factors.

23-23 Please refer to the discussion in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD for additional information. Also note that use of plutonium in VTR fuel would result in a reduction in the amount of plutonium; the plutonium in the discharged fuel would be in a composition undesirable for weapons use; and all of the plutonium and uranium in the VTR SNF would be diluted and disposed of as SNF.

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into DOE's recommended "transport, aging and disposal" TAD canister. The Yucca Mountain repository concept also relies on never designed titanium drip shields that no one honestly believes are feasible to install decades after the waste is emplaced.

The draft EIS must address that fact that the Department of Energy has no spent nuclear fuel repository program and hasn't since 2010. It must address the fact that the Department of Energy **has no credible cost estimate for the costs of disposal of now-existing spent nuclear fue**l plus the fuel from already operating reactors. Few people know that there is already more than double the amount of spent nuclear fuel (and high-level waste) than Yucca Mountain was set to legally hold. And few people know that if nuclear energy were to make a dent in climate, we would need a new Yucca Mountain every year.

While the Department of Energy's estimated releases from the proposed Yucca Mountain repository are unbelievably low, this in an artifact of reducing the water infiltration rates through the corroding waste containers. Using more realistic water infiltration rates and their variability over time results in far higher releases.

The heat load of the spent nuclear fuel placed in the repository poses a risk to the structure of the repository and the DOE never actually decided whether to use a "hot" repository or a "cool" repository design. The amount of waste and how it is spaced in the repository obviously affect the ability to cool thermally hot spent nuclear fuel.

23-32 cont'd

The criticality issues for Yucca Mountain have grown substantially as the enrichment level used in commercial nuclear power plants has increased. It has also grown because YM originally was not envisioned to dispose of the Department of Energy's highly enriched fuels. And another change has been the included possibility of disposal of surplus plutonium at Yucca Mountain. The Department of Energy concedes that criticalities are possible in the repository, yet it does not address the harm to the repository or the additional spacing requirements.

Doubling the capacity of Yucca Mountain, the slated 70,000 metric tons of spent nuclear fuel and high-level waste, may seem easy, when only the fraudulent radionuclide trickle-out radiation doses are reviewed but in reality, is far more problematic. The slated capacity of Yucca Mountain already required skirting around seismic faults and required 40 miles of underground tunnels.

U.S. Nuclear Regulatory Commission Chairman Kristine Svinicky recently characterized the nation's growing inventory of spent nuclear fuel as having a volume that would fit in a football field. That the head of the agency that would grant a license to the Department of Energy's proposed Yucca Mountain repository would omit the realities of the difficulties of safely containing the spent nuclear fuel is very telling of the mindset of the NRC. The NRC wants to grow nuclear energy no matter the cost to rate-payers, taxpayers, or to humanity. All the NRC has to do is sign off that they believe the DOE's safety case for repository provides a "reasonable expectation" of meeting stipulated requirements.

An online briefing "What Congress Needs to Know About Pending Nuclear Waste Legislation" was held November 13, 2020 by the Environmental and Energy Study Institute, with guest speakers Robert Alvarez, Institute for Policy Studies; Don Hancock, Southwest

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23-24 The comment suggests that the plutonium that would be used in the VTR fuel would be "manufactured," implying that the plutonium does not currently exist. As discussed in Chapter 2, Section 2.6, of this VTR EIS, the proposed feedstock of plutonium proposed for use in VTR fuel already exists and VTR would contribute to a decrease in the inventories of existing plutonium. Proposed sources include excess or surplus DOE/National Nuclear Security Administration plutonium or separated plutonium from foreign countries. Please see Section 2.3, "Nonproliferation," of this CRD for additional discussion of this topic. Please refer to the response to comment 23-2 regarding the statement made in the *Federal Register* Notice of Intent.

23-25 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. DOE always strives to learn from its past projects as well as those from the private sector. Specifically, VTR would begin construction after the appropriate level of final design has been completed as well as development of the supply chain, prototype testing of critical components, and completion of labor analysis studies. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost. Also, please refer to the response to comment 23-23. Metallic driver fuels (e.g., uranium-zirconium fuels) have previously been used as a standard-production driver fuel in EBR-II and demonstrated in FFTF, and uranium-plutonium-zirconium alloy fuel has been tested in EBR-II and FFTF. While there is less experience with the plutonium alloy fuels, the fuel fabrication process, as described in Appendix B, Section B.5, has been demonstrated and is similar to that used for fabrication of EBR-II fuel.

23-26 Note that the purpose of the VTR is to provide a testing capability as is presented in Chapter 1, Section 1.3, of this VTR EIS and discussed in Section 2.2, "Purpose and Need," of this CRD. Refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD for a response to the comment about SNF disposal. Although the VTR is to support development of advanced reactors, it is speculative to conclude what technologies would advance to the stage of

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Research and Information Center; and Diane D'Arrigo, Nuclear Information and Resource Service to explain hazards associated with spent nuclear fuel and history pertaining to the Nuclear Waste Policy Act. [9]

The State of Nevada was attentive to the DOE's rapidly changing disposal concepts and the many times that technically indefensible studies were used to form the basis for how long it would take the waste containers to corrode and how long it would take radionuclides from the waste to migrate to groundwater.

The VTR EIS cites various DOE EISs that are grossly inadequate as well as inconsistent in every essential aspect related to the spread of radiological material and the harm. The Yucca Mountain safety evaluations assumed 0.9999 efficiency for HEPA filters and that there would be no releases from spent fuel stored outdoors and without HEPA filtering. The Yucca Mountain safety evaluations have used fraudulent and unscientific water infiltration modeling to lower predicted doses from the migration of radionuclides from the disposed of waste. The Yucca Mountain EIS assumes the design of spent fuel canisters, the "TADs," that have not been used for commercial spent nuclear fuel storage

When the Department of Energy twice proposed a disposal container for the commercial nuclear power plant owners to use, they ignored it. The electrical utilities would choose cheaper canister designs not intended for disposal because they planned on it becoming the Department of Energy's problem. And this means that the problem would be solved at the expense of the U.S. taxpayer. And the U.S. Nuclear Regulatory Commission did everything in its power to limit the utilities' costs.

The U.S. Nuclear Regulatory Commission claims to have accepted the highly speculative safety case for DOE's proposed Yucca Mountain, yet no construction license was ever issued.

Current law prohibits consolidated interim storage about 10,000 metric tons (MT). Despite this, the U.S. NRC is planning to license two far larger consolidated interim storage facilities for spent nuclear fuel. One facility is in New Mexico and the other in Texas.

Many electrical utilities are seeking to move their spent nuclear fuel away from places the U.S. NRC never should have allowed the spent fuel to be "indefinitely" stored: ocean coastlines and lake shores, among them. These consolidated interim storage sites are planning to accept spent nuclear fuel in non-disposable containers. The proposed consolidated interim storage facilities will have no capability for repackaging a damaged canister, nor repackaging for disposal if a repository were found. And importantly, the Nuclear Waste Policy Act sought to prevent consolidated storage that would have the effect of lessoning the effort to attain a permanent solution for the permanent isolation of the radioactive waste, which remains radio-toxic for millennia.

To help the SONGS utility understand their options for moving their spent fuel farther from the California coastline, they have hired a consultant, North Wind. A tangled web of possibilities

23-32 cont'd

[9] Environmental and Energy Study Institute (EESI) briefing at https://www.eesi.org/briefings/view/111320nuclear#RSVP and see "Yucca Mountain in Brief at https://www.eesi.org/files/Letter_to_Congress-Yucca_Mountain_in_Brief.pdf

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deployment and what the characteristics of those technologies would be. The future development and deployment of reactors, including the management of their SNF, is outside the scope of this EIS. Refer to Section 2.3, "Nonproliferation," of this CRD, for additional discussion of this topic.

23-27 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF. The impacts of potential nuclear energy development are outside the scope of this VTR EIS.

23-28 Although the VTR is to support development of advanced reactors, it is speculative to conclude what technologies would advance to the stage of deployment and what the characteristics of those technologies would be. The proposed VTR is a one-of-a-kind reactor where the neutron production over the desired test volume is maximized and, due to the fuel design, the size of the reactor is minimized. To achieve the desired performance, VTR proposes to use existing plutonium in a metal fuel alloy. Use of this fuel to provide the needed testing performance does not mean that future advanced reactors would use the same fuel; the advanced reactors currently under development would use non-plutonium fuels such as high-assay, low-enriched uranium (HALEU) or thorium fuels. The VTR design as a fast (not breeder) reactor, has no effect on the funding for specific reactor types or the fuel they will propose. As discussed in Chapter 2, Section 2.6, of this VTR EIS, the SNF from the VTR would be managed according to its characteristics. Similar to many other SNF types, it would be stored in casks ready for shipment to an offsite interim storage facility or repository.

23-29 The VTR would not generate electricity. The cost of fast reactors and other reactors that generate electricity is outside the scope of this VTR EIS. The costs of storage and disposal of SNF from NRC-licensed commercial reactors is outside the scope of this VTR EIS.

23-30 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing

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was presented at a public meeting for the San Onofre spent fuel but currently there is no place to move their spent nuclear fuel to. [10]

The utility is also concerned that the full costs of transportation and storage may not be fully reimbursable from the Judgment Fund from the litigation with the Department of Energy's partial breach of contract in failure to start disposing of the spent nuclear fuel from commercial nuclear power plants. Also, it was pointed out that utility customers may not be fully shielded from liability for accidents involving storage of spent nuclear fuel at private storage facilities. Utilities want the Department of Energy to take ownership of the spent nuclear fuel. But the Department of Energy has no place to put it. The Nuclear Waste Policy Act of 1982 and amended in 1987 sought specifically to avoid letting up the pressure on the Department of Energy to obtain permanent, safe disposal of spent nuclear fuel. The DOE was restricted from obtaining interim spent fuel storage unless it had obtained a license for a facility for permanent disposal.

Both the U.S. NRC and the Department of Energy are touting consolidated interim storage as though it were equivalent to obtaining a permanent solution for isolating the radioactive waste. They know that repackaging will be needed, acknowledged to be needed every one hundred years or so. Yet both proposed consolidated storage facilities the NRC is planning to approve this year do not have any canister repackaging or isolation capability.

So why would the U.S. NRC be ready and willing to license two consolidated interim storage facilities that by design will not include any capability to repackage damaged canisters? The answer that the U.S. NRC has given is that the situation is similar to the spent fuel facility it licensed in Utah but which was never built. The U.S. NRC said that the Private Fuel Storage facility in Utah did not need any repackaging capability because if a canister of spent nuclear fuel was damaged, it would be sent back to the licensee that generated the waste.

This is important to understand, as the Department of Energy is actively promoting nuclear energy and failing to mention its continuing failure to find a permanent solution to safety isolate the spent nuclear fuel (and high-level waste) and failing to discuss the problems of short-sighted consolidated interim storage that the U.S. NRC is ready to approve. The challenges of spent nuclear fuel disposal are greater now than they were assumed to be 40 years ago. In fact, the technology to safety isolate these radioactive wastes from our air, soil and water has not been found and this is whispered by the U.S. Nuclear Waste Technical Review Board.

The ridiculousness of the NRC's argument that the consolidated storage facilities have no need for repackaging capability because they would just require the waste to be returned to the utility that generated it shows the extent of nonsensical lying the agency is prone to. A damaged canister cannot be legally shipped. And spent nuclear fuel being sent to a consolidated storage site may have shut down its reactors and decommissioned all its facilities. The NRC's argument that the compromised canister would simply be shipped back to the utility that generated the spent nuclear fuel is utterly absurd. But this is the quality of thought that the NRC has put into much of its licensing and its "waste confidence" rule and its subsequent environmental impact

23-32 cont'd

[10] San Onofre Nuclear Generating Station (SONGS), 11/20/20, North Wind slide presentation https://www.songscommunity.com/_gallery/get_file/?file_id=5faf01792cfac225d3c64352&ir=1&file_ext=.pdf

VTR driver fuel, and managing SNF. The impacts of potential deployment of micro reactors are outside the scope of the VTR EIS.

23-31 The VTR would use up to 34 metric tons of plutonium over a 60-year operation period. The VTR project is not designed to dispose of the excess plutonium, but rather uses the plutonium as a viable source of fuel for meeting the intended need of the VTR project as detailed in Chapter 1 of this VTR EIS. As noted previously (e.g., response to comment 23-16), DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository.

23-32 DOE acknowledges that there is not a geological repository for the disposition of the SNF and high-level wastes in the United States. DOE has evaluated the potential impact of such repository at Yucca Mountain. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF and high-level wastes. However, how DOE will meet this commitment and other issues associated with the quantity of commercial SNF, DOE SNF, and DOE-managed HWL and the capacity of the first repository are beyond the scope of this VTR EIS. The commenter's concerns regarding NRC's activities for the construction of the interim storage and related decisions, which would support the argument of interim dry storage, are also beyond the scope of this EIS. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. While the treated and solidified metal-ingot SNF is in dry cask storage, there would be no releases of radioactivity.

23-33 Refer to the response to comment 23-31: the purpose of the VTR is to provide a test facility, not to reduce the quantity of plutonium. As a result of performing its function to provide a high-energy neutron source, the VTR would generate SNF. Driver fuel and test specimens of fuel that come from the reactor would be managed in accordance with applicable laws, regulations, and DOE orders. SNF and radioactive waste would be disposed of in accordance with their categorization and radiological hazards.

The commenter incorrectly compares the throughput of the current process of statement for continued storage of spent nuclear fuel. The NRC gave up on trying to keep track of the latest promised date that a repository would be available and now assumes that a repository will become available "when needed." The NRC also assumes that the facilities to repackage the spent nuclear fuel, every 100 years or so, will also become available "when needed." And it simply isn't the NRC's problem what the cost is, or who pays for it, as long as it is not one of its licensees, the electrical utilities who operated nuclear reactors.

The technology to repackage the spent nuclear fuel canisters used prevalently by commercial nuclear power plants does not exist. It is recognized that these operations will pose many worker risks and radiological release risks as well as billions of dollars in cost. The disposal canister designs do not exist. And the capability to terminate the radiological release from a damaged canister does not exist. This is problem for the U.S. NRC who assumes no liability for the releases. And actually, the U.S. NRC undermines the radiological monitoring where spent nuclear fuel is stored so that citizens won't know that actual release levels either.

The VTR EIS fails to mention that the Department of Energy has no designed disposal canister for its spent nuclear fuel, for disposal at the repository that the DOE has long promised but, in fact, does not exist, and was never licensed or constructed.

The Department of Energy is rushing to create more spent nuclear fuel, both DOE-owned SNF and new kinds of commercial spent nuclear fuel, while ignoring the problems we already face from decades of spent nuclear fuel accumulation. Each new variety of spent fuel cladding type, enrichment type, burnup and design require new storage and disposal analyses and designs, and more indefinite storage facilities, which fall to the U.S. taxpayer to fund.

23-32 cont'd

VTR Spent Nuclear Fuel Poses Unevaluated Storage and Disposal Risks

Table D-4 in the VTR EIS lists 6112.2 grams of plutonium-239 per assembly of fresh fuel and 5550 grams after use in the reactor to a burnup of 6 percent. There are 66 fuel assemblies in a VTR core and additional in-vessel spent nuclear fuel storage locations where fuel is stored at least one year before removal. The VTR, thus gives a tiny reduction in the amount of plutonium-239, while creating millions of curies of short- and long-lived fission products that complicate storage and disposal. The VTR is expected to use 400 kg annually of plutonium-239 and 24 metric tons over 60 years of operation. The nuclear fuels it will test in the VTR are an additional waste stream for which the Department of Energy has granted to itself the ability to pretend that nuclear fuels used in experiments or tests are not actually spent nuclear fuel. This allows the Department of Energy to bury such material in shallow landfills as it has at the Idaho National Laboratory and at other national laboratories.

The VTR EIS states that about 2 metric tons of spent VTR fuel would need to be treated annually at the MFC FCF (the Fuel Conditioning Facility with pyroprocessing capability). But the throughput of the FCF has not been that high according to the 2017 U.S. Nuclear Waste

23-33

pyroprocessing to separate and recover uranium from spent fuel with the proposed treatment of VTR SNF. There would be no recovery of nuclear materials from the VTR SNF; after treating it to remove sodium, the fuel and diluent would be melted together and cast into ingots for storage. The process proposed for FCF would be able to handle the 2 metric tons per year generated by the VTR.

SNF from the VTR would be cooled for a number of years before it is treated to remove sodium. As a result of the timing of VTR startup and the SNF cooling period, DOE expects to have completed the backlog of other SNF before the need to initiate VTR SNF treatment.

23-34 As the commenter notes, DOE's estimate for the emissions from the treatment of VTR fuel is based on the current radiological emissions from the FCF. DOE started with the emissions for the processing of fuel from FCF (currently processing EBR-II sodium-bonded fuel), which were assumed to be of similar composition (e.g., activation and fission products) as VTR fuel. Conservative assumptions were made regarding the fuel being processed as to its age (fuel was assumed to be the oldest EBR-II fuel being processed) and burnup. Data was adjusted to consider the difference in curies released per kilogram of fuel processed (higher for the VTR than the EBR-II fuel currently being processed), the quantity of fuel being processed annually, and the fresher nature of the VTR fuel (VTR fuel would be out of the reactor for a shorter time) compared to the EBR-II fuel. By assuming the EBR-II fuel is the oldest of the EBR-II fuel being processed and limiting the time out of the reactor for VTR fuel (i.e., 4 years) the adjustment for decay of fission products and activation products is maximized; that is, the VTR fuel radionuclide inventory is maximized. Based on these considerations, DOE estimated that the annual releases from the treatment of VTR fuel would be 40 percent of the releases from the current FCF emissions from the treatment of EBR-II fuel. These emissions would be through the FCF exhaust systems, utilizing the same filtration systems currently in use. As noted in Chapter 3, Section 3.1.10, the releases from MFC are well within regulatory limits and the VTR emissions would be a fraction of these. The radiological consequences of the emissions from the treatment of VTR SNF have been presented in Chapter 4, Section 4.10.1. As shown in that section the annual population and MEI dose from all VTR activities at INL are fractions of a person-rem and fractions of a millirem. If selected, DOE intends to complete the VTR mission. Consideration of termination of the VTR project after it has been selected for implementation is not a required analysis for the EIS. If conditions change with regard to the VTR project, DOE would perform any needed NEPA analysis at

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Technical Review Board. Annually averages have been about 0.3 MT/yr between 1996 and 2009 and only a rate of 0.1 MT/yr between 2009 and 2013. [11]

23-33 cont'd The VTR EIS must explain how the backlog of all existing spent fuel to be treated at the MFC's FCF will be addressed.

23-34 The VTR EIS has presented Table B-27, as an estimate of treating VTR fuel at FCF based on the current radiological releases from FCF. The current level of usage or the fuel characteristics of the fuel being treated at FCF for HALEU is much higher than previous levels at FCF but it is not clear that even the currently high radiological releases from FCF will bound future releases from FCF for the VTR feedstock and 2 metric tons annually of VTR SNF treatment is conducted.

The VTR EIS must make much more information available about how the radiological routine emissions have been estimated and how they will bound future FCF releases that include treating VTR spent fuel. The VTR EIS also needs to explain why it can't do more to reduce these huge levels of airborne radiological releases and so close to many communities.

Then VTR EIS must explain the risk and consequence of failing to treat all the VTR spent fuel to remove the sodium and make SNF ingots, if due to funding cuts or program cuts or unavailability of the FCF due to aging, accidents, etc. prevents VTR spent fuel treatment. The tendency for DOE to not timely provide treatment of spent nuclear fuels is prevalent at the INL and other DOE sites. The VTR EIS needs to include a summary of DOE's continuing failure with many of its other projects, such as the failure to treat leaking tanks at Hanford, Hanford vitrification plant delays, INL Integrated Waste Treatment Unit delays, failure to repackage spent nuclear fuel at the INL in order to meet the 1995 Idaho Settlement Agreement, etc. Why should claims to meet stated performance levels for waste treatment in the VTR EIS have much credibility?

As it is now known that the spent nuclear fuel packaged at commercial nuclear reactor sites has used welded-closed canisters where currently there is no technology developed to safely or affordably open the canisters in order to replace a damaged canister or in order to repackage the spent nuclear fuel into a disposable canister, the VTR EIS needs to answer questions about of the VTR spent nuclear fuel storage system. Namely, does the technology exist to open the casks and the VTR ingot canisters inside the casks and safely remove the spent fuel ingots for repackaging?

With the DOE's disposal canister not designed, licensed or built, how, when and where will the VTR fuel be repackaged for disposal? The VTR EIS must answer how many DOE repository disposal canisters will be needed for the VTR spent fuel ingots. The VTR EIS must answer what kind of facility will be needed for the VTR spent fuel ingots to be repackaged, perhaps many decades from VTR closure?

23-35 The VTR EIS must acknowledge that the DOE has already exceeded its allotted limit of spent nuclear fuel and HLW in Yucca Mountain. The VTR EIS must explain how after decades of promising to open a repository but failing to, that the DOE, with no repository program since

23-33 cont'd

[11] U.S. Nuclear Waste Technical Review Board (NWTRB), Management and Disposal of U.S. Department of Energy Spent Nuclear Fuel. Arlington, December 2017. See p. 97.

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that time. The commenters concerns about DOE activities at other sites and for other programs are not within the scope of this EIS. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD for additional information.

23-35 As discussed in the response to comment 23-32, notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF and high-level radioactive wastes. However, how DOE will meet this commitment and other issues associated with the quantity of commercial SNF, the capacity of future repositories, and the associated costs are beyond the scope of this VTR EIS.

Regarding the operability of FCF, part of INL's investment strategy addresses the maintenance of base operations, plant health, and research, development, and demonstration capability. A portion of this includes reviving and improving historical MFC capabilities and improving facility reliability through refurbishment and replacement of aging instruments and plant systems that can impact facility reliability and availability. Needed upgrades to ensure continued safe operation of the FCF would be addressed as part of this effort. Should the FCF be designated for decommissioning at some point in the future while still supporting the VTR project, the construction of a replacement facility or the relocation of VTR spent fuel treatment activities would be evaluated to determine the need for future NEPA action.

The VTR SNF would be cooled for a number of years, before it is treated, melt, diluted, cast into metal ingots, and placed into sealed canisters. The ingot canisters would have a robust metal shell, fix the ingots into a location for criticality and transportation accident considerations. The ingot canisters would be filled with inert gas (e.g., argon or helium) and close-seal welded. These, in turn, would be loaded into a dual-purpose canister. The advantages to double containment include protecting the ingot canisters from corrosion during any interim storage period, increasing the chances of being able to direct dispose the ingot canisters (if not the entire dual-purpose canister), and reducing the likelihood of ever needing to handle the used fuel ingots in the future. The spent fuel ingots are not expected to be pyrophoric (due to an iron content of about 50 percent) and an unfavorable surface-to-volume ratio), and the double containment further reduces the risk of any metallic fire in the event of a transportation or handling accident. A dual-purpose canister loaded with VTR used fuel should be as safe as commercial spent fuel in a similar canister. If a geologic disposal repository becomes available, the canisters of

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2010, is going to obtain a repository. The VTR EIS must explain whether it expects DOE to obtain a repository by 2048 or if it has some other date in mind. How will the FCF still be operable decades from now? The VTR EIS must explain the costs of continued repackaging of the spent nuclear fuel as it waits for a repository to open. The VTR EIS must explain how DOE is going to obtain a repository for existing SNF that would already fill the Yucca Mountain repository to capacity allowed by law and then obtain a second repository for the VTR SNF.

The VTR fuel is unique and poses higher and different risks than other fuels slated for disposal. The VTR EIS must examine the repository performance issues for the VTR fuel, in terms of criticality, migration of contaminants, pyrophoricity and other differences from commercial spent nuclear fuels so that any repository licensing issues worsened by VTR SNF are identified. The VTR EIS must explain how and when this evaluation will take place and who will pay for it. **23-35 cont'd**

And given decades of the DOE struggling to deal with U.S. surplus plutonium, the VTR EIS needs to be honest about the likelihood of importing much or all of the plutonium to be used for VTR fuel from foreign countries' plutonium from their commercial spent nuclear fuel reprocessing. The reduction in impurities from the reprocessed foreign SNF may be attractive to the VTR project but the harm of making the U.S. now shoulder the burden of an added approximately 34 MT plutonium is not fully admitted in the VTR EIS because it is simply waiving at past spent nuclear fuel EISs that are clearly inadequate to be relied upon for existing SNF let alone for the added VTR spent nuclear fuel. **23-36**

The VTR EIS fails to provide enough information about the spent fuel ingot forms and fails to acknowledge that no DOE EIS for spent fuel management addresses this SNF form. **23-37**

On page B-55 of the VTR EIS, it simply states "This treated fuel would be stored at the site until an offsite storage option (either an interim storage facility or a permanent repository when either becomes available for VTR fuel), at which time it would be shipped off site."

It is currently not legal for the Department of Energy to use a consolidated interim storage facility for SNF because no license has yet been obtained for a repository. There is no permanent repository, no license for one, nor is there a program to obtain a permanent repository. And there's already more spent nuclear fuel and HLW than will fit in one repository, by law. So, the VTR EIS statement is testament to a lack of transparency in disclosing the truth about the problems the U.S. will face in dealing with spent nuclear fuel disposal from the VTR project. **23-38**

The VTR EIS must also evaluate the risk that the VTR spent nuclear fuel is not treated by pyroprocessing, i.e., in the FCF, to remove the sodium and make to spent fuel ingots. If the facilities do not remain available due to lack of funding or other reasons, the VTR metallic U-Pu-Zr spent nuclear fuel has not been evaluated for any DOE disposal facility. The untreated sodium-bonded SNF could pose additional criticality, instability, and safety risks for repository disposal and actually preclude disposal in a repository. The uniqueness of the VTR metallic U-Pu-Zr fuel and how it may pose additional difficulties in its disposal in treated ingot form and if left untreated, must be explained in the VTR EIS. **23-39**

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VTR fuel should be eligible for disposal (low decay heat, low radionuclide inventory, robust double containment, in a package sized correctly for the disposal option).

23-36 As indicated in Chapter 2, Section 2.6, "From a performance perspective, DOE's pit plutonium would be the technologically preferable source of plutonium for VTR fuel." However, the source of fuel for the VTR has not been selected. The VTR project is examining their options and both current stockpiles within the DOE complex and from foreign sources are being considered. As noted by the commenter, the impurity content of the foreign-sourced plutonium is different from that in domestic DOE sourced material. However, due to age and other factors, on average the foreign-sourced material contains more impurities. All of these factors were considered in addressing the potential impacts of fuel production. Chapter 4, Section 4.12, and Appendix E look at the different overland transportation routes and evaluate impacts for both domestic-sourced and foreign-sourced plutonium. Appendix F addresses the impacts of ship transport of foreign-sourced plutonium. Impacts from the production of fuel were developed considering both the use of domestic DOE sourced plutonium and foreign-sourced plutonium (see for example the analysis results in Chapter 4, Section 4.10.3). Also, please refer to the discussion in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD for additional information.

23-37 Please refer to the discussion in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD. Appendix B provides information on the spent fuel ingots form: metallic eutectic of the spent fuel (e.g., uranium, plutonium, zirconium, and fission products) and the stainless steel clad, combined to assure a plutonium content of less than 10 percent. The spent fuel would be stored in casks and the material would meet any thermal and criticality safety criteria for the (as yet not selected) storage cask. It is beyond the scope of the VTR EIS to attempt to resolve the national issue of SNF disposal. The VTR EIS specifies the quantity of SNF to be generated, and as is appropriate, addresses processing the spent fuel to a stable form and safely storing it until an offsite storage facility or repository is available.

23-38 Please refer to the discussion in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD for additional information. As the EIS notes in multiple places, ultimate disposal of the SNF is pending on decisions regarding long-term interim storage and a geologic repository. Those actions are not within the scope of this EIS.

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The lack of coverage and the overall inadequacy of existing DOE spent fuel management EISs must also be addressed by updating and reissuing those EISs before the VTR can be fully evaluated. **23-9 cont'd**

VTR Radioactive Waste Disposal (Other Than Spent Nuclear Fuel) is Not Adequately Explained

The radionuclides and the curie amount of each and the location where the radioactive waste will be disposed of, is generally missing from the VTR EIS. The authors perhaps did not want to reveal just how much radioactive waste they would pour into open-air evaporation ponds to release to Idaho skies or admit how much radioactive waste they would be burying over the Snake River Plain aquifer. The VTR EIS must be much more specific about the radioactive waste it will generate, include radionuclides and curie amounts and where, specifically, the radioactive waste will be disposed of.

The low level and mixed low-level waste generated from treating VTR spent fuel, in pounds, are identified in Table B-28 without saying what radionuclides would be in the waste. The VTR EIS did not say when the low-level waste would likely exceed greater-than-class-C levels, which limits the disposal options. The VTR EIS must state where this waste will be disposed of. The VTR EIS must include the specific radionuclide and curie amounts in this waste and where this waste is expected to be disposed of. The DOE disposes of low-level radioactive waste at the INL over the Snake River Plain aquifer, particularly if no LLW facility will accept the waste. **23-40**

On page B-51, the VTR EIS, again, hides more than it reveals, stating: "The sealed steel shells of stabilized salt and iron would be transferred to a packaging station where they would be placed in road-ready containers for shipment to a temporary waste storage location. Iron from sodium stabilization, sodium salt, and the processed plenums (sodium-free steel clads either as ingots or as scrap metal) would be treated as remote-handled low-level radioactive waste."

The VTR EIS must identify the radionuclides and composition of the non-SNF waste. It must identify where the temporary storage location is and how it will be protected from fire, structural damage, neglect, etc. Because it is stated to be treated as "remote-handled low-level radioactive waste" it is expected to have a significant level of gamma radiation. The VTR EIS, here, as in many other places, leaves much to the imagination – what is in the waste, where will it be stored and where will it be disposed of.

The VTR feedstock and fuel fabrication processes create large radioactive waste streams. The VTR EIS must explain specifically the HEPA filter performance it has assumed for all building and stack releases (i.e., from FCF and HFEF). And although it is difficult to get DOE to keep its EIS commitments, the design and performance level of the HEPA filters needs to be a stated commitment. I have seen at the INL, failure to replace HEPAs or failure to keep fans to the HEPAs operable. **23-41**

The VTR EIS has listed pounds of radioactive waste streams, i.e., in Tables B-34 and B-39, but fails to say when, where and how the radioactive waste will be disposed of. The DOE allows itself (or has the ability to allow itself) to shallowly bury radioactive waste at the INL over the Snake River Plain aquifer that is greater-than-class C waste, that may be remote-handled waste, **23-40 cont'd**

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23-39 The VTR driver fuel would be treated, after at least a year of storage in the VTR reactor vessel and at least 3 more years in a dry storage facility, through a melt-distill-dilute process. This treatment would remove the sodium and dilute the fissile material to convert it into a form that should meet the criteria of a future permanent repository. This action is a part of the VTR alternatives. Failure to complete an action that is part of the alternative, in this case failure to treat the fuel, is not required to be addressed in an EIS. Should the situation change, and the treatment of the VTR SNF is not performed, additional NEPA analysis would be performed as required.

23-40 For information on radioactive waste and spent fuel management, storage, and disposal, see the discussion in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD. Determining the source of existing contamination at the INL Site is not within the scope of this EIS. All discharges to the ATR Complex Evaporation Pond are sampled, reported, and dose modeled in accordance with the facility's air permit and EPA requirements contained in Subpart H and Appendix D (i.e., the "NESHAP" annual report). This includes any incidental or "accidental" discharges to the evaporation pond. ATR Complex does not purposely flush radioactive resin to the evaporation pond; however, discharges of resin to the evaporation pond are not prohibited by the facility's air permit or Subpart H. Note that while ATR does have an evaporation pond, VTR SNF treatment and packaging does not involve evaporation ponds or burial of waste above the Snake River Plain Aquifer. The U.S. NRC waste disposal activities are not within the scope of this EIS.

23-41 Please refer to the discussion in Section 2.11, "High-Efficiency Particulate Air (HEPA) Filter Performance," of this CRD.

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that may include any amount of test material that is actually spent nuclear fuel. And rather than use clay-lined or other design precautions, as the Idaho CERCLA Disposal Facility for cleanup wastes, the DOE uses the Radioactive Waste Management Complex or its replacement. The VTR EIS must explain all of the radioactive waste, radionuclides and curie amounts of each, it plans to bury over the Snake River Plain aquifer from the VTR project. It must explain the radionuclides and curie amounts of each, that it plans to dispose of outside the INL and state specifically where all radioactive waste will be disposed of.

The VTR EIS must explain where the Liquid Radioactive Waste System mentioned in Appendix B will dispose of the waste water, i.e., the waste water it says will be exported via truck from VTR. The VTR EIS must explain where this waste water will go. The open-air evaporation ponds that the INL is using is spreading inadequately characterized and inadequately monitored radionuclides to the Idaho skies. And in fact, the limited monitoring is not publicly available and is destroyed every two years. And in fact, the discharges historically and ongoing have included radioactively laden resins with radionuclides from the Advanced Test Reactor, and once in the evaporation ponds are released to the Idaho skies.

The Department of Energy continues to and historically has not adequately reported the radionuclides disposed of via open-air evaporation ponds. The INL operations, including the radioactive waste evaporation ponds, have been releasing larger amounts of radioactivity than they have declared in annual environmental surveillance reports or NESHAPs reports. The VTR EIS must explain why yellow-bellied marmots in Pocatello contain numerous short-lived radionuclides that could only have come from the Advanced Test Reactor. The VTR EIS must explain why the Department of Energy has allowed unstated amounts of radionuclides, not declared in air effluent estimates for NESHAPs reporting to continue to be flushed from the ATR to the evaporation ponds. The trucking of waste water to evaporation ponds is inadequately monitored and there is inadequate oversight of the radiological releases from the evaporation ponds.

23-40 cont'd

The decontamination and decommissioning of the VTR will also no doubt result in additional "forever" contamination sites at the INL such as those currently expected to require preventing humans from digging, living or visiting there, throughout millennia via the use of "active" administrative controls. Thus, the push by the U.S. Nuclear Regulatory Commission is to increase access of nuclear waste to ordinary landfills in communities around the U.S.

23-42

In Idaho, we have extensive radioactive disposal not just at the INL but also at the US Ecology Grandview hazardous waste site that accepts radioactive waste from around the country and the world, despite not being a low-level radioactive waste dump. The U.S. NRC is the regulator for radioactive waste disposal outside of Department of Energy facilities. The NRC is aggressively promoting using ordinary landfills for nuclear waste And the U.S. NRC has allowed *special nuclear material* including plutonium to be disposed of, in Idaho, at the Grandview facility that is not even a radioactive waste dump. The loop hole for RCRA hazardous waste dumps has allowed extensive soil, air and water radiological contamination on the Boise side of the State of Idaho, which most people don't even know about. The VTR EIS must explain where it expects its radioactive waste to be disposed of.

23-40 cont'd

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23-42 The specifics of deactivation, decommissioning, and demolition of the VTR and associated facilities are decades in the future. Therefore, the discussion in the EIS reflects the general process and not the specifics which are not sufficiently developed for evaluation at this time given the length of proposed operations and the potential for changes in future DOE Program needs. The decontamination and decommissioning of the VTR would include the removal of hazardous and radioactive materials to ensure adequate protection of public health and the environment. However it would be accomplished, the end result of these activities would be a site that would provide adequate protection of human environment from radiation exposure. U.S. NRC activities associated with the disposal of radioactive waste are not within the scope of this EIS.

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VTR Siphons Money from Real Climate Solutions

23-43

The completion of the VTR can be reasonably expected to have years of schedule delays. This means that the VTR and projects that would test nuclear materials will be too late to address climate concerns. The high cost of VTR siphons scare money away from real climate change solutions. And any meaningful increase in the use of nuclear energy would mean needing a new Yucca Mountain repository every year. [12] The Department of Energy has no repository and no repository program and the VTR EIS tries to hide this because it would reasonably mean that making plans to create far more spent nuclear fuel is of high adverse environmental impact.

23-32 cont'd

VTR Accident Risks Downplayed but May Devastate SE Idaho

23-44

The VTR EIS tries to down play the reactor accident risk, yet acknowledges that the core disruption of the sodium-cooled fast reactor, the VTR, can cause accident consequences "in the hundreds or thousands of rem to the public," and "can have very high, likely fatal doses."

Fast Reactors such as the VTR are prone to have something called "core disruptive accidents" where the core explodes. Because monitoring these reactors is difficult, coolant stratification, coolant channel blockages, voids in the coolant or other unexpected situations can occur unpredictably. Partial melting and movement of the fuel can then result in the reconfiguration of the fuel in the core and a low yield explosion that destroys the reactor and releases a devastating amount of fission products and actinides like plutonium-239 to blow in the wind.

Even with light-water reactors, like Fukushima or Three Mile Island, the "experts" had much confusion as to what was going on, or what to do about it. The problem can be compounded for certain circumstances in sodium-cooled fast reactors and there won't be time to respond.

The VTR EIS asserts and with no evidence that the VTR will be safer than conventional reactors. We will be lucky if the VTR is as safe as conventional LWRs because of the unknowns about the new design and because a test reactor changes nuclear-fueled-experiments and other experiments frequently, leaving little time for analyzing the new core configuration's safety.

Fast reactors have high density core and require a coolant that doesn't slow the neutrons down, like liquid metals, molten salt or helium gas. In 1951, the EBR I, a small sodium-cooled fast reactor, operated at what is now the Idaho National Laboratory. [13] It experienced a core melt down. Fast reactors can fission plutonium, americium and curium as well as breed plutonium by neutron capture by uranium-238.

The U.S. fleet of commercial nuclear reactors are "slow" neutron reactors or thermal reactors that use fuel consisting of uranium-238 and less than 5 percent enrichment in uranium-235. These thermal neutron reactors are water-moderated to slow down the neutrons. These conventional nuclear reactors also produce plutonium, americium and curium. There is plentiful uranium-238 and when it absorbs a neutron, it will, following successive decays, create

23-32 cont'd

23-44 cont'd

[12] Edited by Allison M. Macfarlane and Rodney C. Ewing, *Uncertainty Underground Yucca Mountain and the Nation's High-Level Nuclear Waste*, The MIT Press, 2006. Page 4.

[13] Sonal Patel, *Power Magazine*, "Rapid Advancements for Fast Nuclear Reactors," March 1, 2019. https://www.powermag.com/rapid-advancements-for-fast-reactors/

23-43 DOE has an aggressive, but achievable schedule for the development of the VTR. DOE is focused on managing those factors under its control that affect the schedule, but also recognizes that Federal appropriations will dictate how quickly progress can be made. DOE believes that any future developments that combat emission of greenhouse gases benefit efforts to address climate change. Refer to Section 2.2, "Purpose and Need," of this CRD for a discussion about nuclear energy being part of the mix of U.S. energy sources.

23-44 The consequences of the hypothetical beyond-design-basis accident referred to in the comment are high, but are for a bounding (worst case) accident. The beyond-extremely-unlikely event evaluated in the VTR EIS is appropriately assigned an event frequency of 1×10^{-7} per year. The event frequency is applied consistently between VTR alternatives and thereby allows a fair comparison between the VTR alternatives. Based on a comparison of the annual accident risks at conventional nuclear reactors to the annual accident risk at the VTR as presented in Appendix D of this VTR EIS, the VTR is demonstrated to be much safer than conventional reactors.

The VTR would make use of the characteristics of sodium coolant and metallic fuel to design the core with inherent safety and decay heat removal that does not require electric power, such that the reactor can passively achieve a safe state under transient conditions even if no source of power is available. The inherent and passive safety characteristics have been demonstrated in the past, most notably in tests conducted at EBR-II. The VTR would use metallic fuel, passive decay heat removal, and other features demonstrated in those tests.

During operation of the VTR, DOE would require safety analysis of configurations, tests, and experiments associated with the VTR to show that the VTR would

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plutonium-239. The plutonium-239 that builds up in a conventional reactor may fission in conventional reactors or absorb a neutron without fissioning, producing plutonium-240, plutonium-241 etc. through successive neutron captures. Plutonium-239 is produced in and will fission in thermal reactors. All commercial nuclear spent fuel contains most of the original uranium-238 and uranium-235 plus a host of fission products and a large amount of actinides including plutonium-239 and other plutonium isotopes along with americium and curium.

Mistakes made in a test reactor design or its operation can lead to disaster. The VTR is to be located 30 miles from Idaho Falls at INL's MFC, the proposed location for the VTR, and it can mean Idaho Falls and surrounding communities face forever contamination, financial devastation to home and business values because loss due to radiological contamination is not insurable, not to mention illness and much reduced life expectancy.

Materials testing reactors, including the VTR, are used to test reactor materials, typically for the military. The reactor size in megawatts-thermal makes them sound relatively small in comparison to large 3000 MW-thermal (or 1000 MW-electric) nuclear plants. But these test reactors have very high enrichment and high burnup, which means disproportionately high fission products can be released from an accident.

The VTR is a very high-power density which makes cooling the fuel a greater challenge than conventional reactors. And these reactors run with changing configurations due to varied experimental materials and their coolants.

The added risk posed by making one mistake in the calculations for the new configuration of experiments in the VTR not only add to the material-at-risk to be released by an accident, these experiments can be the cause of a reactor accident.

The rapid configuration changes of the experiment configurations make safety review very challenging and the pressure to take short cuts is real.

There are more mistakes and close calls than the DOE discloses to the public. Put the experiment in the wrong position, or over irradiate the test and experiments can swell and get stuck so they are difficult to remove, or welds that burst and contaminate the loop or the coolant or a problem may affect the entire core. Materials testing is more of an ongoing high-wire circus act that poses all kinds of risks to workers and to reactor safety if a mistake is made. If the basic reactor of the VTR were safer than a conventional reactor, the materials testing function would still significantly increase the risk.

The draft VTR EIS is disclosing some of the horrendous risks all while dismissing the risks as overly conservative. The draft VTR EIS is placing more emphasis on speculative propaganda than on honest assessment of VTR accident risks.

This VTR EIS wrongly asserts that a severe accident at the VTR is less likely than for a conventional light-water reactor. The likelihood of a severe radiological release from the VTR is high not only because of the reactor and fuel design and its sodium coolant but also because of the wide variety of materials it will be testing.

23-44 cont'd

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continue to operate safely under the new conditions and in compliance with the documented safety analysis. Controls would ensure that the testing program would not result in sudden and rapid changes to the core configuration. Changes of specimens in test locations primarily would occur during refueling outages (those changes and the use of rabbits would be evaluated carefully and there would be safety envelopes defined for the test designs). For the tests with different coolants, only unique core positions would be used. Potential impacts of the tests on the core would be properly analyzed and the successful testing experience in previous test reactors, EBR-II and FFTF, would be used in the design and conduct of tests. Safe operation of the VTR and support facilities is paramount. DOE is committed to maintaining the safety basis for the VTR and all fuel production and support facilities in compliance with 10 CFR Part 830.

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The VTR EIS acknowledges that accident likelihood has not been studied and there is no probabilistic risk assessment of the likelihood of an accident. Yet the VTR EIS asserts that a beyond-design-basis accident for the VTR is less likely than for a conventional light-water reactor. The VTR EIS also acknowledges that consequences of an accident at the VTR "can be in the hundreds or thousands of rem to the public," and "can have very high, likely fatal doses," see Appendix D of the VTR EIS. **23-44 cont'd**

Construction of the VTR at the Idaho National Laboratory's Materials and Fuels Complex builds in the **use of seismically inadequate facilities** including the Fuel Conditioning Facility (FCF) and other hot cells. This is completely unacceptable, particularly for the proposed 60-year mission. **23-7 cont'd**

Chapter 4 of the VTR EIS says the economic harm from a beyond-design-basis accident is discussed in Section D.4.9.4. But it's not. Its discussed in D.4.9.8. And the discussion low-balls the economic harm of an accident. It is really no wonder why the Department of Energy refused to give hard copies of the draft VTR EIS and provided so little time for review – their EIS is full of mistakes, both small and exceedingly large, like relying on spent nuclear fuel disposition programs that don't exist. **23-45**

The VTR EIS promotes the lower population around the Idaho site location compared to the Oak Ridge location. I know from experience as a safety analyst at the Idaho National Laboratory, that the Department of Energy will take more shortcuts and underfund needed maintenance and safety features precisely because of the population being low and therefore, doesn't matter. **23-46**

The Economic Impact of an Accident at the VTR is Grossly Understated in the VTR EIS

The economic impact of an accident at the VTR is grossly understated in the VTR EIS and must address decades of non-use of farm land, worthless real estate, long-term evacuation of residents and elevated levels of health harm, not limited to cancer. The cost of remediation to the local hospitals which become contaminated would likely exceed the entire cost figure the EIS presents.

The EIS must explain the insurance availability, or lack-there-of, for radiological contamination from radiological emissions from operations associated with the VTR, including the lack of analysis of realistic impacts to containers during transportation. **23-47**

The Accident Release Fractions Low-ball the Radiological Releases from a VTR Accident

Accident release fractions from a VTR accident are not known now, nor will they be known after an accident. The cost of attempting to clean up the reactor site would cost more than the economic figure the EIS presents for total economic cost of than accident.

Not only have the accident release fractions been low-balled for PRISM, they continue to be low-balled in order to reduce the estimated accident consequences. **23-48**

Errors and Omissions in VTR EIS Radionuclide Composition

Table D-8 for 4-year cooled VTR fuel includes Ru-103 and Ru-106. But Table D.7 for 220-day cooled VTR fuel lists Ru-105 and Ru-106, but does not list Ru-103. **23-49**

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23-45 The cross reference in Chapter 4, Section 4.11.5, to Appendix D, Section D.4.9.4, was corrected to D.4.9.8 as indicated in the comment. The specific magnitude of economic damage of a VTR accident involving loss of cooling and a large release of radioactivity is debatable, but it is agreed that if such a beyond-extremely-unlikely accident were to occur, there would be a substantial economic impact. The important points of the analysis are that the annual frequency of such an accident is less than 1 in 10 million (no credible initiating event has been identified), and that the impacts would be larger at Oak Ridge National Laboratory than at INL. DOE notified the public of the availability of the Draft VTR EIS on December 21, 2020. Using digital notification and access to the Draft EIS made it immediately available to those who had expressed an interest in the project and saved DOE, and ultimately the taxpayers, the cost of printing and mailing paper copies. With the extended public comment period ending on March 2, 2021, the public was provided additional time to review the Draft VTR EIS beyond the minimum comment period in Council on Environmental Quality regulations (40 CFR 1506.10(c)). Regarding SNF disposition, refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

23-46 DOE takes its responsibility for the safety and health of the workers and the public seriously. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons.

23-47 The MACCS2 projected economic impacts are based on best-estimate engineering models as the current state of knowledge is ever changing. The MACCS2 computer program projected economic costs, including population-dependent costs, farm dependent costs, decontamination costs, interdiction costs, emergency phase costs, and milk and crop disposal costs based on local land use and economic conditions. The models projected economic costs within 50 miles for the severe accidents at INL and ORNL. The models' projected economic costs for the ORNL regions are much higher than for INL primarily due to the higher population density and the more varied land use. In any case, the long-term impacts are applied consistently between VTR alternatives and the feedstock preparation alternatives to allow a

Table D-8 has omitted numerous uranium isotopes which may be useful to monitor in the environment as they are not naturally occurring, e.g., thorium decay feeding uranium-232 and uranium-236. Fully inclusion of radionuclides in Table D-8 would be helpful even if expected dose is small because the chemical form of the uranium, etc. may make it far more harmful than currently estimated based on natural uranium.

Due to the limited time to review, there may certainly be many more errors than I have recognized thus far. 23-49 cont'd

The VTR May Leave Citizens Uncompensated for Transportation Accidents and Facility Accidents

As a country, we have not found the money to keep up with normal and expected repair of our crumbling roads, railways and bridges. Bridge and railway accidents have increased during the last twenty years, as has the severity of fires involved with railway transport of oil.

Yet the nuclear promotors want to greatly increase the transportation of nuclear waste and in larger and heavier containers. The Price Anderson Act does not compensate citizens for radiological releases from transportation accidents that may result in contaminated homes, property, businesses and shortened life spans and disease. The radiological contamination could be severe, despite assertions and active government-sponsored propaganda campaigns to the contrary. 23-50

The VTR Will Be A Giant Electricity User Just to Keep the Sodium Coolant Liquid

Keeping the sodium from hardening requires continuous heating and that requires a lot of electricity, even when the reactor is not running. While the reactor is running, the VTR will require electricity for cooling the reactor. The Hanford Fast Flux Test Facility, a sodium-cooled fast reactor operated the reactor over the course of 10 years but operated the sodium-coolant for 20 years! The VTR is an electrical usage drain for our region. 23-51

Historical Proof of Inadequate Department of Energy Regulatory Oversight 23-52

The Department of Energy's draft Environmental Impact Statement for the Versatile Test Reactor relies on speculation that the VTR will be operated safely. Core disruption events at the VTR would destroy many lives and even more livelihoods. 23-53

The Department of Energy's track record, specifically at the Idaho National Laboratory's Materials and Fuels Complex, is to cover up safety deficiencies, especially those deficiencies associated with offsite radiation dose to the public. At MFC, seismic studies were "lost" for years, the safety analysis documentation remained unfinalized for years because no one could agree on how to finagle the radiation doses to be low enough, the DOE officially approved safety documentation as 10 CFR 830 compliance when it knew the documentation was not at all compliant.

Then in 2005, Battelle Energy Alliance took over the contract, pointed to the skeleton in the closet, and DOE admitted that the nuclear facility safety documents were not 10 CFR 830 23-52 cont'd

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fair comparison. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons.

23-48 Release fractions are applied to the MAR to determine the source term for each event evaluated in the EIS. Since the purpose of the accident analysis is to provide a means for comparing the consequences between alternatives and options, the release fractions are applied consistently in the events for the VTR alternatives and the feedstock preparation options. The damage ratio is chosen to best represent the amount of material that is affected by the event. The airborne release fraction and respirable fraction are based on previous studies that determined how an event might affect material involved in an event. The leak path factor was set at 1 to maximize the release for an event where filtration or building confinement was assumed to not exist. In some cases the leak path factor was less than 1 to account for physical barriers that would reduce the amount of material released. The release fractions in Table D–32 correspond to the isotope groups included in the MACCS release calculations. Elements are grouped by general chemical characteristics typically used for development of reactor accident releases. Some of the isotope groups contain elements of a different group because of the specific melting characteristics of the elements at the temperatures shown in the table. The text in Appendix D indicates that the release fractions for the fuel melting region of ~1,100 degrees Celsius are assumed. The table indicates that the release fractions are "less than or equal to." To further clarify the accident calculations, text was added that indicates the release fractions used are the upper limit values.

23-49 Thank you for identifying the omission in the table. The MACCS2 calculations were run with all isotopes that contribute significantly to radiological impacts.

23-50 DOE believes that the transportation of nuclear materials to the reactor fuel fabrication and operational facilities, and the low-level radioactive waste (LLW) and transuranic (TRU) wastes to the disposal facilities would result in low overall human health risks, as these activities are conducted in a safe manner based on compliance with Federal and State comprehensive regulatory requirements. The transportation occurs by the truck-trailers only; no rail transports are included in

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compliant. DOE agreed that it would take many more years to actually make the safety bases for MFC anywhere near code-of-federal regulations compliant.

Despite the Department of Energy signing off on the Materials and Fuels Complex safety bases as code-of-federal regulations compliant about 20 years ago, when it was not compliant, the DOE also bolstered its argument by saying nothing bad was going to happen because of the strong safety culture at MFC.

But at INL's MFC, the condition of safety processes, safety equipment, and safety attitude was still so poor that managers at MFC ignored written warnings of high hazard to workers and MFC managers directly caused the plutonium inhalation event in 2011. After conducting 6 years of safety bases updates, the MFC managers actively ignored repeated warnings of worker radiological safety risks – and the preventable accident was not prevented and 16 workers (and actually more) were harmed by the 2011 plutonium inhalation event at MFC.

And the best the contractor, Battelle Energy Alliance, could do was blame workers despite even the DOE investigation report blaming management. The contractor also produced fraudulent lung count results to lie about the magnitude of the accident.

And because it was clearly Battelle Energy Alliance management's fault and there were multiple inadequate safety programs, BEA was quick to (1) falsify the urine and fecal sample results and the lung count results and (2) to attempt to coerce workers to sign that they had received information about their radiation dose when in fact, they hadn't. Radiation dose information from DOE contractors is not to be believed when high doses would get the contractors hands slapped (with fines). BEA blamed the workers even when DOE's own accident investigation found no fault by the workers who were contaminated. **23-52 cont'd**

And these events follow years of hiding adverse findings about seismic safety at MFC and the DOE's other test reactor, the Advanced Test Reactor as well as other safety problems that often were not reported.

There may be one agency worse at nuclear reactor safety regulation than the U.S. Nuclear Regulatory Commission and that is the Department of Energy, which has set its sights on overseeing safety at the VTR presumably because of military missions that aren't being discussed. And now we have the U.S. Nuclear Regulatory Commission Chairman Kristine Svinicky actually bragging about how the NRC is hiring former Department of Energy personnel and placing them in high positions in the NRC.

VTR EIS Ignores Repeated Accidents with Inadequate Emergency Response

The VTR EIS fails to acknowledge decades of repeated inadequate emergency preparation for site emergencies in terms of training, decontamination, radiological medical treatment, inadequate emergency radiological monitoring during and after the emergency. **23-54**

Not only was the emergency response to the Department of Energy WIPP accidents inadequate in 2014, and the Department of Energy plutonium inhalation event at INL in 2011, it was inadequate at the INL's Radioactive Waste Management Complex in 2018 when, due to deliberate actions to ignore the known contents of waste drums, four waste drums forcefully **23-55**

this EIS. For each destination (e.g., facility or disposal site), the routes most affected would be the interstate highways that are closest to the site. The route selection for all of the nuclear and radioactive wastes meet the requirement of an HRCQ as prescribed in 49 CFR Part 397. The objectives of the regulations are to reduce the impacts from transporting radioactive materials, establish consistent and uniform requirements for route selection, and identify the role of State and local governments in routing radioactive materials. The regulations attempt to reduce potential hazards by prescribing that populous areas be avoided and that travel times be minimized. In addition, the regulations require the carrier of radioactive materials to ensure (1) that the vehicle is operated on routes that minimize radiological risks and (2) that accident rates, transit times, population density and activity, time of day, and day of week are considered in determining risk. Appendix E of the VTR EIS details the transportation analysis, and provides a perspective of the expected impacts in terms of the individual and population exposure from normal option (incident-free) and accident conditions. The results are summarized in Table 4-57 of the VTR EIS, which clearly indicate the risks from transport of various radioactive materials to be very small, when considering that each U.S. resident receives about a 300-millirem dose from natural background radiation per year. With regards to expected damage to the infrastructure (e.g., roads and bridges) from transports of various wastes in this EIS, it should be noted that the annual expected transports would be a very small fraction of what is currently occurring. As indicated in Table 4-57 of the VTR EIS, the largest annual traveled distances transported (if we were to consider round trip transport) would be about 1.2 million miles (or about 2 million kilometers). In contrast, the average annual total vehicle-mile transports on the nation roads is estimated to be about 3,180 billion-miles (or about 5,374 billion-kilometers) over the calendar years 2015-2018 (DOT 2020), which indicates the VTR EIS contribution to be less than 0.00004 percent of the total miles traveled. Hence, this contribution is essentially non-significant. With regards to the State-level interface, the Senior Executive Transportation Forum was established by the Secretary of Energy in January 1998 to coordinate the efforts of Departmental elements involved in the transportation of radioactive materials and waste. In response to recommendations from various DOE programs and external stakeholders, the Forum agreed to evaluate the shipping practices being used or planned for use throughout the Department, document them, and, where appropriate, standardize them. The results of that effort are reflected in the DOE Manual 460.2-1A, "Radioactive Material Transportation Practices Manual." This manual establishes a set of standard transportation practices for DOE organizations to use in planning and executing offsite shipments of radioactive materials including

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expelled their powdery contents within a fabric enclosure. The fire department responded to the event due to activation of a fire alarm and the fire department had no idea a radiological event had occurred. The radiation constant air monitors did not alarm and the facility had no available radiological support with knowledge of what might have happened in the facility and had no radiological support staff with self-contained breathing apparatus training – because it was assumed that no matter the unreasonable risks they were taking, there would not be an event. **23-55 cont'd**

In fact, the Department of Energy actually avoids any oversight or evaluation of the emergency preparedness of facilities that it recognizes have large deficits. It is for this reason that the Department of Energy has long avoided any oversight assessment of the INL's Materials and Fuels Complex emergency preparedness. **23-54 cont'd**

The VTR EIS fails to acknowledge that the routine and emergency monitoring will ignore the uranium-235 released by the accident as well as inadequate actinide (plutonium, americium, curium, etc.) monitoring because of intentional environmental monitoring inadequacies to avoid implicating the INL as the source of the contamination. The decay products from plutonium-240 and uranium-236 are thorium decay progeny which the environmental monitoring falsely asserts are from naturally occurring thorium-232. The elevated levels of uranium-234, uranium-235, uranium-236 are intentionally not delineated by the specific isotope so the DOE can falsely claim that the uranium is naturally occurring. **23-56**

From the 1961 SL-1 accident where radiological monitoring was especially inadequate for emergency responders, to the 2011 plutonium inhalation accident caused by management failure to heed repeated warnings of high worker risks and the multiple failures that caused the event and the multiple failures in responding to the event, to the 2018 four drums of waste that exploded and fire fighters, once again, responded without support of adequate training or radiological support personnel. **23-55 cont'd**

The VTR EIS fails to acknowledge that the lack of proper decontamination facilities means that an injured worker is going to radiologically contaminate medical facilities in Idaho Falls. **23-54 cont'd**

DOE Actively Seeks to Undermine State and Federal Laws

The VTR EIS implies by listing various laws that the Department of Energy complies with state and federal laws and complies with meaningful DOE regulations and Orders. **23-57**

In fact, DOE has for years sought to send radioactive waste to WIPP despite laws prohibiting it.

DOE has for years been seeking consolidated interim storage of spent nuclear fuel and in quantities prohibited by law because the NWPA laws sought to prevent DOE from simply providing above ground storage rather than obtaining permanent disposal. **23-58**

The DOE has been recognized by the courts as modifying it radioactive waste DOE Orders at whim, which means no EIS that cites a DOE Order can be relied upon.

The DOE has ignored federal law and state legal agreements by unilaterally declaring it can declare its high-level waste is now low-level waste, and with vastly reduced disposal limitations. **23-57 cont'd**

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radioactive waste. These practices establish a standardized process and framework for interacting with State, tribal, and local authorities and transportation contractors and carriers regarding DOE radioactive material shipments. The manual was developed in a collaborative effort with the State Regional Groups (i.e., Western Governors Association, Southern States Energy Board, Midwest and Northeast Councils of State Governments) and Tribal representatives. The DOE maintains a working relationship with the State Regional Groups to address transportation planning issues as they arise. Use of the State Regional Groups ensures that we address concerns from one region to another when planning routing. It should be noted that for radioactive waste transports, the carrier is responsible for the routing of the shipment in accordance with Department of Transportation (DOT) 49 CFR requirements. The DOE has also established the Transportation Emergency Preparedness Program (TEPP) to address the concerns and help ensure Federal, State, Tribal, and local responders have access to the plans, training, and technical assistance necessary to safely, efficiently, and effectively respond to radiological transportation accidents. TEPP focuses training and outreach along active or planned DOE transportation corridors and is coordinated with local and State officials in the affected jurisdictions. TEPP actively works with the corridor States and Tribes to provide training, planning assistance and exercises. More information on TEPP can be found at www.em.doe.gov/otem. Contrary to the assertion in the comment, the Price-Anderson Act would compensate members of the public following a transportation accident involving DOE radioactive materials.

23-51 The electricity demands for the VTR and supporting facilities (16.2 MW [150 thousand MWh] per year) has been identified in Chapter 4, Section 4.7.1.2. The current INL Site electrical grid, possibly with minor modification as discussed in this section of the EIS, would be capable of supporting this additional load.

23-52 In January 2005, as part of the transition to Battelle Energy Alliance, LLC (BEA) assuming responsibility for operating the Idaho National Laboratory (INL), all of the Argonne National Laboratory-West (ANL-W) nuclear safety documents were reviewed by both an independent group of nuclear safety professionals associated with the new INL M&O contractor (BEA) and the Department of Energy Idaho Operations Office (DOE-ID) facility line management and nuclear safety subject matter experts. The results of both reviews indicated the state of ANL-W nuclear safety documentation was not in concert with the expectations for an approved nuclear safety document and did not fully satisfy the safe harbor provisions of 10 CFR Part 830, Subpart B, Safety Basis Requirements.

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The DOE has made a practice of not referring to the sodium-bearing waste at the INL as high-level waste, despite not having made any steps to officially reclassify it as such — because of the legal challenges this may bring. But not calling the waste high-level waste, it can misinform citizens and State of Idaho officials, however. **23-57 cont'd**

VTR EIS Actively Ignores the Current Scientific Evidence of Radiation Health Harm **23-59**

The Department of Energy's accepted modeling of health risk from radionuclide emissions (routine or from accidents) actively ignores diverse, compelling human epidemiology. I have been told that the reason is "that somebody high up has decided that the benefit of changing the radiation protection standards isn't worth the cost." This basic description comes from university professors and INL lab directors. Basically, the Department of Energy has decided that protecting your health, or your child's health or protecting human beings in the future from its growing inventory of radioactive waste just isn't worth the cost. It would, after all, increase the cost of nuclear waste disposal and it would require reducing airborne emissions from its facilities. **23-60**

The rates of cancer for children continue to be elevated, especially in counties surrounding the Idaho National Laboratory. The incidence of thyroid cancer is double in the counties surrounding the INL and double that of all other counties in Idaho and double the rates for the country from the SEER database. This is a consistent result over a decade. As thyroid cancer incidence was climbing everywhere, is has been consistently double in the counties surrounding the INL (and unlike the VTR EIS, I reviewed all the counties). The VTR EIS presents some of the cancer data and is silent on the trends. The VTR EIS is also silent on many radiogenic cancers such as male breast cancer. And the VTR EIS is silent on the rates of childhood cancer which are elevated. **23-61**

The Department of Energy, while accepting lower tabulated radiation doses and focusing on whole-body doses exclusively, has remained silent on the increased thyroid cancer incidence rates from various alpha emitters, and especially americium-241. Due to the low tissue weighting value, whole body dose estimates are not affected much by the elevated thyroid doses.

A 2013 Pacific Northwest National Laboratory (PNNL) report incorporating Federal Guidance Report 13 tabulated whole body and organ specific dose conversion factors for an average half-male and half-female at various ages. [14] The 2013 PNNL report is to be used for calculating radiation dose but not the risk of higher radiation risks recognized in the EPA's 1999 Federal Guidance Report 13. Buried near the end of the PNNL report is a chart of how wildly increased the thyroid cancer incidence was for various radionuclides, by a factor of 10, of 100, of 1000, of 10,000 and of 100,000! See Figure 1. **23-60 cont'd**

[14] T.R. Hay and J.P. Rishel, Pacific Northwest National Laboratory, Department of Energy, *Revision of the APGEMS Dose Conversion Factor File Using Revised Factor from Federal Guidance Report 12 and 13*, PNNL-22827, September 2013. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22827.pdf

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Steps taken to rectify this issue included the following:

- DOE-ID documented the identified issues in a vulnerability assessment issued in January 2005.
- Documented Safety Analysis (DSA) issues were subjected to a potentially inadequate safety analysis (PISA) process as part of an MFC Unreviewed Safety Question (USQ) process.
- Actions from a USQ resolution plan were incorporated into the Safety Evaluation Report (SER) as part of the DOE-ID Nuclear Safety Basis Approval.
- These USQ controls were implemented as technical safety requirement (TSR)-level controls.
- DOE identified additional DOE-directed controls that were incorporated through an approved DOE-ID SER.
- BEA incorporated an Integrated Safety Management System (ISMS) that followed DOE G 450.4 1B, "Integrated Safety Management Systems Guide" and 48 CFR 970.5223.1, "Integration of Environment, Safety, and Health into Work Planning and Execution." The ISMS described the safety management programs used to protect workers, the public, and the environment.
- BEA developed and DOE approved Safety Performance Measures, Objectives, and Commitments that were tracked by senior DOE management to monitor the contractor's performance to these commitments. These commitments included nuclear-safety-related performance measures.
- A DOE vulnerability assessment informed the development of a DOE management control plan, resulting in a review of Nuclear Safety Management practices at MFC.
- DOE-ID created an approved Action Plan as required by DOE Order 413.1A. MFC DSA upgrade and implementation activities were tracked as part of the Action Plan, which included a DOE and BEA agreed upon MFC facility prioritization for the MFC DSA upgrade plan.
- The MFC DSA upgrade effort and implementation provided an upgraded MFC facility documented safety analysis that was fully compliant with 10 CFR Part 830, Subpart B, and provided the closure action for the MFC PISA/USQ identified during the INL transition reviews.

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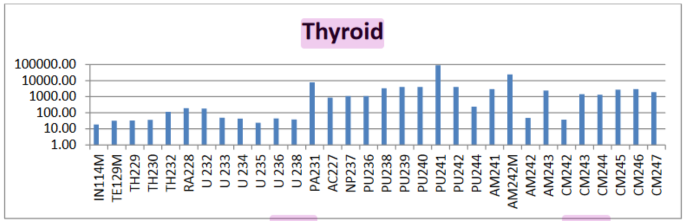

Figure 1. Ratio of the revised Federal Guidance Report (FGR) 13 thyroid dose conversion factors (DCFs) to the original Department of Energy (HUDUFACT.dat) thyroid DCF for radionuclides having the largest increases. (PNNL-22827)

23-60 cont'd

The radionuclides in Figure 1 include thorium, uranium and uranium decay progeny, plutonium, curium and americium. The thyroid cancer incidence rate increases for plutonium-238, plutonium-239, plutonium-240, plutonium-241 and americium-241 is over 1000.

It is important to understand that for many years, releases of these various americium, curium and plutonium radionuclides were not stated or were understated by the Department of Energy in its environmental monitoring reports. The 1989 INEL Historical Dose Evaluation does not list americium-241 as a radionuclide that it released. Yet, there is evidence of extensive americium-241 contamination at INL facilities when CERCLA cleanup investigations were conducted in the early 1990s.

23-62

23-59 cont'd

The Department of Energy has largely thwarted efforts to have epidemiology conducted near the INL. Epidemiology that was conducted of INL workers found unexplained elevated levels of certain radiogenic cancers in both radiation and non-radiation workers.

Epidemiology of thousands of radiation workers found elevated cancer risk occurring at an average 200 mrem/yr. [15] An INL-specific study found radiation and nonradiation workers at the site had higher risk of certain cancers. [16] The US Nuclear Regulatory Commission and the

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[15] Richardson, David B., et al., "Risk of cancer from occupational exposure to ionizing radiation: retrospective cohort study of workers in France, the United Kingdom, and the United States (INWORKS), BMJ, v. 351 (October 15, 2015), at http://www.bmj.com/content/351/bmj.h5359 Richardson et al 2015] (And please note that studies of high leukemia risk in radiation workers and of ongoing studies to assess health effects of high and low-linear energy transfer internal radiation must also be studied in addition to this one on external radiation.)

[16] "An Epidemiology Study of Mortality and Radiation-Related Risk of Cancer Among Workers at the Idaho National Engineering and Environmental Laboratory, a U.S. Department of Energy Facility, January 2005. http://www.cdc.gov/niosh/docs/2005-131/pdfs/2005-131.pdf and http://www.cdc.gov/niosh/oerp/ineel.htm and Savannah River Site Mortality Study, 2007. http://www.cdc.gov/niosh/oerp/savannah-mortality/

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- In early February 2007, DOE-ID lead two reviews on MFC hazard category 2 and 3 facilities that focused on prioritization of the DSA upgrades and provided an analysis of the adequacy of the existing controls.

As part of the DOE-directed changes from the SER on the MFC DSA USQ, greater emphasis was placed on the identification, operation, and maintenance of safety significant (SS) and safety class (SC) structures, systems, and components (SSCs). DOE-ID personnel developed criteria, review, and approach documents for the conduct of focused reviews on selected MFC facility SS-SSCs and SC-SSCs. These focused reviews ensured that the relied upon safety systems were operating and maintained consistent with DSA assumptions and descriptions. BEA conducted reviews focused on the MFC facility SSCs anticipated for selection as SC or SS in the upgraded MFC DSA that were relied upon in existing, approved facility DSAs for their safety function. These reviews served two functions: (1) they verified that the performance criteria of the existing facility DSAs were satisfied and that surveillance and maintenance activities were complete to ensure long-term operability and (2) they identified additional SSCs that would be necessary for safe facility operations, if any, over the currently identified SSCs. These reviews provided additional information as to the adequacy of the existing control set and if any additional controls were needed for current facility operations. These activities/reviews contributed to the hazard control development for the MFC DSA upgrade effort and implementation for each of the MFC nuclear facilities. While the USQ/PISA issues were resolved during upgrade and implementation period from 2005 through 2018, MFC nuclear facility operations were compliant with 10 CFR Part 830, Subpart B, and DOE orders and safe for facility workers, collocated workers, members of the public and the environment.

DOE-ID and BEA conducted and completed activities to identify potential vulnerabilities with existing MFC nuclear facility DSAs. The follow-on corrective actions, which are approved by the DOE-ID Safety Basis Approval Authority, bridged any gaps identified and ensured facility operations were bounded by the nuclear safety envelope and were compliant with applicable laws and regulations. DOE-ID and BEA also reviewed the relied upon facility hazard control sets and ensured that equipment which satisfies a DSA identified safety function performs as intended. These actions related to the eleven MFC nuclear facility safety basis documents ensured that facility operations remained safe for human health and the environment and were appropriately described and approved by DOE.

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Department of Energy maintain that their 5 rem/yr worker exposure limit is protective despite compelling scientific evidence to the contrary. [17]

The NRC cancelled funding of what would have been the first meaningful epidemiology study of health near US nuclear facilities. They claimed it would cost too much (at $8 million) and take too long. [18]

23-59 cont'd

The US NRC prefers reliance on the 1980s epidemiology study that mixed children and adults and populations near and far from nuclear plants and predictably found no harm. [19] The NRC actively ignores the irrefutable studies from Germany that found increased cancer and leukemia rates of children living near each of the plants. [20 21 22]

The U.S. NRC knows that if people knew the harm of living near nuclear power plants, just from routine radiological emissions, it would be the end of nuclear energy.

Realistic and Based on Newer Available Information is Ignored in the Radiation Health Impacts Presented in the VTR EIS

23-63

The negative health impacts from radiation in general and from the INL specifically have not been addressed in the VTR EIS. Isotope production and separation processes, even with no reactor accident, are poisoning people in Idaho and this matters at least as much as the detailed tracking of pygmy rabbits which is included in the EIS.

Decades of continuing radiological releases from the Idaho National Laboratory have harmed the health of people living in the counties within 100 miles of the INL. In a state beset with high levels of radioactive contamination from past nuclear weapons testing and INL radiological releases and the Grand View and Bruneau hazard waste dumps that have accepted radioactive waste via an NRC loop hole, only the counties near the INL do citizens of Idaho have double the

23-59 cont'd

[17] "Health Risks from Exposure to Low Levels of Ionizing Radiation BEIR VII – Phase 2, The National Academies Press, 2006, http://www.nap.edu/catalog.php?record_id=11340 The BEIR VII report reaffirmed the conclusion of the prior report that every exposure to radiation produces a corresponding increase in cancer risk. The BEIR VII report found increased sensitivity to radiation in children and women. Cancer risk incidence figures for solid tumors for women are about double those for men. And the same radiation in the first year of life for boys produces three to four times the cancer risk as exposure between the ages of 20 and 50. Female infants have almost double the risk as male infants.

[18] NRC (Nuclear Regulatory Commission) 2010. NRC Asks National Academy of Sciences to Study Cancer Risk in Populations Living near Nuclear Power Facilities. NRC News No. 10-060, 7 April 2010. Washington, DC: NRC. The framework for the study was reported in "Analysis of Cancer Risks in Populations Near Nuclear Facilities; Phase I (2012). See cancer risk study at nap.edu.

[19] NCI (National Cancer Institute) 1990. Cancer in Populations Living near Nuclear Facilities. 017-042-00276-1. Washington, DC: Superintendent of Documents, U.S. Government Printing Office.

[20] Kaatsch P, Kaletsch U, Meinert R, Michaelis J.. 1998. An extended study of childhood malignancies in the vicinity of German nuclear power plants. Cancer Causes Control 9(5):529–533.

[21] The study is known by its German acronym KiKK (Kinderkrebs in der Umgebung von Kernkraftwerken): Kaatsch P, Spix C, Schmiedel S, Schulze-Rath R, Mergenthaler A, Blettner M 2008b. Vorhaben StSch 4334: Epidemiologische Studie zu Kinderkrebs in der Umgebung von Kernkraftwerken (KiKK-Studie), Teil 2 (Fall-Kontroll-Studie mit Befragung). Salzgitter: Bundesamt für Strahlenschutz.

[22] Kaatsch P, Spix C, Schulze-Rath R, Schmiedel S, Blettner M.. 2008. . Leukemia in young children living in the vicinity of German nuclear power plants. Int J Cancer 122(4):721–726.

After the November 8, 2011 plutonium contamination accident involving 30-year-old legacy materials at the Zero Power Physics Reactor (ZPPR), the DOE Office of Health, Safety and Security conducted a detailed accident investigation and prepared an Accident Investigation Report (DOE 2012). The Accident Investigation Report included 18 Judgement of Need conclusions for actions where BEA and/or DOE-ID needed to improve. In response to the incident and the Accident Investigation Report, BEA and DOE-ID developed a Corrective Action Plan and have tracked and completed the corrective actions. DOE-ID and BEA have made substantial safety improvements at MFC and INL since the unfortunate 2011 plutonium inhalation incident at ZPPR.

During operation of the VTR, DOE would require safety analysis of configurations, tests, and experiments associated with the VTR to show that the VTR would continue to operate safely with the new configuration and in compliance with the DSA. Safe operation of the VTR and support facilities is paramount. DOE is committed to maintaining the safety basis for the VTR and all fuel production and support facilities in compliance with 10 CFR Part 830.

23-53 Worker and public safety are DOE's highest priority, and INL workers are highly trained in performing their jobs. Education and training, including safety and radiation protection, requirements are commensurate with job functions. The purpose of this EIS is to assess the environmental impacts of the proposed action. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons.

23-54 DOE takes its responsibility for the safety and health of the workers and the public seriously. The INL Emergency Management Program implements DOE policy and requirements for an emergency management system and a RCRA contingency plan and complies with DOE Order 151.1D, Comprehensive Emergency Management System, and other DOE and regulatory requirements.

23-55 DOE takes its responsibility for the safety and health of the workers and the public seriously. The INL Emergency Management Program implements DOE policy and

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incidence of thyroid cancer compared to the rest of the state and the rest of the limited regions in the U.S. where cancer statistics are tracked. Thyroid cancer incidence rose rapidly state- and country-wide, but near the INL, and for years, the thyroid cancer incidence rates have been roughly double that of the rest of the state and the country (via the SEER cancer database). 23-63 cont'd

The routine emissions from the Idaho National Laboratory and also from U.S. Nuclear Regulatory Commission approved radioactive waste disposal on the western side of the state of Idaho are poisoning the state, as airborne contamination results in gyrating public drinking water contamination. The VTR EIS and the Department of Energy fail to acknowledge the airborne pathway into our drinking water supplies. 23-64

Public water supplies are intermittently monitored, yet reveal gyrating levels of high levels of gross alpha emitters which usually cannot be shown to be from natural uranium and thorium levels or from past weapons testing fallout. Monitoring programs routinely seek to avoid reporting elevated levels of radionuclides in water, air and soil. These programs, including the state program for the INL and the DOE's contractor for environmental reporting, actively use poor sampling protocols, data deletion, biased blanks for count comparison, and false narratives to explain elevated results. 23-6 cont'd

The VTR EIS Ignore Elevated Rates of Thyroid Cancer Incidence in Counties Surrounding the INL and Other Radiation Health Issues

23-65

The VTR EIS generally fails to address the Department of Energy's refusal to acknowledge strong epidemiology that shows far more cancer risk and other health risks than the biased and inadequate models it relies on.

The VTR EIS specifically implies that its radiation monitoring and radiation health models are adequate.

The VTR EIS fails to address the inadequacy of the radiation health modeling despite years of double the thyroid cancer incidence in the counties surrounding the INL. As the DOE has been forbidden to conduct epidemiology because of its many past efforts to improperly bias human epidemiology, the assessment of growingly obvious health impacts of INL radiological releases must be conducted by properly independent evaluation. This has not been done, as is evident in the VTR EIS which displays some of the increased cancer rates yet fails to utter any recognition of the obvious doubling of thyroid cancers in counties surrounding the INL. The incidence of thyroid cancer has been doubling for years and is wide-spread, yet the rates ramp up at double the rest of Idaho and the US, in the counties surrounding the INL. Refusing to recognize the impact, which would not be predicted by DOE's accepted radiological release estimates and radiation health models, is immoral as well as not based on scientific integrity.

In 1975, the rate of thyroid cancer incidence for men and women combined was 4.8 per 100,000 in the US. In 2015, thyroid cancer incidence reached 15.7 per 100,000 according to the Surveillance, Epidemiology, and End Results Program (SEER) website. Thyroid cancer incidence and mortality in the US may have finally leveled off after years of increases, according to the National Cancer Institute, Surveillance, Epidemiology, and End Results Program (SEER).

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requirements for an emergency management system and a RCRA contingency plan and complies with DOE Order 151.1D, Comprehensive Emergency Management System, and other DOE and regulatory requirements. When accidents do occur, an integral part of DOE's program is to conduct investigations to determine root causes of incidents. Lessons learned from the investigation are incorporated into procedures and practices as part of a continuing process to improve the safety of future activities. The EIS acknowledges that the emergency management system at INL includes emergency response facilities and equipment, trained staff, and effective interface and integration with offsite emergency response authorities and organizations. INL maintains the necessary apparatus, equipment, and a state-of-the-art Emergency Operations Center in Idaho Falls to respond to emergencies, not only at INL, but throughout the local communities. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons.

23-56 Existing stack monitoring systems meet current applicable requirements, including state and national NESHAP monitoring and reporting requirements. Annual reporting is performed as required and releases evaluated annually to ensure compliance with applicable requirements. Stack monitoring for VTR would be conducted, as appropriate, in consultation with the applicable regulatory agency and would meet all applicable requirements. An emergency plan for the VTR at INL or ORNL has not been developed. As described in Chapter 3, Section 3.2.11, DOE Order 151.1D, "Comprehensive Emergency Management System (DOE 2016b)," describes detailed requirements for emergency management that all DOE sites must implement. Each DOE site, facility, and activity, including INL and ORNL, establishes and maintains a documented emergency management program that implements the requirements of applicable Federal, State, and local laws, regulations, and ordinances for fundamental worker safety programs (e.g., fire, safety, and security). Should the VTR be located at INL or ORNL, the site emergency plan would be updated to reflect changes mandated by the addition of VTR activities, including provisions for post-accident sampling and monitoring.

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[23] However, several counties surrounding the Idaho National Laboratory have roughly double (or more) the thyroid cancer incidence than the Idaho state average and US average.

The SEER 9 region is roughly 10 percent of the US population and includes parts of California [San Francisco and Oakland], Connecticut, Georgia [Atlanta only], Hawaii, Iowa, Michigan [Detroit only], New Mexico, Utah, and Washington [Seattle and Puget Sound region]. [24]

Thyroid cancer incidence in the US increased, on average, 3.6 percent per year during 1974-2013, from 4.56 cases per 100,000 person-years in 1974-1977 to 14.42 cases per 100,000 person-years in 2010-2013. These thyroid cases were not trivial: the mortality also increased. Mortality increased 1.1 percent per year from 0.40 per 100,000 person-years in 1994-1997 to 0.46 per 100,000 person-years in 2010-1013 overall and increased 2.9 percent per year for SEER distant stage papillary thyroid cancer. [25] From 1974 to 2013, the SEER 9 region cancer data included 77,276 thyroid cancer patients and 2371 thyroid cancer deaths.

Bonneville County, where Idaho Falls is located, has double the thyroid cancer rate of the US and double the rate compared to the rest of Idaho, based on the Cancer Data Registry of Idaho (CDRI) for the year 2017. [26] See Table 1.

Table 1. Bonneville County thyroid cancer incidence rate compared to the rest of Idaho, 2017.

Cancer type	Sex	Rate in Bonneville County	Adjusted Rate in Bonneville County	Rate for remainder of Idaho
Thyroid	Total	28.2	30.7	14.2
	Male	16.0	17.8	7.4
	Female	40.3	43.5	21.0

Table notes: Rates are expressed as the number of cases per 100,000 persons per year (person-years). Rates are expressed as the number of cases per 100,000 persons per year (person-years). Adjusted rates are age and sex-adjusted incidence rates for the county using the remainder of the state as standard. Data from Factsheet for the Cancer Data Registry of Idaho, Idaho Hospital Association. Bonneville County Cancer Profile. Cancer Incidence 2013-2017. https://www.idcancer.org/ContentFiles/special/CountyProfiles/BONNEVILLE.pdf

Some people have wondered if the thyroid incidence rate is due to overdiagnosis of elderly patients — no, it is not. A study of pediatric thyroid cancer rates in the US found that in pediatric

[23] National Cancer Institute, Surveillance, Epidemiology, and End Results Program, Cancer Stat Facts: Thyroid Cancer. https://seer.cancer.gov/statfacts/html/thyro.html
[24] National Cancer Institute, Surveillance, Epidemiology, and End Results Program, Cancer Query System. https://seer.cancer.gov/canques/incidence.html
[25] Hyeyeun Lim et al., JAMA, "Trends in Thyroid Cancer Incidence and Mortality in the United States, 1974-2013," April 4, 2017. https://pubmed.ncbi.nlm.nih.gov/28362912/ or https://jamanetwork.com/journals/jama/fullarticle/2613728
[26] C. J. Johnson, B. M. Morawski, R. K., Rycroft, Cancer Data Registry of Idaho (CDRI), Boise Idaho, Annual Report of the Cancer Data Registry of Idaho, *Cancer in Idaho – 2017*, December 2019. https://www.idcancer.org/ContentFiles/AnnualReports/Cancer%20in%20Idaho%202017.pdf

23-65 cont'd

23-57 Management of radioactive waste and SNF generated from the operation of the VTR would comply with applicable laws, regulations, permits, DOE orders, and agreements. Comments related to the HLW interpretation are outside the scope of the VTR EIS.

23-58 Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment as well as the Waste Isolation Pilot Plant (WIPP) facility operations are beyond the scope of the VTR EIS.

23-59 The DOE does not ignore scientific evidence for the health effects from radiation. As needed, DOE updates its radiological protection requirements to implement requirements consistent with the latest approved information from the ICRP and the EPA (e.g., use of FGR 13 data and models). For the public and environment, these requirements flow to several DOE orders and standards (e.g., DOE Order 458.1, "Radiological Protection of the Public and the Environment"). For workers, DOE provides multiple levels of progressively more restrictive dose limits in its requirements and orders, from the 5-rem-per-year limit imposed under 10 CFR Part 835, to the 2-rem-per-year administrative limit in DOE-STD-1098-2017, *DOE Standard: Radiological Control Technical Standard*, to lower individual site restrictions. Appendix C of this VTR EIS contains a discussion of relevant radiation protection guides developed based on recommendations of the ICRP, the National Council on Radiation Protection and Measurements, the National Research Council/ National Academy of Sciences (which publishes the BEIRS reports) and explains the methodology used in this EIS for the estimation of latent cancer fatalities. These organizations provide the latest accepted guidance on the modeling of health risks from radiation exposures. The analysis in this EIS uses a dose-to-risk factor of 0.0006 latent cancer fatalities per rem of exposure as recommended by the Interagency Steering Committee on Radiation Standards (ISCORS), which is in agreement with values contained in the *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2* report. The model used in this EIS is a linear no-threshold model, meaning that all exposure to radiation is assumed to result in an increase in the risk of a fatal cancer. (See Chapter 5 for an assessment of the long-term human health impacts from the VTR and all other reasonably foreseeable INL Site activities.) The actions of agencies other than DOE described in this comment are not within the scope of this EIS.

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patients with thyroid cancer diagnosed from 1973 to 2013, the annual percent change in pediatric cancer incidence increased from 1.1 percent per year from 1973 to 2006 and markedly increased to 9.5 percent per year from 2006 to 2013. [27]

Some people have wondered if the increased rate of incidence is due to overdiagnosis of trivial nodules — no, it is not. The figures for the incidence rates for large tumors and advanced-stage disease suggest a true increase in the incident rates of thyroid cancer in the United States. I've seen this just from a handful of acquaintances in Idaho Falls.

For pediatric patients, the thyroid incidence rate was 0.48 cases per 100,000 person-years in 1973 to 1.14 cases per 100,000 person-years in 2013. The incidence rate for large tumors were not significantly different from incidence rates of small (1-20 mm) tumors.

Both thyroid cancer US trend studies (by Lim and by Qian) used the SEER cancer incidence file maintained by the National Cancer Institute and includes 9 high-quality, population-based registries.

As the SEER 9 region thyroid incidence peaked at 15.7 per 100,000, and the State of Idaho thyroid incidence average was 14.2 per 100,000, Bonneville County reached thyroid cancer rates of 30.9 per 100,000. [28] But other counties near the Idaho National Laboratory also have elevated thyroid cancer incidence rates: Madison (29.3 per 100,000), Fremont (27.9 per 100,000), Jefferson (28.9 per 100,000), and Bingham (28.6 per 100,000). But let's not forget Butte county. Butte county's thyroid cancer rate of 45.9 per 100,000 puts it in a class by itself. Much of Butte county is within 20 miles of the INL and nothing says radiation exposure like Butte's leukemia rate at 3 times the state rate and myeloma at 5 times the state average rate.

The news headline for the Idaho cancer register report issued in 2018 read that "cancer trends for Idaho are stable." [29] That is what citizens were supposed to take away from the 2017 cancer rate study in Idaho. Why were citizens not told about any of the cancers in the counties in Idaho that significantly exceeded state average cancer rates and exceeded the rest of the US? [30]

The wide-spread thyroid cancer incidence increases in the US do not appear to be due to radiation exposure. I suspect other governmentally permitted and highly profitable environmental toxins related to our food and perhaps also cell phone use. **But the rates that are double the rest of Idaho and the US in only counties near the Idaho National Laboratory are, I believe, due to the radiological releases from INL and are perhaps aggravated by airborne chemical releases from the INL.**

23-65 cont'd

[27] Z. Jason Qian et al., *JAMA*, "Pediatric Thyroid Cancer Incidence and Mortality Trends in the United States, 1973-2013," May 23, 2019. https://pubmed.ncbi.nlm.nih.gov/31120475/ or https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6547136/

[28] Environmental Defense Institute February/March 2020 newsletter article "Rate of cancer in Idaho continues to increase, according to Cancer Data Registry of Idaho."

[29] Brennen Kauffman, *The Idaho Falls Post Register*, "New cancer report on 2017 shows stable cancer trends for Idaho," December 13, 2018.

[30] https://statecancerprofiles.cancer.gov/

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23-60 The information the commenter cites addresses updating dose conversion factors to be in agreement with FRG12/13 recommendations. While that update did increase the factor for uranium americium and plutonium isotopes impacts on the thyroid, those conversion factors are still very small. The cancers identified as most prevalent due to exposure to americium are associated with bone tissue, the lungs, and liver; it is not a significant thyroid cancer source. The dose conversion factor update discussed in the commenter's reference report has already been considered in the estimation of health impacts from the releases of plutonium, uranium, and americium. The reference to the 1989 INEL historical dose evaluation not listing americium is also not relevant, as the releases used to assess human health in the VTR EIS is based on more recent release data, data that includes americium.

23-61 As noted by the commenter, there are elevated levels of thyroid cancer in the counties surrounding the INL Site. However, the overall cancer rate for the surrounding counties is lower than that for Idaho and for the U.S. in general. This EIS provided information on the cancer rates in the area of interest around the INL Site (Chapter 3, Section 3.1.10). It is not the purpose of this EIS to establish a cause for any of these cancer rates. Cancer is caused by both external factors (e.g., tobacco, infectious organisms, chemicals, and radiation) and internal factors (inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). Risk factors for cancer include age, alcohol, cancer-causing substances, chronic inflammation, diet, hormones, immunosuppression, infectious agents, obesity, radiation, sunlight, and tobacco use. Therefore, to determine the cause of any incidence of cancer can be very difficult as there are many confounding factors.

23-62 Chapter 3 discusses ongoing site cleanup and monitoring activities as part of the existing environment at the INL Site. Assessing the scope and status of the ongoing site cleanup is outside of the scope of the VTR EIS. All VTR project-generated wastes would be shipped off site for treatment and disposal, and therefore, would not add to onsite inventories.

23-63 Please refer to the response to comment 23-56.

23-64 Guidance for site-wide monitoring and a description of the site-wide monitoring system are provided on the website: idahoeser.com. Existing monitoring systems meet current applicable requirements. Annual reporting is performed as required and releases evaluated annually to ensure compliance with applicable requirements. Monitoring for VTR would be conducted, as appropriate, in consultation with the applicable regulatory agency and would meet all applicable

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The Department of Energy and the State of Idaho are actively ignoring the likely environmental causes of elevated rates of cancer in the communities surrounding the INL and especially the elevated rates of childhood cancer.

The forty-first annual report of the Cancer Data Registry of Idaho (CDRI) was issued in December 2019 for the year 2017. [31] While the rate of some cancers decreased, the bad news for the State of Idaho is that the overall rate of cancer incidence continues to increase.

And, very importantly, childhood cancers in Idaho continue to increase. Pediatric (age 1 to 19) cancer increased at a rate of about 0.6 percent per year in Idaho from 1975 to 2017, see https://www.idcancer.org/pediatriccancer.

The rate of childhood cancer incidence in Bonneville County exceeded the remainder of the state for boys, based on the adjusted rate of cancer incidence. For girls the rate was high, but not above the remainder of the state, see Table 2.

Table 2. Bonneville County childhood cancer incidence rate compared to the rest of Idaho, 2017.

Cancer type	Sex	Rate in Bonneville County	Adjusted Rate in Bonneville County	Rate for remainder of Idaho
Pediatric	Total	17.8	17.9	18.2
Age 0 to 19	Male	19.0	**19.3**	19.1
	Female	16.5	16.5	17.2

Table notes: Rates are expressed as the number of cases per 100,000 persons per year (person-years).

The INL has continued to release radionuclides to the air within 50 miles of the lab with radionuclides including iodine-131, iodine-129, americium-241, strontium-90, cobalt-60, plutonium-238, plutonium-239, ruthenium-103, cesium-134 and cesium-137 and many others. And while doing so, has continued to insinuate that all the radionuclides are from former nuclear weapons testing or some other mysterious source. A study published in 1988 found the mallard ducks near the ATR Complex percolation ponds at the Idaho National Laboratory to be full of transuranic radionuclides including plutonium-238, plutonium-239, plutonium-240, americium-241, curium-242 and curium-244. [32] An employee who I knew had the habit of jogging around

[31] C. J. Johnson, B. M. Morawski, R. K., Rycroft, Cancer Data Registry of Idaho (CDRI), Boise Idaho, Annual Report of the Cancer Data Registry of Idaho, *Cancer in Idaho – 2017*, December 2019. https://www.idcancer.org/ContentFiles/AnnualReports/Cancer%20in%20Idaho%202017.pdf

[32] O. D. Markham et al., Health Physics, "Plutonium, Am, Cm and Sr in Ducks Maintained on Radioactive Leaching Ponds in Southeaster Idaho," September 1988. https://pubmed.ncbi.nlm.nih.gov/3170205/ (This study evaluated the concentrations of strontium-90, plutonium-238, plutonium-239, plutonium-240, americium-241, curium-242 and curium-244 in the tissues of mallard ducks near the ATR Complex reactive leaching ponds at the Idaho National Laboratory. It found the highest concentrations of transuranics occurred in the gastrointestinal tract, followed closely by feathers. Approximately 75%, 18%, 6% and 1% of the total transuranic activity in tissues analyzed were associated with the bone, feathers, GI tract and liver, respectively. Concentrations in the GI tracts were similar to concentrations in vegetation and insects near the ponds. The estimated total dose rate to the ducks from the Sr-90 and the transuranic nuclides was 69 millrad per day, of which 99 percent was to the bone. The

23-65 cont'd

requirements. Monitoring for the INL Site and surrounding areas is performed by the INL M&O contractor, the Idaho Cleanup Project Core contractor, and the INL ESER Program contractor. Contrary to the commenter's assertion that drinking water is sampled intermittently, the monitoring program schedule calls for semiannual collection of drinking water samples.

23-65 DOE does not ignore scientific evidence for the health effects from radiation. As needed, DOE updates its radiological protection requirements to implement requirements consistent with the latest approved information from the International Committee on Radiation Protection (ICRP) and the EPA (e.g., use of FGR 13 data and models). For the public and environment, these requirements flow to several DOE orders and standards (e.g., DOE Order 458.1, "Radiological Protection of the Public and the Environment"). For workers, DOE provides multiple levels of progressively more restrictive dose limits in its requirements and orders, from the 5-rem-per-year limit imposed under 10 CFR Part 835, to the 2-rem-per-year administrative limit in DOE-STD-1098-2017, *DOE Standard: Radiological Control Technical Standard*, to lower individual site restrictions. Guidance for site-wide monitoring and a description of the site-wide monitoring system are provided on the website: idahoeser.com. Existing monitoring systems meet current applicable requirements. Annual reporting is performed as required and releases evaluated annually to ensure compliance with applicable requirements. Monitoring for VTR would be conducted, as appropriate, in consultation with the applicable regulatory agency and would meet applicable requirements. Monitoring for the INL Site and surrounding areas is performed by the INL M&O contractor, the Idaho Cleanup Project Core contractor, and the INL ESER Program contractor. DOE is sympathetic with those who have chronic illnesses or cancer or who have lost family or friends to disease. Cancer has a major impact not only on family and friends, but also on society at large in the United States. As noted by the commenter, there are elevated levels of thyroid cancer in the counties surrounding the INL Site. However, the overall cancer rate for the surrounding counties is lower than that for Idaho and for the United States in general. This EIS provided information on the cancer rates in the area of interest around the INL Site (Chapter 3, Section 3.1.10). It is not the role of this EIS to establish a cause for any of these cancer rates. Cancer is caused by both external factors (e.g., tobacco, infectious organisms, chemicals, and radiation) and internal factors (inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). Risk factors for cancer include age, alcohol, cancer-causing substances, chronic inflammation, diet, hormones, immunosuppression, infectious agents, obesity, radiation, sunlight, and tobacco use. Therefore, to determine the cause of any incidence of cancer can be very difficult as there are many confounding factors.

the radioactive waste ponds at lunchtime. He died of liver cancer in his 50s. This health-conscious non-smoker was told, like the rest of us, that the radioactivity in the ponds was mainly tritium and was of no health concern what-so-ever.

The stated radionuclide releases from the Idaho National Laboratory to air have often been incomplete or underestimated the releases. The stated "effective dose equivalent" whole body dose has been a *fictional* fraction of a millirem.

The INL releases tons of volatile organic compounds with chlorine compounds to the air, such as the vapor extraction of carbon tetrachloride from buried Rocky Flats waste at the INL's Radioactive Waste Management Complex. A few years ago, EPA monitoring found high levels of carbon tetrachloride in Idaho Falls air. This emission is said to be within federal guidelines, but because chlorine compounds are so unhealthy for the thyroid, the prevalent chemical toxins that are released by the INL that are not even discussed in its environmental monitoring reports may need to be considered in light of elevated thyroid cancer incidence rates near the INL.

The radiation dose reconstruction analysts for the Center for Disease Control, who determine eligibility for the Energy Employee Occupational Illness Compensation Program (EEOICP) continue to ignore what went on and what is still going on at INL facilities, particularly the ATR Complex formerly known as the Test Reactor Area. The radiation dose reconstruction has continued to pretend that the fuel composition of the operating reactors and lack of fuel melt in these reactors means that workers were not exposed to airborne contamination. The CDC need only look at the radionuclides in the ducks. The levels of transuranics including americium-241 and curium in the air at the ATR Complex and other facilities at the INL are sometimes extensive. [33] [34]

The extensive airborne concentrations of americium-241 at the INL may be important to the underestimation of thyroid doses and risks of thyroid cancer incidence. A 1993 study estimated that the dose to the thyroid from americium-241 to be about 1.42 times that delivered to bone. They concluded that the thyroid dose is much higher from americium-241 than has been reported in people. [35]

On the potential health harm of americium-241, the Agency for Toxic Substances and Disease Registry has stated that: "The radiation from americium is the primary cause of adverse health effects from absorbed americium. Upon entering the body by any route of exposure, americium moves relatively rapidly through the body and is deposited on the surfaces of the

23-65 cont'd

estimated dose to a person eating one duck was 0.045 mrem. The ducks were estimated to contain 305 nanoCuries of transuranic activity and 68.7 microCuries of strontium-90.)

[33] F. Menetrier at al., *Applied Radiation Isot*., "The Biokinetics and Radiotoxicology of Curium: A Comparison With Americium," December 2007. https://pubmed.ncbi.nlm.nih.gov/18222696/ (This study found that the biokinetics of curium are very similar to those of americium-241. Lung and bone tumor induction appear to be the major hazards. Retention in the liver appears to be species dependent.)

[34] R. L. Kathren, Occupational Medicine, "Tissue Studies of Persons With Intakes of the Actinide Elements: The U.S. Transuranium and Uranium Registries," April-June 2001. https://pubmed.ncbi.nlm.nih.gov/11319054/ (This study finds that the dose coefficients for alpha radiation induction of bone sarcoma may be too high while those for leukemia are a factor six too low.

[35] G. N. Taylor et al., Health Physics, "241Am-induced Thyroid Lesions in the Beagle," June 1993. https://pubmed.ncbi.nlm.nih.gov/8491622/

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bones where it remains for a long time. As americium undergoes radioactive decay in the bone, alpha particles collide with nearby cell matter and give all of their energy to this cell matter. The gamma rays released by decaying americium can travel much farther before hitting cellular material, and many of these gamma rays leave the body without hitting or damaging any cell matter. The dose from this alpha and gamma radiation can cause changes in the genetic material of these cells that could result in health effects such as bone cancers. Exposure to extremely high levels of americium, as has been reported in some animal studies, has resulted in damage to organs. **23-65 cont'd**

The VTR EIS Addresses Isotope Production by Unrealistically Underestimating Radiological Releases and Health Harm

The VTR EIS relies on various previous EISs, including the Isotope EIS, which has grossly underestimated the health harm from airborne releases associated with DOE's isotope product and examination of tests. **23-66**

The VTR EIS randomly choose to reference the 2018 environmental report, when the airborne radiological releases over the last 15 years have included indications of far higher releases. The assumption that these releases have not been harmful is not born out by the facts, where health facts are available.

The environmental monitoring of radionuclides that can clearly be linked to the INL releases is deliberately biased to avoid reporting or explaining the high level of radionuclides not related to past weapons fallout or to phosphate mining or phosphate operations. **23-67**

When **short-lived activation products from the INL** are present in marmot tissues, the DOE's environmental monitoring program simply erased those radionuclides from the final report and didn't explain how gamma spectrometry had identified those radionuclides in the marmot tissues.

VTR EIS Ignores INL Environmental Monitoring Program Deficits **23-68**

The VTR is increasing the radiological releases as well as moving the releases closer to more populated Idaho communities. The airborne releases, when controlled, will be toward Idaho Falls and communities north of Idaho Falls. **23-69**

The actual releases from the Idaho National Laboratory are commonly low-balled and do not represent the actual releases. The methodology of how the releases are estimated is withheld. The actual releases of highly radioactively-laden resin beads from the Advanced Test Reactor is one example of **deliberate omission** of known radioactive releases to air. **23-67 cont'd**

I believe the reason for such inadequate reporting of radionuclide emissions and inadequate environmental monitoring by the DOE's environmental surveillance contractor is to hide the releases from the Idaho National Laboratory and specifically hide releases associated with isotope production and irradiation test examinations. These releases include americium-241,

33

23-66 The methodology to estimate population health effects from normal operation is presented in Appendix C of the EIS. As stated, radiological releases for the project were developed by scaling existing releases to reflect differences between current operations and VTR-related operations, primarily based on differences in the quantity of material be handled during each aspect of VTR operations. These estimated releases were then combined with additional site-specific information and input into an approved environmental dosimetry computer code (GENII). Release estimates from prior EISs were not used to develop the information used in this analysis. The EIS did not provide only the 2018 ASER data for releases from the INL Site. The Draft EIS provided information on the health effects of airborne emissions for the five-year period from 2014 to 2018. The Final EIS added information from 2019 (see Chapter 3, Section 3.1.10). While the commenter is correct that emissions from previous years were higher, the more-recent 6 years of data is more indicative of conditions associated with current operations at the INL Site. Performance of epidemiological studies by DOE or any other agency is not within the scope of this EIS.

23-67 Please refer to the response to comment 23-6 regarding environmental monitoring at the INL Site. The concerns expressed by the commenter regarding the current monitoring program and the determination of the source of existing contamination (e.g., strontium, cesium and other radionuclides in the marmot tissue samples) at the INL Site are not within the scope of this EIS. Radiological emissions from all INL facilities are measured or calculated in accordance with 40 CFR Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities," requirements. Emissions from radionuclide sources are required by Subpart H to be calculated in accordance with 40 CFR Part 61, Appendix D, "Methods for Estimating Radionuclide Emissions" or other procedure for which EPA has granted prior approval. Because individual radiological impacts on the public surrounding the INL Site remain too small to be measured by available monitoring techniques, the dose to the public from INL Site operations is calculated using the reported amounts of radionuclides released from INL Site facilities and EPA-approved air dispersion codes. The annual INL radionuclide NESHAP reports are available to the public as are INL Annual Site Environmental Reports (ASERs) where emissions are presented by radionuclide and facility. Each regulated INL Site facility determines airborne effluent concentrations from its regulated emission sources as required under State and Federal regulations. Ambient air monitoring performed by the INL M&O contractor; the Idaho Cleanup Project Core contractor; the INL ESER Program contractor (independent from the

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which the environmental monitoring reports almost laughably attribute to past nuclear weapons testing.

I also believe that the fraudulent use of the ATR Complex evaporation pond as the dumping ground for highly radioactive resin beads discharged from the Advanced Test Reactor continues to be covered up. The evaporation pond was not designed to receive the radioactively laden resin beads, but it would explain why so many activation products from the ATR are being spread airborne and yet are not included as radiological releases from the INL. In other words, the INL is releasing unreported radionuclides, repeatedly, and knows it. 23-67 cont'd

A large fraction of the radiation workers harmed by reliance on the Department of Energy's radiation protection programs have been denied compensation. It is known that more investigations of past releases and radiological programs are needed, and yet the Energy Employee compensation program moves ever so slowly to acknowledge the deficits and even slower to work toward completing the investigations. 23-70

The actual harm from Idaho National Laboratory radiological releases is far greater than the very low estimated radiation doses from annual environmental surveillance reports would indicate. Some indication of the higher health harm is available and must be examined by independent organizations other than the Department of Energy. The DOE has a long record of lying about epidemiology and still must not be allowed to perform or control such studies. But the studies are still needed and would show how disconnected the low millirem doses from the INL are from the actual health harm evident in our communities. 23-66 cont'd

Cancer rates in counties surrounding the INL are elevated, particularly for the incidence of thyroid cancer. 23-65 cont'd The VTR EIS has failed to address the continuing radiological releases of Pu-241 and Am-241 from the INL. The VTR EIS has selected 2018 environmental surveillance, while ignoring far higher annual releases during the last 20 years. The DOE's environmental surveillance reporting has unexplained gaps, omissions and technically unsupportable explanations that deny radionuclides are from the INL. The DOE's environmental surveillance reports have routinely explained the Am-241 as being from past nuclear weapons testing, when in fact, numerous CERCLA cleanup reports have found extensive at-facility radiological contamination, including Am-241, that cannot be attributed to past weapons testing.

The VTR EIS needs to present the total plutonium-241 and amercicium-241 releases from the INL and the VTR operations including isotope production and include the Pu-2341 and Am-241 releases. The VTR EIS needs to present the historical plutonium and americium releases because the environmental surveillance reports for the INL through the years have been inconsistent in whether or not plutonium and americium was reported. Plutonium-241 decays to americium-241. Americium-241 is an alpha emitter but also has a gamma ray that penetrates into tissue by 1 centimeter. 23-71

If yellow-bellied marmots in Pocatello had short-lived activation products in their tissues that cannot be from past weapons testing or from the phosphate industry, why weren't questions asked about where the short-lived radioactive manganese, zirconium, cerium and others came from? Why did gamma spectrometry detect these radionuclides both on and off the INL site? 23-72

34

M&O contractor); and the Idaho Department of Environmental Quality (DEQ) INL Oversight Program demonstrate that impacts from the INL are low and consistent with the emissions reported in annual INL radionuclide NESHAP reports. DOE contractors' ambient air monitoring data are reported annually in the ASERs which are available at http://idahoeser.com/Publications.html. DEQ's INL Oversight Program Annual Reports are available at DEQ's INL Oversight Monitoring Program website (https://www.deq.idaho.gov/idaho-national-laboratory-oversight/inl-oversight-program/). All discharges to the ATR Complex Evaporation Pond are sampled. This includes any incidental discharges to the pond. The sample results are used to develop a radioactive source term that is used in air dispersion modeling to calculate an offsite dose resulting from discharges. The air dispersion and dose modeling are performed and reported in accordance with EPA requirements contained in 40 CFR Part 61, Subpart H, and Appendix D. Radioactively contaminated soil was found outside the contamination area boundary on the berm of the Evaporation Pond as reported in the 2016 ASER report. The contaminated soil was evaluated under CERCLA 302.4 against isotopic-specific reportable quantities. In accordance with accepted practices for contaminants at the detected levels, a soil cap of at least 30 centimeters of soil was added over the area where the contaminants were found. Upon the end of the useful life of the ATR Evaporation Pond, the facility will be cleaned up and closed in accordance with applicable regulations. Chapter 3, Section 3.1.10, of this VTR EIS provides NESHAP data from the ASERs. The ASERs also describes data reporting guidelines and quality assurance procedures. Quality assurance is an integral part of every aspect of the INL Site environmental monitoring program, from the reliability of sample collection through sample transport, storage, processing, and measurement, to calculating results and formulating the report.

23-68 Please refer to the response to comment 23-64

23-69 The VTR EIS analyzed the impact on human health based on the location of the VTR adjacent and to the east of the MFC, and the proximity of all of the populations surrounding the INL Site. Only the VTR facility would be a new release point for airborne emissions. Existing facilities at MFC would be the source of emissions for all post-irradiation examination, spent fuel treatment, and fuel production activities. The results of the analysis are presented in Chapter 4, Section 4.10.1 and 4.10.3.

23-70 Chapter 1, Section 1.3 of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the

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Why were the results of the marmot tissue sampling program white-washed? And why weren't additional follow-on studies conducted? **23-72 cont'd**

Currently, public drinking water monitoring does not prescribe (or even allow) determining how much americium-241, plutonium-239 and other man-made radionuclides are in the water. The water supplies can and do become contaminated by the airborne radiological contamination. And even the Department of Energy's environmental monitoring program omits determination of the level of man-made contamination from elevated levels of uranium-235 from enriched nuclear fuel and from reactor-produced uranium isotopes such as uranium-232 and uranium-236. The presumption that uranium in our air, water and soil is naturally occurring is false and the monitoring programs are designed to prevent determining the level of radioactivity from Idaho National Laboratory emissions. **23-73** The VTR releases will consist of not only plutonium-239, americium-241, it will include plutonium-240, uranium-232, and uranium-236 which feed the thorium-232 decay series and the elevated levels of decay products such as thallium-208 are attributed to naturally occurring thorium-232 decay but are actually due to the release of radionuclides from the INL. The levels of radium-228 are elevated in our region not by naturally occurring thorium but by the release of plutonium-240 and uranium-236. **23-74**

The Department of Energy's environmental monitoring programs are often wrong about the source of contamination as it attributes elevated levels of airborne americium-241 to past nuclear weapons testing. There is no independent oversight and no error reporting or review of the DOE's highly biased and inadequate environmental monitoring program, see idahoeser.com.

The DOE's environmental monitoring contractor routinely does not provide quarterly monitoring reports, incorrectly attributes INL radiological releases to historical weapons testing, fails to provide trending information, when it provides trending, fails to explain the large gaps in data availability. There is no independent or honest assessment and oversight of the lapses common to the DOE's environmental monitoring program. **23-75**

The VTR EIS fails to address the inadequate and actually fraudulent environmental monitoring by its contractors, including the annual environmental surveillance report contractor, which incorrectly attributes americium-241 from the INL to past nuclear weapons testing.

Take a look at the plutonium and americium-241 releases from the Idaho National Laboratory between 2001 and 2017 based on Department of Energy environmental monitoring reports. [36] The State of Idaho DEQ does not display, report or trend any data before 2013….and I can see why. The huge releases from the INL between 2004 and 2013 are shocking and certainly would not fit well with a tourist brochure for visiting Idaho. **23-76**

[36] Department of Energy's environmental monitoring reports, see idahoeser.com and inldigitallibrary.inl.gov.

construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF. Investigation of past releases, and workers compensation for injuries from past releases, is outside the scope of this VTR EIS.

23-71 Guidance for site-wide monitoring and a description of the site-wide monitoring system are provided on the website: idahoeser.com. Existing monitoring systems meet current applicable requirements. Annual reporting is performed as required and releases evaluated annually to ensure compliance with applicable requirements. Monitoring for VTR would be conducted, as appropriate, in consultation with the applicable regulatory agency and would meet all applicable requirements. Monitoring for the INL Site and surrounding areas is performed by the INL M&O contractor, the Idaho Cleanup Project Core contractor, and the INL ESER Program contractor. The EIS did not provide only the 2018 ASER data for releases from the INL Site. The Draft EIS provided information on the health effects of airborne emissions for the five-year period from 2014 to 2018. The Final EIS added information from 2019 (see Chapter 3, Section 3.1.10). While the commenter is correct that emissions from previous years were higher, the more-recent 6 years of data is more indicative of conditions associated with current operations at the INL Site. The data referenced in the VTR EIS from the ASERs from 2014 through 2019 consistently identified the plutonium and americium isotopes identified by the commenter in the releases from the INL Site.

23-72 The purpose of this VTR EIS is to assess the environmental impacts of the proposed action. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE acknowledges that many different perceptions are represented in the comments received, but no comments were received that indicate any of the impact data presented in the EIS should be reconsidered based on technical or scientific reasons. DOE evaluated the potential impacts on human health and the environment from the VTR project and the cumulative impact from past, present, and reasonably foreseeable future actions and found effectively no increase in cumulative impacts on the public or collocated workers from radioactive air emissions during normal operations, as discussed in Chapter 4, Section 4.4, and Chapter 5, Section 5.3.4, of this VTR EIS.

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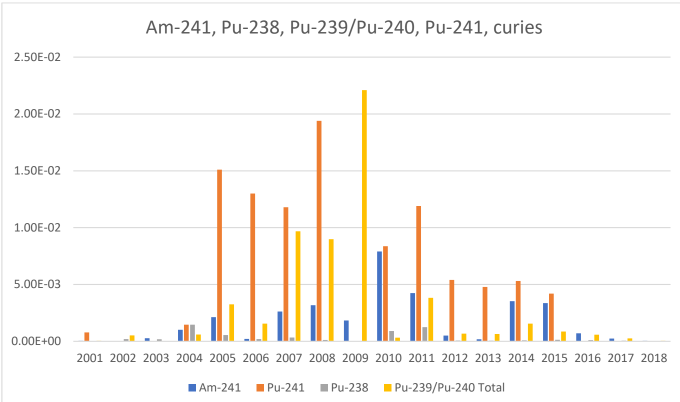
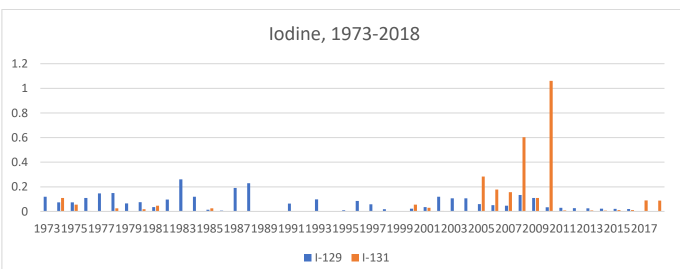


Then let's take a look at the iodine-129 and iodine-131 releases between 1973 and 2017, in curies. The State of Idaho DEQ went from displaying all of their environmental monitoring reports to displaying ten years of the reports, to know displaying only six years of annual reports and only 4 years of quarterly data reports from 2013 to 2018. **Again, here you can see why the Idaho DEQ didn't want to display INL monitoring data before 2013.**



36

23-76 cont'd

23-73 Environmental monitoring is performed at all DOE sites including INL. The monitoring programs record and document the impacts of activities at each site. Information about monitoring may be found in the Annual Site Environmental Reports (ASER) for each location via the following link: https://www.energy.gov/ehss/downloads/aser-links. Information presented in the ASERs complies with DOE Order 231.1B, "Environment, Safety and Health Reporting," and the INL Site Environmental Monitoring Plan is in compliance with DOE Order DOE Order 458.1, "Radiation Protection of the Public and the Environment." This VTR EIS presents the most recent information available on the current environment at the INL Site. The concerns expressed by the commenter regarding the current monitoring program and the determination of the source of existing contamination (e.g., strontium, cesium, and other radionuclides in the marmot tissue samples) at the INL Site are not within the scope of this EIS.

As stated in Section 3.1.3.1.2 of this VTR EIS, surface water samples collected in June 2018 contained alpha activity, beta activity, and tritium concentrations well below EPA maximum contaminant levels. It is not within the scope of this VTR EIS to determine the history or source of the existing environmental contamination. Please refer to the response to comment 23-6 for additional details about the monitoring program.

23-74 Appendix C of the VTR EIS provides a list of the isotopes considered in the assessment of human health impacts from normal operations. All of the isotopes listed by the commenter were included in the assessment. An examination of the source of radioisotopes in the environment is not within the scope of this EIS.

23-75 The INL Site environmental surveillance programs collect and analyze samples or direct measurements of air, water, soil, biota, and agricultural products from the INL Site and offsite locations in accordance with DOE Order 458.1, "Radiation Protection of the Public and the Environment"; DOE-HDBK-1216-2015, "Environmental Radiological Effluent Monitoring and Environmental Surveillance"; and DOE-STD-1196-2011, "Derived Concentration Technical Standard." The programs meet or exceed requirements within these governing documents and have been determined through technical review to effectively characterize levels and extent of radiological constituents in the environment and distinguish INL Site-related contributions from those typically found in the environment at background levels. The air sampling network covers a 9,000-square-mile area in southeast Idaho and Jackson, Wyoming, with over 2,000 samples collected each year and analyzed for key radiological constituents associated with INL Site operations. In addition, radiological emissions

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The plutonium and americium-241 and the iodine-129 and iodine-131 are not the only radionuclides with elevated releases from the INL. But these radionuclides might have influenced the elevated thyroid cancers in Bonneville County reported for 2013 to 2017.

Iodine-129 with its 16-million-year half-life has higher inhalation and ingestion dose conversion factors than iodine-131 with its 8-day half-life. While iodine-131 does give a higher air emersion and ground shine dose, the iodine-129 dose often is a dominant dose contributor for INL airborne releases.

The VTR EIS fails to address the rather short-lived radionuclides produced in nuclear reactors that were found in marmot tissue as far away as Pocatello Idaho which cannot have come from past weapons testing or radioactive disposal activities such as importation of radioactive waste via train car past Pocatello to US Ecology Grandview Idaho.

The VTR EIS ignores the past radiological releases, their resuspension and buildup in the environment.

23-76 cont'd

The INL's EBR-II fuel is the feedstock for its high-assay low-enriched uranium (HALEU), DOE/EA-2087, being pyroprocessed at INL's Materials and Fuels Complex and increasing the radiological airborne emissions from the INL 170-fold, see Table 3.

The EA cumulative impacts evaluation is arbitrary and misleading and fails to address the buildup of radionuclides in our air, water and soil and fails to acknowledge the inadequacy of the environmental surveillance programs.

People might eventually catch on that Idaho is getting more and more radiologically polluted — but with all the deliberate omissions and dis-information, probably not before it's too late.

23-77

from all INL facilities are measured or calculated in accordance with 40 CFR Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities," requirements. Emissions from radionuclide emissions sources are required by Subpart H to be calculated in accordance 40 CFR Part 61, Appendix D, "Methods for Estimating Radionuclide Emissions," or another procedure for which EPA has granted prior approval. The annual INL radionuclide NESHAP reports are available to the public (https://inldigitallibrary.inl.gov/) as are INL Annual Site Environmental Reports (ASERs) at http://idahoeser.com/Publications.html where emissions are presented by radionuclide and facility. Each regulated INL Site facility determines airborne effluent concentrations from its regulated emission sources as required under State and Federal regulations. Ambient air monitoring performed by the INL M&O contractor; the Idaho Cleanup Project Core contractor; the INL ESER Program contractor (independent from the M&O contractor); and the Idaho DEQ INL Oversight Program demonstrate that impacts from the INL are low and consistent with the emissions reported in annual INL radionuclide NESHAP reports. Because individual radiological impacts on the public surrounding the INL Site remain too small to be measured by available monitoring techniques, the dose to the public from INL Site operations is calculated using the reported amounts of radionuclides released from INL Site facilities and EPA-approved air dispersion codes. Compliance with 40 CFR Part 61, Subpart H is demonstrated primarily using the CAP 88 computer code as required by EPA. CAP 88 uses dose and risk tables developed by the EPA. Yearly wind statistics are generated for many of the towers in the INL Site meteorological network; these are used to run the CAP 88 plume dispersion code required for NESHAP compliance. DOE integrates applicable QA requirements into the INL Site monitoring program plans and procedures. The program plans address the QA elements as stated in ANSI/ASQC E4-1994, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Technology Programs (e.g., e-standard, U.S. EPA, current version) to verify that the required standards of data quality are met. DOE prepared this VTR EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impact analyses. Personnel with many years of experience performed the impact analyses using advanced computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in this VTR EIS to be revised based on technical or scientific reasons.

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Table 3. Estimated annual air pathway dose (mrem) to Idaho communities from normal operations to the maximally exposed offsite individual from proposed projects, including the estimated dose from expanding capabilities at the Ranges based on DOE/EA-2063.

Current and Reasonably Foreseeable Future Action	Estimated Annual Air Pathway Dose (mrem)
National Security Test Range	0.04[e]
Radiological Response Training Range (North Test Range)	0.048[d]
Radiological Response Training Range (South Test Range)	0.00034[a]
HALEU Fuel Production (DOE-ID, 2019)	1.6[a]
Integrated Waste Treatment Unit (ICP/EXT-05-01116)	0.0746[h]
New DOE Remote-Handled LLW Disposal Facility (DOE/ID 2018)	0.0074[a]
Recapitalization of Infrastructure Supporting Naval Spent Nuclear Fuel Handling (DOE/EIS 2016)	0.0006[c]
TREAT (DOE/EA 2014)	0.0011[a]
DOE Idaho Spent Fuel Facility (NRC, 2004)	0.000063[a]
Plutonium-238 Production for Radioisotope Power Systems (DOE/EIS 2013)	0.00000026[b]
Total of Reasonably Foreseeable Future Actions on the INL Site	1.77[g]
Current (2018) Annual Estimated INL Emissions (DOE2019a)	0.0102[f]
Total of Current and Reasonably Foreseeable Future Actions on the INL Site [**DOE WOULD INCREASE INL'S AIRBORNE RELEASES BY OVER 170 TIMES**]	1.78[g]

Table notes:
a. Dose calculated at Frenchman's Cabin, typically INL's MEI for annual NESHAP evaluation.
b. Receptor location is not clear. Conservatively assumed at Frenchman's Cabin.
c. Dose calculated at INL boundary northwest of Naval Reactor Facility. Dose at Frenchman' Cabin likely much lower.
d. Dose calculated at INL boundary northeast of Specific Manufacturing Capability. Dose at Frenchman's Cabin likely much lower.
e. Sum of doses from New Explosive Test Area and Radiological Training Pad calculated at separate locations northeast of MFC near Mud Lake. **Dose at Frenchman's Cabin likely much lower. PLEASE NOTE THAT THE PUBLIC AT MUD LAKE IS CLOSER TO THE RELEASE THAN TO FRENCHMAN'S CABIN.**
f. Dose at MEI location (Frenchman's Cabin) from 2018 INL emissions (DOE 2019a). The 10-year (2008 through 2017) average dose is 0.05 mrem/year.
PLEASE NOTE THAT MANY RADIOLOGICAL RELEASES ARE IGNORED AND NOT INCLUDED IN THE RELEASE ESTIMATES IN NESHAPS REPORTING.
g. This total represents air impact from current and reasonably foreseeable future actions at INL. It conservatively assumes the dose from each facility was calculated at the same location (Frenchman's Cabin), which they were not.
h. Receptor location unknown, according to the Department of Energy, the agency that is supposed to know the receptor location.

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23-77 cont'd

23-76 Guidance for site-wide monitoring and a description of the site-wide monitoring system are provided on the website: idahoeser.com. Existing monitoring systems meet current applicable requirements. Annual reporting is performed as required and releases evaluated annually to ensure compliance with applicable requirements. Monitoring for VTR would be conducted, as appropriate, in consultation with the applicable regulatory agency and would meet all applicable requirements. Monitoring for the INL Site and surrounding areas is performed by the INL M&O contractor, the Idaho Cleanup Project Core contractor, and the INL ESER Program contractor. Decisions made by the Idaho DEQ and a determination of the source of existing radioisotopes in the areas around the INL Site are not within the scope of this EIS.

23-77 The numbers quoted by the commenter from DOE/EA-2063 are estimates of cumulative dose, a dose that includes the dose from current operations (less than a millirem to the maximally exposed individual) and all reasonably foreseeable future actions, which includes actions that may or may not ultimately happen at the INL Site. The VTR EIS has a similar cumulative impact assessment which is presented in Chapter 5, Section 5.3.10. The results of the assessment in this EIS are similar. The commenters 170 factor is roughly accurate for the cumulative impacts assessment of the VTR EIS. But even with this increase from cumulative actions, the dose to the maximally exposed individual is less than 2 millirem. This is well below any regulatory limits for dose to an offsite individual (10 millirem is the dose limit [40 CFR Part 61, Subpart H] for airborne releases from a DOE facility). Guidance for site-wide monitoring and a description of the site-wide monitoring system are provided on the website: idahoeser.com. Existing monitoring systems meet current applicable requirements. Annual reporting is performed as required and releases evaluated annually to ensure compliance with applicable requirements. Monitoring for VTR would be conducted, as appropriate, in consultation with the applicable regulatory agency and would meet all applicable requirements. Monitoring for the INL Site and surrounding areas is performed by the INL M&O contractor, the Idaho Cleanup Project Core contractor, and the INL ESER Program contractor. According to the 2019 ASER, "The INL Site environmental surveillance programs emphasize measurements of airborne contaminants in the environment because air is the most important transport pathway from the INL Site to receptors living outside the INL Site boundary. Because of this pathway, samples of airborne particulates, atmospheric moisture, and precipitation were collected in 2019 on the INL Site, at INL Site boundary locations, and at distant communities and were analyzed for radioactivity." In 2019 about 1,200 air samples, including emissions from facilities subject to NESHAP regulations, were collected. These were used for analysis, not estimates.

Commenter No. 23 (cont'd): Tami Thatcher

The VTR EIS ignores many the ongoing radiological releases including the decision by the U.S. Department of Energy to allow the DOE to release long-lived radionuclides to air and soil at the Idaho National Laboratory, from the Expanding Capabilities at the National Security Test Range and the Radiological Response Training Range at Idaho National Laboratory (DOE/EA-2063) at

The VTR EIS fails to address the existing contamination levels in communities and drinking water. The draft EA fails to acknowledge that current INL radiological airborne monitoring is woefully inadequate because (1) emissions from the INL are usually based on estimates and not the reality, (2) the current environmental monitoring programs are designed to be inadequate, (3) the reports are tardy by nearly a year and are increasingly tardy, and (4) the quarterly and annual environmental monitoring reports are not reliable and are prone to "lost samples" or "air monitor not functioning" excuses. **23-77 cont'd**

Historical and current radiological monitoring programs omit INL releases, and are designed to hide, not reveal, the level and the source of radiological contamination.

The VTR EIS fails to truthfully discuss the multitude of INL CERCLA cleanup sites that cannot be released in 2095, as it goes about creating more CERCLA sites at the INL. **23-78**

DOE expects to continue increasing the "normal background" radiation levels both on and off the Idaho National Laboratory site until our communities all receive unhealthy levels of radionuclide ingestion and inhalation.

"Normal background levels" are already elevated above what was naturally occurring and continue to rise. By selecting a contaminated area to determine "normal background," it appears to me that this is how some radiological facilities can claim to operate within "normal expected background" no matter what radiological release incident just occurred.

The DOE continues to not disclose what it considers "normal background levels" on and off the INL or to trend how the "normal background levels" have changed over time. **23-79**

The INL's past practices of inflating "normal background levels" meant that employees worked in contaminated areas that when assessed independently during CERCLA cleanup investigations in 1995, these facilities had to be disposed of as radiological waste. Various INL areas had been highly contaminated for decades, and yet not monitored or controlled as such. See the Administrative Record for CERCLA cleanup at the Idaho National Laboratory at https://ar.icp.doe.gov .

The VTR EIS fails to acknowledge that the DOE's allowable radiation level of 100 mrem/yr would devastate public health

The VTR EIS relies on the DOE's allowable radiation level of 100 mrem/yr and implies that reaching such high levels would not be a devastation to the health of people in our communities. **23-80**

By no means is the DOE's 100 mrem/yr dose limit to the public protective of human health. DOE ignores the epidemiology that shows that a few years of an average 400 mrem/yr to adult radiation workers increases cancer risk. Exposure of pregnant women to DOE's allowed 100 mrem/yr dose would greatly harm fetal health. The DOE ignores all modern epidemiology

23-78 Please refer to the response to comment 23-62.

23-79 Normal background levels are provided in all of the ASERs cited in the VTR EIS. The background levels are consistent with those in *Ionizing Radiation Exposure of the Population of the United States* (NCRP 2009). Comparisons of doses from facility air emissions to doses from naturally occurring background radiation are for informative purposes only. They are not used in any capacity to determine whether a facility meets emission standards.

23-80 The VTR EIS compares the expected doses to the public to the DOE limit of 10 millirem from airborne pathways (from DOE Order 458.1 incorporating the requirements of 40 CFR Part 61, Subpart H), not 100 millirem as incorrectly stated in the comment. As stated in Chapter 4, Section 4.10.1, and in the impacts summary in Chapter 2, Section 2.9, the dose to the maximally exposed individual from any VTR activity at the INL Site is much less than 1 millirem. At this level, no latent cancer fatalities would be predicted in the population around the INL Site resulting from the 60 years of operation of the VTR.

studies for human health effects that show harm greater than DOE chose to believe decades ago, especially to the unborn, and to females and children. 23-80 cont'd

The VTR EIS fails to address the fact the radiation workers are still wrongly told that there is no evidence of damage to DNA or genetic effects from radiation exposure to humans. DOE's radiation workers are not told of the infertility and increased risk of birth defects from radiation.

The VTR EIS fails to address the fact that the investigations into worker contamination at the INL historically are not complete and do find evidence of inadequate worker protection. The investigations continue at a snail's pace by the Center for Disease Control's National Institute of Occupational Safety and Health (NIOSH) for the Energy Employee Occupational Illness Compensation Program. Meanwhile, injured workers and their survivors die, having had their illness claim wrongly denied.

The VTR EIS needs to acknowledge the inadequacy of the 5,000 mrem/yr limit to actually protect adult radiation workers. The VTR EIS needs to acknowledge the extent that radiological records of contamination in urine and fecal samples is withheld from workers, enabling errors and deliberate falsifications. Many workers go to medical providers and the worker lacks exposure and radiological intake history, let alone accurate radiological (and chemical) intake information.

The public as well as radiation workers need to keep in mind that, despite what they may have been taught:

- The cancer risk is not reduced when radiation doses are received in small increments, as the nuclear industry has long assumed. [37]
- Despite the repeated refrain that the harm from doses below 10 rem cannot be discerned, multiple and diverse studies from human epidemiology continue to find elevated cancer risks below 10 rem and from low-dose-rate exposure. [38] 23-81
- The adverse health effects of ionizing radiation are not limited to the increased risk of cancer and leukemia. Ionizing radiation is also a contributor to a wide range of chronic illnesses including heart disease and brain or neurological diseases.

The public and radiation workers take cues from their management that they should not be concerned about the tiny and easily shielded beta and alpha particles. DOE-funded fact sheets often spend more verbiage discussing natural sources of radiation than admitting the vast amounts of radioactive waste created by the DOE. The tone and the meta-message from the

[37] Richardson, David B., et al., "Risk of cancer from occupational exposure to ionizing radiation: retrospective cohort study of workers in France, the United Kingdom, and the United States (INWORKS), BMJ, v. 351 (October 15, 2015), at http://www.bmj.com/content/351/bmj.h5359 Richardson et al 2015 This cohort study included 308,297 workers in the nuclear industry.

[38] US EPA 2015 http://www.regulations.gov/#!documentDetail;D=NRC-2015-0057-0436 . For important low-dose radiation epidemiology see also John W. Gofman M.D., Ph.D. book and online summary of low dose human epidemiology in "Radiation-Induced Cancer from Low-Dose Exposure: An Independent Analysis," Committee for Nuclear Responsibility, Inc., 1990, http://www.ratical.org/radiation/CNR/RIC/chp21.txt And see EDI's April 2016 newsletter for Ian Goddard's summary and listing of important human epidemiology concerning low dose radiation exposure.

23-81 For workers, DOE provides multiple levels of progressively more restrictive dose limits in its requirements and orders, From the 5-rem-per-year limit imposed under 10 CFR Part 835, to the 2-rem-per-year administrative limit in DOE-STD-1098-2017, DOE Standard: Radiological Control Technical Standard, to lower individual site restrictions. The comments regarding worker training are not within the scope of this EIS. The EEOICP is administered by the DOL with DOEHHS (specifically NIOSH). DOL has the primary responsibility to administer the program. Dose reconstruction is the responsibility of NIOSH. The DOE role in the program is informative. DOE responds to requests for facility and worker records (DOE responds to over 15,000 such requests per year; requests may cover worker information from multiple facilities); requests for site characterization and research (DOE typically is responding to four or five such requests at any one time); and requests about issues for specific facilities. (Over 300 facilities are covered, many are private company facilities, and these are considered large-scale requests that could involve researching information for multiple facilities over multiple decades.) DOE has an extensive staff assigned to support the EEOICP who work in a transparent manner. DOE strives to provide timely and accurate responses to the DOL and NIOSH requests for information. As indicated in the following response, DOE follows international and national guidance regarding radiation protection standards; discussion of dose effects that are the basis of those standards is beyond the scope of this EIS.

Commenter No. 23 (cont'd): Tami Thatcher

DOE, the nuclear industry, is that if you are educated about the risks, then you'll understand that the risks are low. Yet, these agencies continue to deny the continuing accumulation of compelling and diverse human epidemiological evidence that the harm of ingesting radionuclides is greater than they've been claiming.

The biological harm that ionizing radiation may cause to DNA is mentioned sometimes but it is emphasized that usually the DNA simply are repaired by the body. And the training to radiation workers will mention that fruit flies exposed to radiation passed genetic mutations to their offspring but workers are told that this phenomenon has never been seen in humans even though, sadly, the human evidence of genetic effects has continued to accumulate. Birth defects and children more susceptible to cancer are the result.

Gulf War veterans who inhaled depleted uranium have children with birth defects at much higher than normal rate. The same kinds of birth defects also became prevalent in the countries where citizens were exposed to DU. There are accounts to suggest that the actual number of birth defects resulting from the World War II atomic bombs dropped on Japan and by weapons testing over the Marshall Islands have been underreported. The Department of Energy early on made the decision not to track birth defects resulting from its workers or exposed populations. But people living near Hanford and near Oak Ridge know of increased birth defects in those communities.

In radworker training, there may be discussion of the fact that international radiation worker protection recommends only 2 rem per year, not 5 rem per year. There is no mention of recent human epidemiology showing the harm of radiation is higher than previously thought and at low doses, below 400 mrem annually to adult workers, increased cancer risk occurs.

23-81 cont'd

There is no mention of the oxidative stress caused as ionizing radiation strips electrons off atoms or molecules in the body at energies far exceeding normal biological energy levels. And there is no discussion explaining the harm of inhaling or ingesting radioactive particles of fission products such as cesium-137, strontium-90, or iodine-131; of activation products such as cobalt-60; or transuranics such as plutonium and americium; or of the uranium itself.

The volatile or gaseous radionuclides, some of which can't be contained even with air filters — include technetium-99, tritium, carbon-14, iodine-129, argon-39, krypton-85, and radon-222 as the volatile radionuclides dominating the proposed Greater-Than-Class C radioactive waste disposal for the Andrews County, Texas facility. In Idaho, it appears that the DOE fails to adequately address these gaseous emissions from waste and other sources.

Often radionuclides with low curie levels dominate the harm to human health from radioactive waste disposal. So, when DOE states an overall curie level without stating which radionuclides and their specific curie levels, neither the radiotoxicity nor the longevity of the radioactive waste has been indicated.

Uranium and thorium and their decay products may be natural but in concentrated form in drinking water, soil or air, they are harmful. Radioactive waste disposal classification has often left out concentration limits for these radionuclides. Massive amounts of depleted uranium are considered Class A radioactive waste but won't be safe at the end of 100 years but will actually

23-82

23-82 Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal" of this CRD for additional information. Doses from internal exposure to radionuclides, either by inhalation or ingestion, are considered in developing the dose estimates to the public. The EIS does not need to describe the exact mechanisms for this internal dose. The DOE does not ignore scientific evidence for the health effects from radiation. As needed, DOE updates its radiological protection requirements to implement requirements consistent with the latest approved information from the ICRP and the EPA (e.g., use of FGR 13 data and models). For the public and environment, these requirements flow to several DOE orders and standards (e.g., DOE Order 458.1, "Radiological Protection of the Public and the Environment"). For workers, DOE provides multiple levels of progressively more restrictive dose limits in its requirements and orders, from the 5-rem-per-year limit imposed under 10 CFR Part 835, to the 2-rem-per-year administrative limit in, DOE-STD-1098-2017, *DOE Standard: Radiological Control Technical Standard*, to lower individual site restrictions. The analysis in this EIS uses a dose-to-risk factor of 0.0006 latent cancer fatalities per rem of exposure as recommended by ISCORS, which is in agreement with values contained in the *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2* report. The model used in this EIS is a linear no-threshold model, meaning that all exposure to radiation is assumed to result in an increase in the risk of a fatal cancer.

be more radioactive through decay progeny. The DOE has typically ignored its extensive releases of uranium and transuranic radionuclides to Idaho communities.

Plutonium-238, plutonium-239, and other transuranic radionuclides in radioactive waste in what appear to be low curie amounts also pose health harm. Is DOE planning to say that they stayed below some curie amount, while not disclosing the actual radionuclides released?

Cancer rates for uranium are typically based on natural forms for uranium and not chemically altered forms that may be more soluble in the human body. The internal radiation cancer harm is not based on solid epidemiological evidence and there are experts from Karl Z. Morgan to Chris Busby to Jack Valentine that understand that the accepted models may understate the cancer harm by a factor of 10, 100 or more. The nuclear industry continues to ignore the epidemiological evidence that implies tighter restrictions are needed.

Importantly, the chemical forms released by the INL may be more harmful than predicted because of particle size, temperatures during processing or releases, or other factors which may affect retention in the human body.

23-82 cont'd

The DOE has long given presentations to the public that deliberately withheld information about long-lived radionuclide contamination. Even now, when filters are evaluated and found to have americium-241, plutonium-238 and plutonium-239, for example, the DOE and State of Idaho usually pretend to not know the source of the radionuclides.

Monitoring of waste burial sites for CERCLA at INL has often been inadequate and biased to hide contamination findings by reduced monitoring and reduced reporting. Spotty monitoring of land and the aquifer means "no discernable trend could be found."

At the Idaho National Laboratory, formerly the Idaho National Engineering and Environmental Laboratory, the Idaho National Engineering Laboratory, and the National Reactor Testing Station, historical releases were monitored yet not actually characterized as to what and how many curies were released. When asked by the governor in 1989 to provide an estimate of the radionuclides released from routine operations and accidents, the Department of Energy issued the "INEL Historical Dose Evaluation." [39] [40] It has been found to have underestimated serious releases by sometimes 10-fold. Furthermore, the past environmental monitoring used all along to claim no significant releases had occurred were not used in the INEL Historical Dose Evaluation. The environmental records that could have been used against the Department of Energy or its contractors were destroyed.

23-83

The Center for Disease Control commenced reviewing the DOE's radiological release estimate that were the basis for denying that any epidemiological study was needed in Idaho communities near the site. The CDC in 2007 issued its review of the 1989 study and found many

23-84

23-83 cont'd

[39] US Department of Energy Idaho Operations Office, "Idaho National Engineering Laboratory Historical Dose Evaluation," DOE-ID-12119, August 1991. Volumes 1 and 2 can be found at https://www.iaea.org/inis/inis-collection/index.html

[40] Environmental Defense Institute's comment submittal on the Consent-based Approach for Siting Storage for the nation's Nuclear Waste, July 31, 2016. http://www.environmental-defense-institute.org/publications/EDIXConsentFinal.pdf

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23-83 As part of the information provided in Chapter 3 of the EIS, impact of current radiological emissions are discussed. Historical releases are not within the scope of the EIS. Guidance for site-wide monitoring and a description of the site-wide monitoring system are provided on the website: idahoeser.com. Existing monitoring systems meet current applicable requirements. Annual reporting is performed as required and releases evaluated annually to ensure compliance with applicable requirements. Monitoring for the INL Site and surrounding areas is performed by the INL M&O contractor, the Idaho Cleanup Project Core contractor, and the INL ESER Program contractor.

23-84 Thank you for your comment. Prior INL epidemiology studies and the SL-1 accident are not within the scope of this EIS. See also the response to comment 23-52.

Commenter No. 23 (cont'd): Tami Thatcher

releases, some of the largest ones, underestimated by a factor of 7. [41] Errors causing underestimation of the INL releases continue to be found as energy worker compensation studies have continued. The INL was originally called the National Reactor Testing Station, later called the Idaho Engineering Laboratory, and then the Idaho National Engineering and Environmental Laboratory before being named the Idaho National Laboratory.

The estimates of the 1991 INEL Historical Dose Evaluation [42] continue to be found in error and to significantly underestimate what was released. [43] [44] [45] Theoretical and idealized modeling of the releases were used for estimating the releases for the 1991 INEL HDE without using environmental monitoring to confirm the estimates — except for the 1961 SL-1 accident in which the environmental monitoring showed that the **theoretical modeling had underestimated the release**. In fact, many of the environmental monitoring records were deliberately destroyed before the 1991 report was released. [46] INL airborne releases included a long list of every fission product that exists including iodine-131, long-lived I-129, tritium, strontium-90, cesium-37, plutonium, and uranium.

The source documents for the INEL HDE are in fact part of the Human Radiation Experiments collection of DOE documents. Why? Because there was enough information available for the DOE to know that showering nearby communities and their farms and milk cows with radiation really was likely to be harmful to their health. The INL (formerly the NRTS, INEL and INEEL) takes up dozens of volumes of binders in the DOE's Human Radiation Experiments collection and that isn't including the boxes of documents no one can get access to or the records that were deliberately disposed of. [47]

23-84 cont'd

[41] Center for Disease Control, CDC Task Order 5-2000-Final, Final Report RAC Report No. 3, by Risk Assessment Corporation, October 2002. https://www.cdc.gov/nceh/radiation/ineel/to5finalreport.pdf

[42] US Department of Energy Idaho Operations Office, "Idaho National Engineering Laboratory Historical Dose Evaluation," DOE-ID-12119, August 1991. Volumes 1 and 2 can be found at https://www.iaea.org/inis/inis-collection/index.html p. 40

[43] Risk Assessment Corporation, "Identification and Prioritization of Radionuclide Releases from the Idaho National Engineering and Environmental Laboratory," October 8, 2002, https://www.cdc.gov/nceh/radiation/ineel/to5finalreport.pdf See p. 117, 118 for SL-1.

[44] SENES Oak Ridge, "A Critical Review of Source Terms for Select Initial Engine Tests Associated with the Aircraft Nuclear Program at INEL," Contract No. 200-2002-00367, Final Report, July 2005. http://www.cdc.gov/nceh/radiation/ineel/anpsourceterms.pdf See p. 4-67 for Table 4-13 for I-131 estimate for IET's 10A and 10B and note the wrong values for I-131 are listed in the summary ES-7 table.

[45] CDC NIOSH, "NIOSH Investigation into the Issues Raised in Comment 2 for SCA-TR-TASK1-005," September 3, 2013. https://www.cdc.gov/niosh/ocas/pdfs/dps/dc-inlspcom2-r0.pdf See p. 3 stating various episodic releases underestimated by the INEL HDE: IET 3, IET 4 and IET 10.

[46] Chuck Broscious, Environmental Defense Institute Report, "Destruction and Inadequate Retrieval of INL Documents Worse than Previously Reported," Revised September 1, 2018. http://environmental-defense-institute.org/publications/DocDestruction.pdf

[47] February 1995, the Department of Energy's (DOE) Office of Human Radiation Experiments published *Human Radiation Experiments: The Department of Energy Roadmap to the Story and Records* ("The DOE Roadmap"). See also the INL site profile on Occupational Environmental Dose: http://www.cdc.gov/niosh/ocas/pdfs/tbd/inl-anlw4-r2.pdf) Most of the documents in the DOE's Human Radiation Experiments collection remain perversely out of public reach. Documents are said to be stored at the INL site, out of state in boxes, [Good luck with getting these documents via the Freedom of Information Act] and in the National Archives. I found that retrieving documents from the National Archive would require extensive fees for searches and copying. Where is the transparency in creating a document collection that cannot be viewed by the public?

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DOE and the CDC still not disclosing the full extent of historical releases, including the magnitude of the 1961 SL-1 release which affected communities including Atomic City and Mud Lake.

Communities near the INL, include Atomic City to the south and Mud Lake to the north and Osgood west of the MARVEL project have been adversely affected already and isn't the harm done to those poor people enough?

The Atomic Energy Commission, predecessor of the Department of Energy, claimed that no other fission products were detected other than 0.1 Curies of strontium-90 and 0.5 curies of cesium-137 within the perimeter fence of the SL-1. [48] The derived release fractions based on trying to fit the AEC claims to a computer derived release fraction show that the AEC claimed low curie amount releases are fiction. Never before or since has a reactor fuel had such low release fractions! The AEC not only left out many radionuclides, they underestimated the amount of the fission product releases from the accident by a factor of over 22 for iodine-131, 588 for Cs-137 and 277 for Sr-90. And even with the low-balled curie releases, the SL-1 accident was a serious accident.

Despite what Risk Assessment Corporation (RAC) writes about prevailing meteorological conditions at the time of the SL-1 accident being characteristic of the typical conditions at the time of year, the conditions were not typical. During the accident, the prevailing winds were from the north to northeast for 100 hours with an extremely strong inversion. Typical conditions are a prevailing wind in the opposite direction during the daytime, with wind reversals at night typical. The SL-1 radionuclide plume blew south toward American Falls and Rupert, Idaho.

23-85

The SL-1 reactor fission product inventory consisted of radionuclides produced during the excursion and also radionuclides the had built up in the fuel during previous reactor operations. The operating history of the reactor consisted of 11,000 hours for a total of 932 MW-days. The reactor accident resulted in a total energy release of 133 MW-seconds. Roughly 30 percent of the core's fuel inventory was missing from the vessel, when examined after the accident. [49 50 51]

Risk Assessment Corporation used the computer code RSAC to calculated a fission product inventory based on operation of the reactor at a power level of 2.03 MW (mega-watts) for 458 days, followed by a shutdown period of 11 days and the excursion power level of 88,700 MW for a period of 0.015 seconds. The Center for Disease Control did not call out what were obvious

[48] Report by Risk Assessment Corporation for Centers for Disease Control and Prevention, Department of Health and Human Services, *Final Report Identification and Prioritization of Radionuclide Releases from the Idaho National Engineering and Environmental Laboratory*, RAC Report No. 3, CDC Task Order S-2000-Final, October 2002, pages 117, 118. https://www.cdc.gov/nceh/radiation/ineel/TO5FinalReport.pdf

[49] Department of Energy, Idaho National Engineering Laboratory Historical Dose Evaluation, DOE/ID-12119, August 1991. See https://inldigitallibrary.inl.gov

[50] Atomic Energy Commission, "Final Report of the SL-1 Recovery Operation," IDO-19311, June 27, 1962. See p. III-77 regarding fuel damage. https://inldigitallibrary.inl.gov/PRR/163644.pdf

[51] Atomic Energy Commission, "Additional Analysis of the SL-1 Excursion Final Report of Progress July through October 1962," IDO-19313, November 21, 1962. See p. 27 Table I-VIII. https://inldigitallibrary.inl.gov/PRR/163644.pdf

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23-85 Thank you for your comment. Discussions of the impact of the SL-1 accident are not within the scope of the VTR EIS. Also, please refer to the response to comment 23-52.

Commenter No. 23 (cont'd): Tami Thatcher

discrepancies and which meant that the SL-1 radiological consequences have been grossly understated.

Sage brush samples were collected and according to the AEC, the "gamma spectra of representative samples indicated that the activity was due to iodine-131. (IDO-12021, p. 131)

It was customary for the AEC to monitor jack rabbit thyroids and the iodine-131 levels before the SL-1 accident, for jack rabbit thyroids were typically 100 picocuries per gram. After the SL-1 accident, the levels were as high as 750,000 picocuries per gram at the SL-1, 180,000 picocuries/gram at nearby Atomic City, located south of the SL-1, and 50,000 picocuries per gram at Tabor, a farming community southeast of SL-1 and west of Blackfoot, and 11,200 picocuries at Springfield. These rabbit thyroid results reveal much higher rabbit thyroid iodine-131 levels than produced by the other large episodic and routine releases from the Idaho National Laboratory during the 1950s and 1960s. [52 53 54 55]

The DOE has lied to the public about the SL-1 accident and still publishes false information about the SL-1 accident, you can read my report about the consequences of the SL-1 accident on the Environmental Defense Institute website, *The SL-1 Accident Consequences*, at http://environmental-defense-institute.org/publications/SL-1Consequences.pdf and the cause of the SL-1 accident on the Environmental Defense Institute website, *The Truth about the SL-1 Accident – Understanding the Reactor Excursion and Safety Problems at SL-1* at http://environmental-defense-institute.org/publications/SL-1Accident.pdf

23-85 cont'd

The VTR EIS Implies by Listing Various Department of Energy Regulations but Fails to Assess How Likely DOE is to Ignore Compliance

23-86

From the DOE's nuclear weapons testing at the Nevada Testing Station, in the Pacific islands, and elsewhere, the DOE told people they were safe and then covered up epidemiology that showed people had increased rates of leukemia and cancer from the fallout. The DOE claimed its releases from the INL were too low to cause harm, but when asked to state what it had released to the Idaho skies, the DOE didn't know. Then when the DOE issued a report of estimated releases through its history to 1989, reviews by the Center for Disease Control found the releases had been significantly underestimated. It is also documented that many environmental monitoring records were subsequently destroyed, which would have indicated more contamination that the DOE wanted others to know about. The DOE has lost or destroyed worker radiation dose records throughout its history when the records would show elevated doses. The DOE uses secrecy, document destruction, omission of key information during public presentations, and adherence to providing false information about its plans, and breaks its commitments. The DOE would not have conducted any cleanup at all if other federal agencies

23-87

[52] Atomic Energy Commission, "1958 Health and Safety Division Annual Report, IDO-12012, See p. 72, 73 for iodine-131 in sage brush and rabbit thyroids. https://inldigitallibrary.inl.gov/PRR/112697.pdf

[53] Atomic Energy Commission, "Annual Report of Health and Safety Division, 1959," IDO-12014, See p. 88 for iodine-131 in rabbit thyroids. https://inldigitallibrary.inl.gov/PRR/112700.pdf

[54] Atomic Energy Commission, "Health and Safety Division Annual Report, 1960," IDO-12019, See p. 91 for iodine-131 in rabbit thyroids. https://inldigitallibrary.inl.gov/PRR/90927.pdf

[55] Atomic Energy Commission, "Health and Safety Division Annual Report, 1961," IDO-12021, See p. 128, 133 for iodine-131 in jack rabbit thyroids. https://inldigitallibrary.inl.gov/PRR/163656.pdf

23-85 cont'd

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23-86 Construction and operation of the VTR and associated facilities would comply with applicable laws, regulations, permits, DOE orders, and agreements.

23-87 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR, and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF. The topics raised by the commenter, including (1) activities at other DOE sites; (2) workers compensation for injuries from past releases; and (3) comments related to the HLW interpretation are outside the scope of the VTR EIS. In addition, please refer to the response for comment 23-6 related to environmental monitoring.

had not been able to say that hazardous chemical laws needed to apply to DOE sites, allowing CERCLA cleanup investigations. The DOE has systematically lied about the pervasive long-lived radionuclides at sites likes the INL, omitting what it well knew, that uranium, plutonium and americium were included in soil and perched water. It omitted this information so well that the DOE and the U.S. Geological Survey have often, without justification, omitted the reporting of extensive radiological contamination at the INL, later found by CERCLA investigations.

DOE lied about its radiological releases decades ago from nuclear weapons testing, reactor testing, and reactor accidents and other operations and it continues to misinform the public about its past and about current contamination.

The Department of Energy has a long history of telling workers they are protected from radiological hazards — but workers got illnesses. Nationwide, billions of dollars of illness compensation have been paid out under the Energy Employee Illness Compensation Program Act (EEICOPA) even with two-thirds of INL claims denied.

The Department of Energy has a long history of saying its radiological releases were too small to affect the public — but studies found that the public had higher infant mortality and certain cancers and leukemia.

The Department of Energy has rightfully earned and continues to earn the public's distrust. The Department of Energy must not be allowed to unilaterally reclassify HLW waste because the DOE cannot be trusted to comply with its own regulations should its regulations or DOE Orders be deemed inconvenient or costly.

The Idaho National Laboratory along with other Department of Energy operations at Hanford and Rocky Flats have a long tradition of falsification of lung count results. The last situation requiring lung counts, reported that lung counts were not required, despite lung counts being required. Workers are not informed that their lung count results can be manipulated in order to obtain lowered intake results.

23-87 cont'd

The VTR EIS Fails to Acknowledge that the DOE has a Record of Not Disclosing Safety Problems Publicly or Accurately and Usually Fails to Publish the Public Comment Submittals

The Department of Energy routinely makes its unusual occurrence reports and other safety information impossible or difficult for the public to obtain. If reported, the public can expect months of delay before information is available publicly.

The DOE has also conducted numerous public comment opportunities, only to refuse to publish those public comments such as the consent-based interim spent nuclear fuel storage meetings conducted a few years ago. [56] [57]

23-88

[56] Before ending the consent-based siting effort, information found about the Department of Energy's consent-based siting at www.energy.gov/consentbasedsiting and its Integrated Waste Management and Consent-based Siting booklet at http://energy.gov/ne/downloads/integrated-waste-management-and-consent-based-siting-booklet

[57] Environmental Defense Institute's comment submittal on the Consent-based Approach for Siting Storage for the nation's Nuclear Waste, July 31, 2016. http://www.environmental-defense-institute.org/publications/EDIXConsentFinal.pdf

46

23-88 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR, and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF. This CRD presents the comments DOE received on the Draft VTR EIS and presents responses to those comments that are within the scope of the EIS. Concerns about the ability to obtain information from DOE are outside the scope of this VTR EIS. Activities related to consent-based siting for a high-level waste and SNF repository are outside the scope of this VTR EIS.

Commenter No. 24: Ken Isaac

From: ken isaac
Sent: Thursday, January 28, 2021 12:48:56 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL]

Build the reactor!
Save our planet from pollution from burning fossil fuels!
Please, think of our grandchildren. We can deal with the nuclear waste FAR BETTER than we are dealing with the pollution we breath every day from mining, processing and burning our fossil fuels.
Build the reactor
Ken isaac
Bountiful Utah

24-1

24-1 DOE acknowledges your preference for the INL VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition," and Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD for additional information.

Commenter No. 25: Merriann Isaac

From: Merriann Isaac
Sent: Thursday, January 28, 2021 12:56:19 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL]

Build the reactor!
Save our planet from pollution from burning fossil fuels!
Please, think of our grandchildren. We can deal with the nuclear waste FAR BETTER than we are dealing with the pollution we breath every day from mining, processing and burning our fossil fuels.
Build the reactor *25-1*

25-1 DOE acknowledges your preference for the VTR project. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition," and Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD for additional information.

Commenter No. 26: Diane Jones

From: Diane M. Jones
Sent: Thursday, January 28, 2021 4:39:59 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] VTR Draft EIS

We need to invest public funds in the development of clean, renewable energy. Public funds should not be invested in the development of new forms of nuclear energy generation. Nuclear power production still creates toxic waste for which there is no viable long-term storage solution. This is a misguided approach to addressing the climate crisis. **26-1** **26-2** **26-1 cont'd**

Diane Jones
[redacted]
Boise, Idaho

26-1 DOE acknowledges your preference for development of renewable energy resources and your position that funds should not be expended on nuclear energy. DOE believes there is a potential societal benefit from the development of advanced reactors and that nuclear energy should be part of the overall mix of energy sources in the United States. Refer to Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic. Support and funding for renewable energy, and the prioritization of funding for climate change solutions, is outside the scope of this VTR EIS.

26-2 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR SNF would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS.

Commenter No. 27: Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

From: SHERMAN W. BRAITHWAITE
Sent: Wednesday, December 23, 2020 2:32:18 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] When will you look into this opportunity?

Atomic Electronic Weight Chips and Circuits, Inc. (aewcac.com)

I have been rejected many times after submitting proposals to the DOE RFPs.

Thus far the DOE became interested in:

- Hydroelectric
- Wind
- Nuclear
- Solar
- Even Water "Wave Energy"

Let me just mention, I entered several online contests and I have been rejected every time. In one of those contests, "Water [Wave Energy]"
was a winning entry:

- ELECTRIC POWER GENERATION USING CIRCUIT BOARD OR MICROCHIP III - Climate CoLab
- Braithwaite Particle Trap Power Electronic & The Imaginary Battery Combination - Climate CoLab

During the development of my Intellectual Property (BPT), it has been compromised in many ways:

- It is not abandoned and more useful than earlier concepts:
  - US20090278595A1 - Braithwaite particle trap (THE BPT) - Google Patents
- Publication disasters that make my Intellectual Property (BPT) short name look as if I created a mockery of something else. That is due to a typo made by some researchers incorrectly categorizing chronologically, the name "BPT" that should be BHT" instead. The short name "BPT" was used by me in 2007. An internet publication shows information concerning "BPT (Should be BHT) was published online in 2012 after my 2007 usage of the name as seen in the 2009 patent application:
  -
  - https://arc.aiaa.org/doi/pdf/10.2514/6.1999-2283
  - (21) BPT-4000 Multi-Mode 4.5 KW Hall Thruster Qualification Status | Request PDF (researchgate.net)
  - (21) 4.5 Kw Hall Thruster System Qualification Status (researchgate.net)
  - Plume Characterization of an Ion Focusing Hall Thruster (gatech.edu)

27-1

27-1 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR, and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). DOE funding for alternative energy technologies is outside the scope of this VTR EIS.

Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

The disregarding of the above facts I feel caused the many rejections I received from NASA, the DOE, DARPA, the DoD, online contests, and other entities. As I experience the many rejections, it feels as if they were coming from the same source, and now I feel the misleading information is constantly referenced creating some bad opinions concerning my solicitations. After the discovery of the typo on 12/09/2020, I now feel the typo makes me look like a crook. Less, I looked up "BPT" online in 2007 before I used it in my Electron Energy Research projects, and zero (0) hits were found. Since then, years after, hundreds of "BPT" hits showed up online. From stock names to God knows what. I even had a website called bpt.com; One I wish I was able to maintain.

27-1 cont'd

My submission of this "comment" in reference to the Environmental Impact Statement addresses sources of electrical energy generation used by the DOE in the US. All of the above-listed sources of electrical energy generation were funded by the DOE directly or indirectly by a 3rd party entity using DOE funding. I have been overlooked by the DOE several times. It is leading to social interaction disasters.

Thank you
CEO
Atomic Electronic Weight Chips and Circuits, Inc. (aewcac.com)
Sherman W. Braithwaite

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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

47th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit
31 July - 03 August 2011, San Diego, California

AIAA 2011-5588

Plume Characterization of an Ion Focusing Hall Thruster

Kunning G. Xu[1] and Mitchell L.R. Walker[2]
High-Power Electric Propulsion Laboratory, Georgia Institute of Technology, Atlanta, GA 30332 USA

The T-220HT is a 10-kW class Hall effect thruster developed as the primary propulsion system for satellites. In-channel electrodes and additional magnetic coils are added to study ion focusing to decrease energy losses from ion-wall neutralization and plume divergence in order to increase the thrust-to-power ratio. In this study, electrically-biased graphite electrode rings are embedded in the discharge channel walls to repel radial ions. The thruster is tested from 125-300 V at 9 A discharge, with the electrodes either floating, biased to 10 V or 30 V. The mass flow rate was varied from 9.8-10.4 mg/s to maintain constant current. Maximum chamber pressure was 1.5e-5 Torr-Xe. Performance measurements on xenon show a maximum increase in thrust-to-power ratio of 4.84 mN/kW, 15.3 mN thrust, 206 s I_{sp}, and 8% anode efficiency. The plume ion current density, ion energy distribution function, and plasma potential is characterized and indicates a collimation of the ion beam and a increase in ion number density without an increase in propellant neutrals, which results in an increase in mass utilization. The different electrode currents and ion energy distribution functions at 10 V compared to 30 V electrodes leads to the idea of different modes of operation with different electrode biases.

I. Introduction

HALL effect thrusters (HET) are one of the prime candidates for use as primary propulsion systems for satellites. They provide a combination of thrust and specific impulse (I_{sp}) that offers advantages for many near Earth missions. They have been studied in both Russia and the US and their performance has been demonstrated in laboratory tests. Current space propulsion demands a higher thrust-to-power (*T/P*) ratio for shorter burn times and quicker orbit changes. Operating a HET at high *T/P* ratios requires a low discharge voltage and high discharge current for efficiency operations. As the discharge current increases, the ion density increases and the number lost to the discharge channel wall also increases, which decreases efficiency. Thus, to increase the efficiency at high *T/P* requires a reduction in ion-wall collisions. The goal of this research is to reduce such collisions through the use of ion focusing technology in the discharge chamber. The ion focusing guides ions with trajectories intersecting the chamber wall towards the centerline of the chamber, which results in an increase in efficiency and *T/P*.

Current developments in high *T/P* Hall thrusters have yielded many designs. Thrusters such as the NASA-173M from Michigan, Busek's BHT-1000, Aerojet's BPT-4000, and the 6 kW Hall thruster at Michigan generate high *T/P* levels at low voltages.[1, 3-5] The BHT-1000 show the highest of 96 mN/kW at 100 V, 2.5 A discharge.[4] These designs have demonstrated an optimized in channel magnetic field will increase performance. Published knowledge acquired from these activities is incorporated into the design of the magnetic field in the modified T-220HT, herein referred to as the Embedded Electrode Hall Effect Thruster (EEHET).

The EEHET includes embedded graphite electrodes and an additional pair of electromagnets to generate a shielding field around the electrodes. The thruster is tested on xenon propellant on an inverted pendulum thrust stand and the results show increased performance in thrust, *T/P* ratio, I_{SP}, and anode efficiency. The mechanism for the increased performance is not yet understood. A study of the near field plume is necessary to gain an understanding of the physics. The goal of the work presented here is to determine the effect of the in-channel electrodes on the plume plasma. The electrodes generate an electric field near the channel surface that should repel ions that come in contact with the field. This should divert ions to a more axial path. This reduces ion-wall neutralization which increases ion density and decreases the plume divergence angle. The plume divergence angle is determined through ion current density measurements in the plume. A retarding potential analyzer (RPA) is used

[1] Graduate Student, Aerospace Engineering, 270 Ferst Dr NW, Student Member AIAA.
[2] Associate Professor, Aerospace Engineering, 270 Ferst Dr NW, Associate Fellow AIAA.

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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

to measure ion energy distribution function through the plume to determine the effect of the electrodes on the acceleration mechanism.

II. Experimental Setup

A. Hall Thruster

All experiments are performed on a modified Pratt & Whitney T-220HT Hall thruster. Extensive testing has mapped the performance of the thruster over a power range of 2-22 kW at discharge voltages of 200-600 V.[6] The T-220HT has a mean channel diameter of 188 mm, channel depth of 65 mm, and nominal power rating of 10 kW.

An Electric Propulsion Laboratory 375 series cathode is located at the 12 o'clock position of the thruster and declined approximately 40 degrees to the horizontal to be aligned with the local magnetic field. The cathode orifice is located approximately 1.5 cm downstream from the thruster exit plane. The cathode flow rate is set to 1 mg/s for all cases investigated. The discharge channel of the thruster is made of M26 grade boron nitride. A more detailed description of the T-220HT and its characteristics can be found in Ref. 6.

The T-220HT HET discharge supply is a 45-kW Magna-Power TSA800-54 power supply, and all other thruster components are power with TDK-Lambda 1 or 3.3 kW Genesys power supplies. All electrical connections enter the chamber through separate feedthroughs. The thruster discharge supply is connected to a filter consisting of a 1.3 Ω resistance and 95-µF capacitor. The filter acts as a low pass filter preventing oscillations in the current over 1.4 kHz from reaching the discharge supply. High-purity (99.999%) xenon propellant is supplied to the thruster via stainless steel lines. MKS 1179A mass flow controllers meter the propellant flow to the cathode and anode with an uncertainty of ±0.03 and ±0.2 mg/s, respectively. The flow controllers are calibrated by measuring gas pressure and temperature as a function of time in a known control volume.

B. Ion Focusing

Ion focusing is achieved with the application of positively-biased electrodes embedded in the inner and out channel surfaces. The electrodes are biased above anode potential. The resultant electric fields repel off-axis ion and reduce wall collisions. However, the positive bias also causes the electrodes to collect a large amount of electron current. This may result in a performance loss as the overall discharge current would increase due to increased electron current on the electrodes. To reduce electron collection, cusp-shaped magnetic fields are placed over the electrodes. The cusp fields trap electrons being accelerated toward the electrodes and thus reduce collected current. The static magnetic fields in the thruster are analyzed in MagNet by Infolytica, and modified to create the cusp magnetic fields along specific sections of the channel wall. The target strength of the cusp field is determined by the Larmor radius of electrons, and in this case requires 95 G for an assumed 25 eV electron with a 1-mm radius.

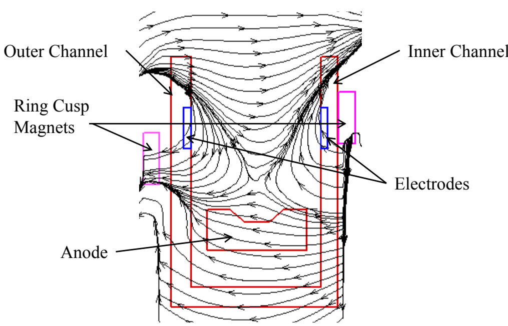

Figure 1. Simulated magnetic field for the redesigned thruster.

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Figure 1 shows the resultant 2-D magnetic field, and the magnetic field is confirmed with physical Gauss probe measurements. Figure 2 shows a schematic of the electrode electrical connections.

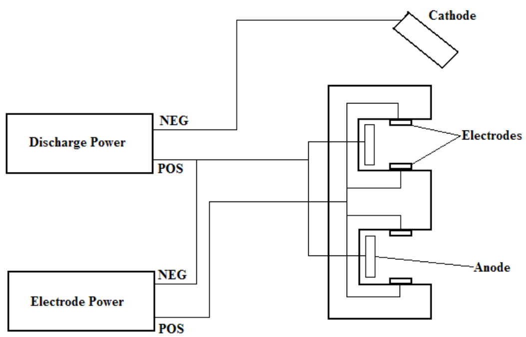

Figure 2. T-220HT electrical schematic.

C. Thrust Stand

Thrust is measured with a null-type inverted pendulum thrust stand based on the NASA GRC design by Haag.[7] The null-type stand holds the thruster at a constant position with use of PID-controlled solenoid coils that move a center magnetic rod. Thrust is correlated to the amount of current on the null-coil required to hold the thrust stand at zero. Thrust stand calibration is performed by loading and off-loading a set of known weights. The resultant linear curve of null-coil current versus weight is used as the conversion for thrust measurements. A copper shroud surrounds the stand and coolant is passed through to maintain thermal equilibrium. Further details of the thrust stand and its operation can be found in Ref. 7.

D. Faraday Probe

A Faraday probe is a simple plasma diagnostic used to measure ion current density in the HET plume. Its use has been well documented.[2, 8-11] Figure 3 shows a picture and electrical schematic of the Faraday probe used in this work. The probe consists of a tungsten-coated, stainless-steel collection electrode with a stainless-steel guard ring surrounding it, with a 0.12 cm gap between. The collector and guard ring are both biased to 20 V below ground to repel electrons. Biasing the collector and guard ring to the same potential reduces edge effects by creating a uniform sheath potential around the collector. The collector disk is 2.31 cm in diameter. A Lambda GENH 60-12.5 power supply biases the collector and shield to 20 V below ground. A 1.417 kΩ, 0.5 W resistor is placed in series with the collector line and voltage across the resistor is read by an Agilent 34980A data acquisition unit. The probe is mounted above the thruster, and centered over the exit plane. The collector surface is placed 1 meter downstream of the thruster exit plane. Sweeps are taken from -100 to +100 degrees from thruster centerline in one degree increments. Measurements were taken at 80 Hz sample rate for one second at each position and averaged to produce the recorded current density at that location.

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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

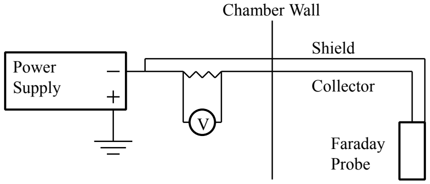

Figure 3. Faraday probe of JPL design.[2]

E. Retarding Potential Analyzer

A retarding potential analyzer (RPA) measures ion energy per charge with a series of biased grids to selectively filter ions.[12, 13] The RPA cannot discriminate between singly- and doubly-charged ions. An RPA acts as a high-pass filter that only allows ions with energy higher than the ion repulsion grid to pass through to the collector. By increasing the voltage on the ion retarding grid, ions with equal or less energy are repelled and the collect current drops. The derivative of the resulting current-voltage data is proportional to the ion energy distribution function *f(V)* by Eq. (1).[12]

(1)

The RPA used in this work, along with an electrical schematic, is shown in Figure 4. The RPA uses four grids and a collector. In order, they are the floating, electron repulsion, ion repulsion, and electron suppression grids. The floating grid charges to the plasma potential to reduce perturbations caused by the probe presence. The electron repulsion grid is negatively biased with respect to ground to repel plasma electrons, and the ion repulsion grid is positively biased with respect to ground to retard ions. The electron suppression grid is biased negative with respect to ground to repel any secondary electrons emitted from the collector due to ion collisions. The electron repulsion and suppression grids are both biased to -30 V by a pair of GENH 60-12.5 power supplies. The ion repulsion grid is powered by a Keithley 2410 Sourcemeter. The collector current is measured with a Keithely 6487 Picoammeter. Both the sourcemeter and picoammeter are controlled via LabVIEW.

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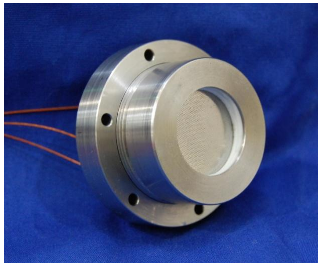

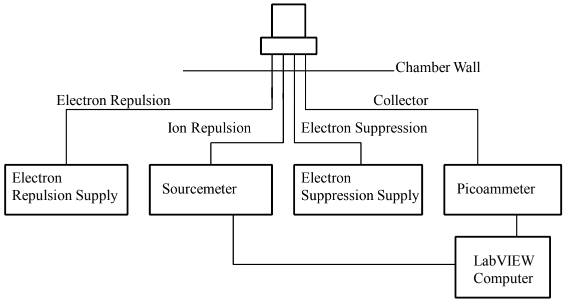

Figure 4. Four-grid RPA.[1]

F. Floating Emissive Probe

The ion energy distribution obtained from RPA is measured with respect to ground, but the ions are referenced with respect to the plasma potential. To correct the RPA measurements, the plasma potential is needed. To measure the plasma potential, a floating emissive probe is used. Emissive probes are a widely used plasma diagnostic to measure the plasma potential. The probe consists of a thermally emissive filament loop housed in a ceramic insulator. A Xantrex XPD 60-9 power supply applies current and heats the filament to the point of thermionic emission of electrons. When exposed to the plasma, any probe naturally floats from ground to the floating potential. At the floating potential a sheath forms around the probe and there is no net current to the probe. This is due to the negative plasma electron current balanced by the positive plasma ion current and secondary electron emission. However, because the emissive probe emits its own electrons, the probe becomes more positive, which in turn draws in more plasma electrons. This process continues until the probe potential reaches the plasma potential.

The measured plasma potential is subtracted from the RPA measurement, shifting the RPA results to lower potential. This corrects for artificially high ion energies due to the aforementioned ground/plasma potential referencing. The emissive probe used in this work consists of a 1.5 mm diameter thoriated-tungsten filament housed in a double-bored alumina tube based on ones used by Haas.[14] The filament loop has a radius of 1.5 mm. Figure 5 shows a schematic of the probe. The voltage reading between probe and ground is taken with the Agilent 34980A data acquisition unit at the same time as RPA measurements are taken, averaging 400 points.

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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

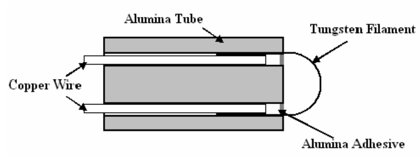
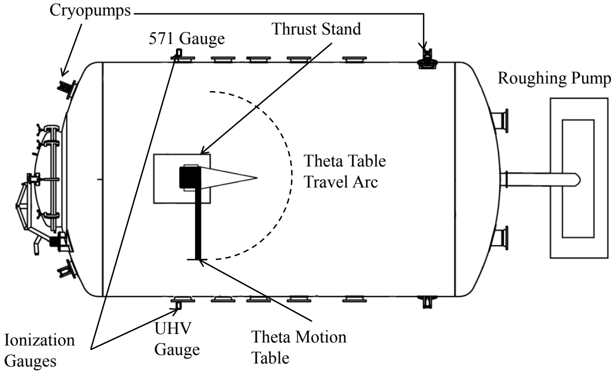


Figure 5. Emissive probe.

G. Vacuum Facility

All experiments are performed in the Vacuum Test Facility 2 (VTF-2) shown in Figure 6. VTF-2 is 9.2 meters long and 4.9 meters in diameter. It is pumped to rough vacuum with one 3800 CFM blower and one 495 CFM rotary-vane pump. Ten liquid nitrogen cooled CVI TMI re-entrant cryopumps with a combined pumping speed of 350,000 l/s on xenon bring the chamber to a base pressure of 5×10^{-9} Torr. A Stirling Cryogenics SPC-8 RL Special Closed-Looped Nitrogen Liquefaction System supplies liquid nitrogen to the cryopump shrouds. MKS 1179A mass flow controllers meter the propellant and a constant volume calibration system is used to calibration the mass flow rate. Two ionization gauges, Varian 571 and UHV-24, are mounted on either side of the chamber.



III. Results

The thruster is operated over 125-300 V discharge voltage at 9 ± 0.1 A. The electrodes are tested at three setting, electrically floating, biased to 10 V and 30 V above anode potential. These three settings are noted as Floating, 10 V_e, and 30 V_e respectively from here on. Magnet currents remain constant through all tests to provide the field topography shown in Figure 1. The thruster is run through a one hour conditioning cycle before data are taken. Figure 7 and Figure 8 shows the performance (thrust, *T/P* ratio, I_{sp} and anode efficiency) of the EEHET running on xenon at 9 A. Additionally, data for a no electrode configuration are shown as well. In this case, labeled as BN in

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the data, the graphite electrodes are replaced with BN rings to approximate the original discharge channel. The power used in the *T/P* ratio and efficiency calculations is the total discharge power, which includes both anode and electrode powers. The floating and BN data fall within close proximity with each other, indicating the addition of the embedded electrodes has a minor effect on the thruster. The thruster performance increased along all four metrics with biased electrodes. *T/P* and efficiency are higher at 10 V_e than at 30 V_e. The 30 V_e case has larger increases in thrust than 10 V_e, however there is a large increase in electrode power at 30 V_e, which reduces the *T/P* ratio and efficiency. The maximum total *T/P* ratio increase occurs at 175 V discharge, resulting in a gain of 4.2 mN/kW, 135 s of I_{sp}, and 6% efficiency. Chamber pressure is between 9 x 10^{-6} – 1.5 x 10^{-5} Torr-Xe for all tests.

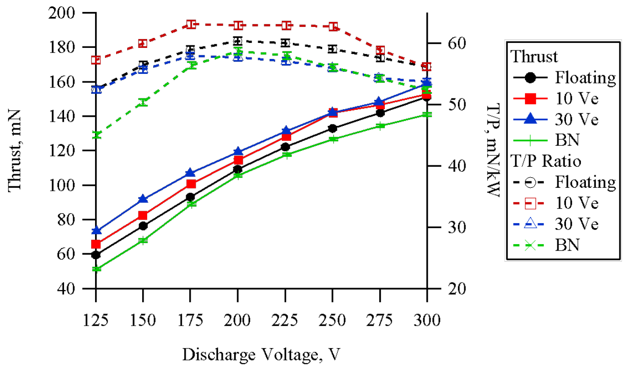

Figure 7. Thrust and T/P ratio at 9 A on xenon at Floating, 10 V_e, 30 V_e, and BN rings.

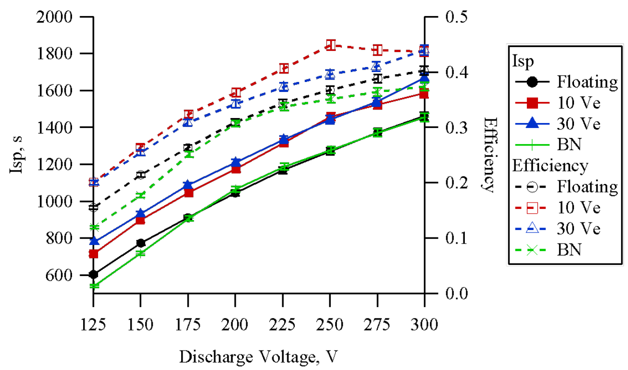

Figure 8. Specific impulse and anode efficiency at 9 A on xenon at Floating, 10 V_e, 30 V_e electrode bias and BN rings.

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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

Plume measurements are taken at the same operation conditions as Figure 7 and 8, namely 125-300 V and 9 A discharge with floating, 10 V_e and 30 V_e. All three probes are placed 1 meter downstream of the thruster exit plane on a radial motion arm centered above the exit plane. There is a 5-degree separation between each probe. The probes are aligned to thruster center with a laser tool. Faraday traces of the ion current density are done from +100 to -100 degrees. Figure 9 shows the measured ion current density for the floating case at 125-300 V and 9 A discharge. The mass flow rate varied from 10.02 to 10.36 mg/s to maintain current as shown in Table 1.

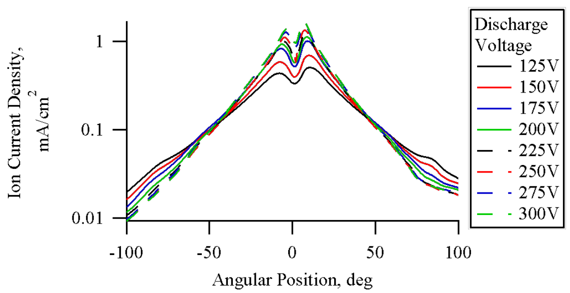

Figure 9. Current density map for 125-300 V discharge with floating electrodes at 9 A .

Table 1. Operating conditions for data presented.

	Floating		10 Ve		30 Ve	
Discharge Voltage	**Mass Flow, mg/s**	**Id, A**	**Mass Flow, mg/s**	**Id, A**	**Mass Flow, mg/s**	**Id, A**
300	10.02	9.12	9.91	9	9.80	8.98
275	10.02	9.03	10.02	8.97	9.80	8.97
250	10.02	8.97	10.02	9.1	9.91	9.03
225	10.14	8.92	10.14	9	9.91	8.98
200	10.36	8.93	10.36	9.02	10.02	8.9
175	10.36	8.98	10.25	9.02	10.14	8.98
150	10.14	8.9	9.91	9.08	9.91	8.93
125	10.25	8.93	9.80	9	9.80	8.9

The T-220HT thruster exhibits a double peak structure which signifies the focal length is longer than 1 meter. The peaks rest between 6-9 degrees on either side of centerline. The exact peak location varies depending on operating conditions. The asymmetry of the peaks can be attributed to blockage of the propellant distributor holes at certain locations and imperfect alignment. The current densities decrease with discharge voltage and thus acceleration and ionization capability decreases, resulting in fewer ions. All data are taken at discharge currents between 8.9 – 9.12 A as shown in Table 1, thus lower voltages sees an increase in electron current. Figure 10 shows the change in the current density with biased electrodes for 125, 175, 225 and 300 V. The 10 V_e case shows a minor change from the floating case, but 30 V_e creates a noticeable change in the current density. The current density trend upwards as discharge voltage is increased, which is expected. The current density increases at small angles resulting in larger peaks and decreases at large angles. The increase at small angles without a net upward shift of the

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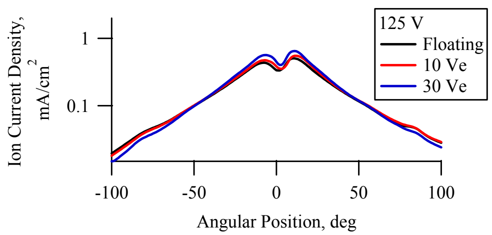
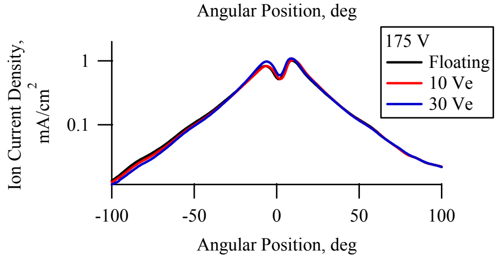
plot indicates an increase in the ion density specifically in that region as opposed to everywhere. This is further supported by the decrease at large angles. Figure 11 shows a magnified view of the same data at large angles.

At any given voltage, the discharge current in kept approximately constant and the magnet settings are the same. The only difference is the electrode power. As electrode bias increases, so does the current seen by the electrodes. The average electrode current at 10 V_e and 30 V_e are 1.5 and 9.2 A respectively. The increase in the ion flux around centerline and decreases in the wings can be attributed to a narrowing of the ion beam and decreased plume divergence angle. Figure 12 plots the plume divergence angle for all three cases (Floating, 10 and 30 V_e). The divergence angle was calculated by taking a linear fit of the 10-30 degree data on a semi-log plot and extrapolating it to 90 degrees.[15] This removes charge exchange ion contribution to the current density. Trapezoidal integration is used to find the area under the curve. Numerical interpolation is then used to determine the 90% beam current angle on the right and left sides. The right and left angles are then averaged to produce the final divergence angle. The angles are larger than typical for a modern HET. This is largely due to the magnetic field placement and the plasma lens existing just beyond the exit plane of the thruster. The accelerated ion can have a wider angle due to lack of a wall. There are minor changes in plume divergence angle from floating to 10 V_e, but at 30 V_e the plume angle decreases by up to 6 degrees. Along with the increase in thrust observed, this suggests either increased axial ion velocities or increased ion count.





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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

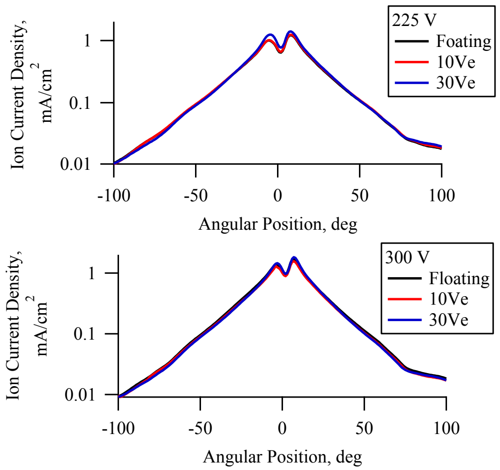

Figure 10. Ion current density profile for operating conditions of (125 V, 8.93 A), (175 V, 8.98 A), (225 V, 8.98 A), and (300 V, 9 A) for electrode bias configurations floating, 10 V, and 30 V.

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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

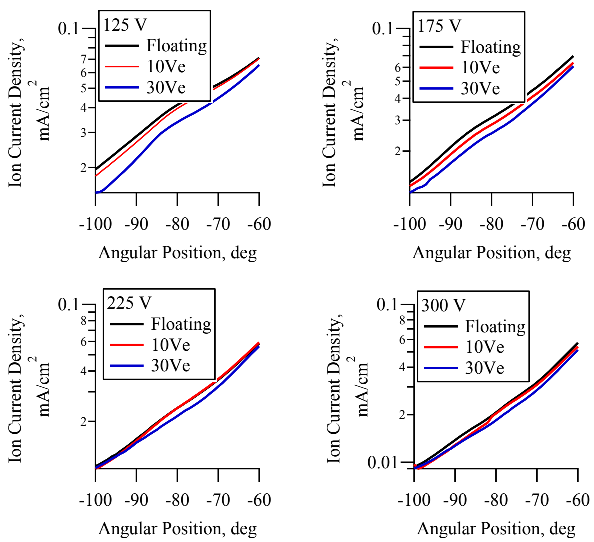

Figure 11. Close up ion current density profiles from Figure 10, from 60 to 100 degrees of chamber centerline.

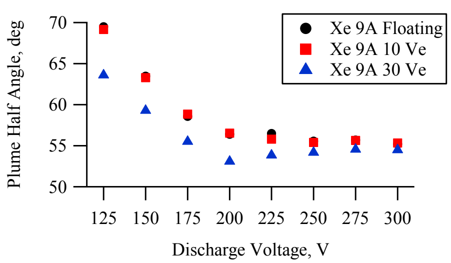

Figure 12. Plume divergence half angle for 90% of total beam.

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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

Ion energy and plasma potential measurements are taken with the RPA and emissive probe at 10 locations around the plume. From 0 to 30 degrees measurements are taken in 5-degree increments and from 40 to 60 degrees in 10 degree increments. One RPA sweep at each location was taken, however at each ion repulsion grid potential setting three measurements were taken and averaged. A 4th order Savitzky-Golay smoothing filter was applied to the raw data prior to taking the derivative. Figure 13 shows the ion energy distribution function on thruster centerline. The profile shows that the ion energy distribution function broadens as the discharge voltage increases. This is expected as high voltages result in increased ionization across the acceleration region and thus a larger spread in possible ion energies.

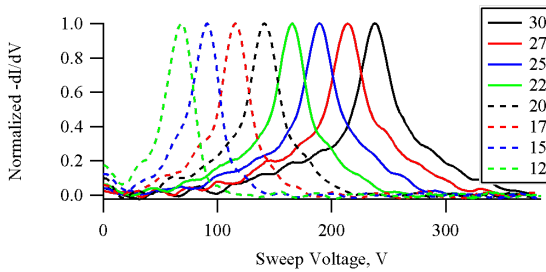

Figure 13. Ion energy distribution function on thruster centerline for floating electrodes at 9 ± 0.1 A.

Figure 14 shows the computed ion energy distribution function when the thruster is operating at 175 V and 9 A for all three electrode cases at four angular locations. The biased electrodes generate a shift in ion energy distribution function to higher voltages. Similar trends are observed for other discharge voltages. At 10 V_e, there is a slight rightward shift of the ion energy distribution, on the order of a few volts. At 30 V_e, the shift is an average of 20 V. Figure 15 plots the most probable ion energy for the 175 V operating condition at all measured angles. There is a definite change in behavior from 10 V_e to 30 V_e which will be discussed in the next section. The ion energy distribution also widens with increased electrode bias. The widening decreases at larger angles. This means the electrodes increase the spread of ion energies at small angles to centerline. This can be cause either by increased ionization potential which would generate a large spread, or focusing of lower energy ions towards small angles. The latter seems more likely as the widening is significant only at small angles. If base ionization potential is increased, the ion energy distribution function would be broader everywhere.

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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

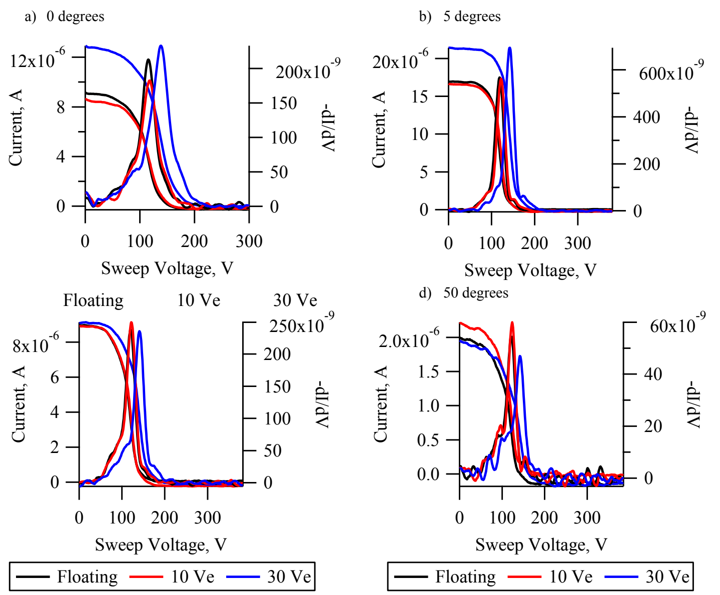

Figure 14. Ion energy distribution function with electrodes at 175 V discharge voltage at various angular

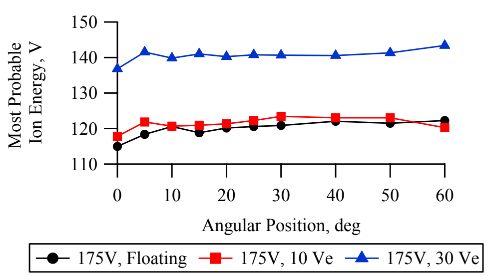

Figure 15. Most probable ion energy for the ion energy distribution fuction at each measured angle on xenon at 175 V and Floating (8.98 A discharge), 10 V_e (9.02 A), and 30 V_e (8.98 A).

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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

IV. Discussion

The goal of this work is to reduced ion-wall neutralization, plume divergence, and increase the ion number density. Evidence that this has occurred would present as an increased ion current density for the same propellant and a more collimated ion beam. Evidence of a tighter or more collimated ion beam is a decrease in the plume divergence angle, and increase in ion density at small angles from thruster centerline, and a decrease in ion current density at large angle. As Figure 12 shows, there is indeed a decrease in the plume divergence angle when the electrodes are biased above anode potential. This divergence angle decrease is not unexpected as previous work done with secondary electrodes in the discharge channel also shows a decreased plume divergence angle.[16, 17] At 10 V_e the effect is very minor, typically less than one degree half angle. At 30 V_e the plume divergence half angle decreases by up to six degrees. The current density profiles increase around the centerline of the thruster and decreases at large angles as electrode bias is increased. The change is small at 10 V_e, and larger at 30 V_e. The integration of the beam current also shows a similar trend. Figure 16 shows the integrated beam current divided by the discharge current, I_i/I_d. There is an overall increase in the total ion current as electrode potential increases. Figure 17 shows the mass flow rates for the current fractions in Figure 16. As the thruster was operated at constant current, the mass flow rate changed to match. The cathode flow rate was kept constant, and as Figure 17 shows, the anode flow rate either stayed constant, or decreased as electrode bias increased. Coupled with increase current fraction, this means the increased ion beam fraction is caused by an increased number of ions as opposed to more propellant neutrals. This equates to increased mass utilization.

Increased beam current fraction is the result of increase ion density. Two possible explanations for the increase density are increased ionization or reduction in ion losses. The electrodes are located upstream of the ionization/acceleration regions near the plasma lens, so they are unlikely to have a significant impact on ionization. The effect is greater at lower discharge voltages because a 30 V potential has a greater effect on a 125 V ion compared to a 300 V one by simple vector addition. This points to electrodes repelling ions from the walls, and a reduction in ion-wall neutralizations.

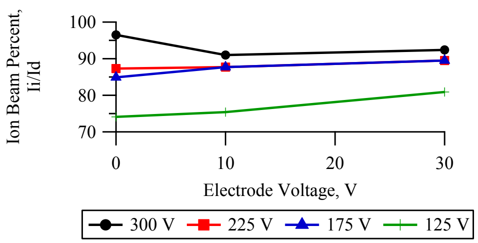

Figure 16. Ion beam current percentage, Ii/Id.

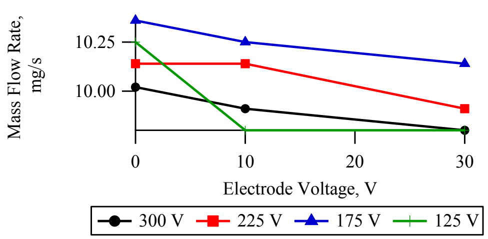

Figure 17. Mass flow rate for 125, 175, 225, and 300 V at various electrode conditions.

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It is important to note that the ion energy distribution functions increases as the electrode bias increases. Figure 18 shows the most probable ion energy for the various test conditions in Figure 16 Figure 17. At 10 V_e the increase in ion energy is small, less than 6.3 V at the maximum. At 30 V_e the increase ranges from 19 to 25 V. Though the increase in ion energy is small at 10 V_e, combined with the decrease in divergence angle results in a significant increase in thrust and *T/P* ratio over the floating case (up to 7.6 mN and 4.2 mN/kW). At 30 V_e the thrust increases even more (up to 13.7 mN), however the electrodes also see a marked increase in collected current, which leads to a reduction in the *T/P* (loss of 1-3 mN/kW). Figure 19 shows the electrode collected current. At 10 V_e, the electrode current is higher at both ends of the discharge voltage test range, but at 30 V_e the current is relatively constant across the test range. This suggests that at the lower electrode bias the electrode effect on the plasma depends on other factors while at higher bias the plasma reaches some steady state. This means there are possibly two different modes of operation or behaviors that depend on electrode bias. At 10 V_e the electrodes may be primarily focusing ions, pushing energetic ions towards centerline. However, the larger increase at 30 V_e suggests an acceleration mechanism, in addition to or instead of ion focusing, is in effect. The electrodes may become the primary anode at this point. However the current on the main anode did not change significantly. Current was not shifted from anode to electrodes, which contradicts the idea of the electrodes as primary anode.

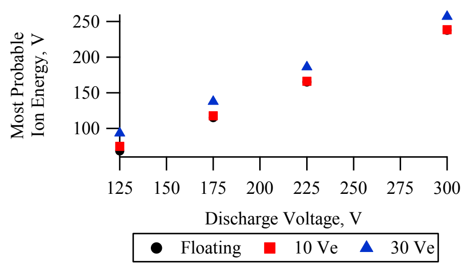

Figure 18. Most probable ion energy for 125, 175, 225, and 300 V at 9 A and various electrode conditions.

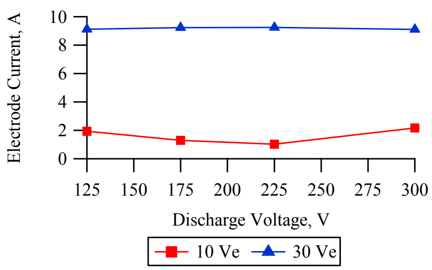

Figure 19. Electrode current for 125, 175, 225, and 300 V at 9A and 10 and 30 V electrode bias.

One possible explanation of the difference from floating to 10 and then to 30 V_e is expansion of the plasma sheath. At 10 V_e the plasma sheath surrounding the electrode shields out the electric field from the majority of the

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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

plasma. The electrode thus only affects a small fraction of the plasma. Once the electrodes increase to 30 V_e though, their electric field reaches out further and is able to affect a larger portion of the bulk plasma. This would require an increase in the sheath thickness. Anders showed with a DC-biased flat substrate that the sheath thickness does increases with surface bias.[18] In that work however the substrate was biased to many kilovolts of potential and the sheath increase was on a few millimeters, but the relation is likely still valid at lower voltages.

Another contribution to sheath thickness could be the near-wall magnetic fields. The static magnetic field in Figure 1 shows cusp fields surrounding the two electrodes. The intent of these fields is to reduce electron collection. A secondary effect of oblique or parallel fields near a surface is the extension and enlargement of the near-wall sheath. Research has shown that magnetic fields next to wall surfaces can increase the thickness of the plasma sheath.[19-22] In the probe data presented, the magnets were kept constant and thus the magnetic field effects on the sheath can be assumed the same between 10 V_e and 30 V_e. Preliminary test of the thruster with different ring cusp magnet settings does show a change in electrode current with magnet settings. Figure 20 shows the electrode current measured as the shielding ring-cusp magnets were increased. The electrode current decreases at first in response to increased field strength around the electrodes which decrease electron transport, however it rises again when the magnets are brought up to 15A. This behavior indicates a secondary phenomenon occurring at high enough magnetic field strength besides trapping of electrons on field lines. The two effects of a biased surface and near-wall cusp magnetic field could in part explain the changes seen in ion energy. In-channel measurements of the near-wall plasma are necessary to further pursue this line of analysis.

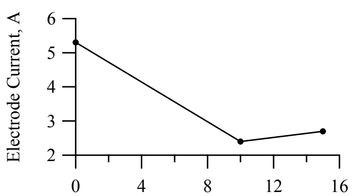

Figure 20. Electrode current at various ring-cusp shielding magnet currents at 175 V, 9 A discharge and 20 Ve.

V. Conclusion

This work shows that the addition of focusing electrodes in the discharge channel has positive effects on Hall thruster performance. The thruster is tested on xenon at 9 A at several combinations of discharge voltage and electrode bias voltage. The electrodes cause a definite increase in thruster performance across all four metrics of thrust, total *T/P* ratio, anode efficiency, and specific impulse at 10 V electrode bias. Plume measurements show an increased current density at small angles to centerline and decrease at large angles. Along with increase ion beam current fraction, this points to an increased ion number density, specifically near the centerline of the thruster. The goal to decrease ion-wall neutralization and plume divergence losses by biasing the electrodes above anode potential to force the off-axis ions away from the discharge chamber walls seems to have been accomplished.

The RPA data shows increased most probable ion energy. The increase is small at 10 V_e and much larger at 30 V_e. As the discharge conditions were not changed, this means the electrodes provided an additional acceleration to the ions in addition to any ion focusing. The increased ion current fraction with constant or decreasing mass flow means an increased mass utilization with electrode bias. The difference in level of ion energy change between the two electrode conditions leads to the conclusion the thruster is operating in two different modes, dependent on electrode bias. The biased electrode may extend the near-wall plasma sheath thickness as seen by other researchers. An increased plasma sheath due to near-wall cusp magnetic fields may also have a part in the observed differences, but the plume plasma response to a changing magnetic field data was not taken here. Further study of the in-channel discharge plasma is required to better understand the observed behaviors.

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Commenter No. 27 (cont'd): Sherman W. Braithwaite, CEO, Atomic Electronic Weight Chips and Circuits, Inc.

Acknowledgments

The research contained herein is sponsored by American Pacific In-Space Propulsion. We would like to thank Pratt & Whitney for supplying HPEPL with the T-220HT, Gregory McCormick for work in simulation and modifications, Hoang Dao for programming assistance, and departmental technical staff and other graduate students at HPEPL for assistance with this work. Kunning Xu is supported by the National Defense and Science Engineering Graduate Fellowship and the Georgia Institute Fellowship. The authors are greatly appreciative of this support.

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Commenter No. 28: Michael Mancuso

From: Michael Mancuso
Sent: Saturday, January 30, 2021 6:41:13 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] VTR

This email letter is in regards to the proposed Versatile Test Reactor (VTR) project at INL. I am opposed to this project for safety, security, and economic reason. The VTR reactor uses **28-1** plutonium and highly enriched uranium - two elements that stand at the apex of nuclear proliferation concerns and threats. **28-2** These fuels will also create a dangerous radioactive waste steam that will persist long after the VTR. Safe, long-term waste solutions do not exist for these materials and will probably never be available. The threats to human health and the environment are much too great to condone the use of these materials. **28-3** The use of liquid sodium as a reactor coolant adds another serious layer of a potentially devastating mishap. **28-4** Nuclear power-related projects have consistently gone way over budget in the past. We can expect the 3-6 billion dollar budget projected for VTR to also be an underestimate and a waste of precious taxpayer dollars. **28-5** It makes so much more sense to use these dollars for research, development, and widespread implementation of renewable energy resources. The future is renewable energy not a dying nuclear industry. We need to stop trying to "revitalize" the nuclear industry on the backs of the taxpayer. The amount of human brain power dedicated to a project such as VTR is a staggering loss too when thinking about how it could be used to help solve safer, cleaner energy resource problems and related challenges. **28-6** Please do not allow the VTR project to move forward. **28-1 cont'd**

Thank you,
Michael Mancuso
[redacted]
Boise, ID 83706

28-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition"; Section 2.3 "Nonproliferation"; and Section 2.7, "VTR Facility Accidents," of this CRD for additional information.

28-2 DOE acknowledges your concern regarding nuclear proliferation. The proposed driver fuel for the VTR would contain plutonium and uranium. Uranium would be enriched in the isotope uranium-235 to levels comparable to those in commercial nuclear fuel or possibly higher, but would not meet the definition of highly enriched uranium (20 percent and greater). Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic.

28-3 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR SNF would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS.

28-4 DOE takes its responsibility for the safety and health of the workers and the public seriously. The Experimental Breeder Reactor (EBR)-II and the Fast Flux Test Facility (FFTF) demonstrated safe operation with sodium as the coolant. Using past reactor operating experience and knowledge gained from extensive inherent safety testing at EBR-II and FFTF, along with advanced analysis tools, the VTR is being designed to safely operate with sodium as the coolant. Appendix D, Section D.3.3.1, reviews the history of sodium-cooled reactor operations and accidents. Sodium-cooled reactors have been operated for a number of years. The discussion in Appendix D considers events and tests at EBR-I, Fermi-I, Phenix, SuperPhenix, MONJU, FFTF, and EBR-II. The discussion provided in Appendix D acknowledges the concerns mentioned in the comments as well as other information related to tests in FFTF and EBR-II. Evaluating past performance and tests provides valuable information that is considered in the design of the VTR. Appendix D, Section D.3.3.2, discusses safety analyses that have been performed for the VTR. Appendix D discusses how the

VTR is being designed to ensure safety throughout proposed operating conditions. The VTR design is also resilient under potential accident or upset conditions. DOE guidance for design of the VTR focuses on reducing or eliminating hazards, with a bias towards preventive, as opposed to mitigative, design features and a preference for passive over active safety systems. This general approach creates a design, which is reliable, resilient to upset, and has low potential consequences of accidents. Safe operation of the VTR is ensured by reliable systems design to ensure preservation of the key reactor safety functions. These key safety functions are (1) reactivity control, (2) fission- and decay-heat removal, (3) protection of engineered fission product boundaries, and (4) shielding.

28-5 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost. U.S. Government would provide funding for the VTR and associated facilities through congressional appropriation. Congressional appropriations and funding priorities are outside the scope of this VTR EIS.

28-6 DOE acknowledges your preference for development of renewable energy resources and your position that funds should not be expended on nuclear energy. DOE believes there is a potential societal benefit from the development of advanced reactors and that nuclear energy should be part of the overall mix of energy sources in the United States. Refer to Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic. Support and funding for renewable energy, and the prioritization of funding for climate change solutions, is outside the scope of this VTR EIS.

Commenter No. 29: Marylia Kelley, Board President, Alliance for Nuclear Accountability (ANA)

February 1, 2021

Via email: SPDP-EIS@NNSA.DOE.GOV and VTR.EIS@nuclear.energy.gov

Dear Mr. Galan and Mr. Lovejoy:

The Alliance for Nuclear Accountability (ANA) is a national network of more than 30 organizations working to address issues of nuclear weapons production and waste cleanup. ANA provides the following comments on the Dilute and Dispose Notice of Intent, 85 *FR* 81460-62, December 16, 2020, and the Versatile Test Reactor (VTR) Draft Environmental Impact Statement (DEIS). DOE/EIS-0542.

1. DOE must complete an adequate Programmatic Environmental Impact Statement (PEIS) before proceeding with proposed NNSA and NE disposition documents. The 1996 PEIS (DOE/EIS-0229) did not include dilute and dispose because it does not meet the Spent Fuel Standard. The PEIS specifically excluded the Waste Isolation Pilot Plant (WIPP) as a reasonable disposition alternative. The PEIS did not include disposition in a research reactor or in a fast-neutron source as provided in the VTR DEIS. DOE has abandoned both preferred disposition alternatives – immobilization and MOX. Therefore, the PEIS is out of date and has been de facto deemed inadequate by DOE and NNSA and cannot provide the basis for the now proposed alternative of dilute and dispose of 34 metric tons (MT) of surplus plutonium at WIPP. Nor is disposition of 34 MT of surplus plutonium as fuel for the VTR included in the PEIS. ANA calls on DOE to conduct a new PEIS process before proceeding with other EIS processes. **29-1** **29-2** **29-1 cont'd**

In 2020, the National Academy of Sciences (NAS) issued its *Review of the Department of Energy's Plans for Disposal of Surplus Plutonium in the Waste Isolation Pilot Plant.* Recommendation 5-5 states:

> **The Department of Energy should implement a new comprehensive programmatic environmental impact statement (PEIS) to consider fully the environmental impacts of the total diluted surplus plutonium transuranic waste inventory (up to an additional 48.2 metric tons) targeted for dilution at the Savannah River Site and disposal at the Waste Isolation Pilot Plant (WIPP).**

Thus, there is no adequate legal or technical basis for proceeding with the NNSA or NE EISs. Both NEPA processes should be suspended until there is a legally adequate PEIS.

2. Neither NEPA document includes reasonable alternatives.
ANA supports storage as safely as possible as close to the existing surplus plutonium sites as possible. Such storage should have international inspection. Immobilization methods should be included as a reasonable alternative. Disposal at WIPP is contrary to the Land Withdrawal Act, New Mexico's WIPP permit, and the social contract with New Mexico, as the NAS Report also described. WIPP should not be included as a disposal alternative, rather new disposal sites should be considered, as part of a scientifically sound, publicly accepted program.

Thank you for your careful consideration of all public comments in these two proceedings.

Marylia Kelley, ANA Board President
[redacted] Livermore, CA 94551

2

29-1 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF).

The Surplus Plutonium Disposition Program and alternatives for surplus plutonium disposition are outside the scope of this VTR EIS. DOE and NNSA are engaged in two separate National Environmental Policy Act (NEPA) actions for the VTR and the Surplus Plutonium Disposition Program because the purpose and need for each program is quite different. The VTR project responds to the need for a test facility to provide a reactor-based fast-neutron source and associated facilities that meet identified user needs for a testing capability to support development of next-generation nuclear reactors—many of which require a fast-neutron spectrum for operation. The purpose of the action proposed by the Surplus Plutonium Disposition Program is to reduce the threat of nuclear weapons proliferation worldwide by dispositioning surplus plutonium in the United States in a safe and secure manner, ensuring that it can never again be readily used in nuclear weapons. Each NEPA effort will fully evaluate the potential environmental impacts of its respective proposed actions so they are available for public review.

As discussed in Chapter 2, Section 2.6, one possible source of plutonium for VTR driver fuel is DOE/NNSA excess plutonium managed by the Surplus Plutonium Disposition Program. If this material were used for fuel, there would be coordination between the two programs. As discussed in Section 2.6, DOE/NNSA could propose in the future to make a portion of the excess plutonium available as feedstock for VTR driver fuel. Such a decision to allow use of excess plutonium as feedstock for VTR fuel production would be subject to future NEPA analysis. That analysis would evaluate the different activities that would be required to make excess plutonium available as feedstock as opposed to preparing it for disposition in accordance with current planning.

29-2 The purpose and need for the VTR are not to provide a means to disposition surplus plutonium. Although the VTR as proposed would use a uranium-plutonium-zirconium alloy fuel, the reason for using this fuel is to maximize neutron production over a desired test volume while minimizing the size of the reactor. Refer to Section 2.2, "Purpose and Need," of this CRD for additional information. The management of surplus plutonium as addressed in this comment relates to the scope of the Surplus Plutonium Disposition Program. It is outside the scope of this VTR EIS.

Commenter No. 30: Frank N. von Hippel, Senior Research Physicist, Princeton University

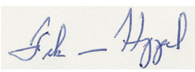
5 February 2021

Mr. James Lovejoy, NEPA Document Manager
US Department of Energy, Idaho Operations Office
1955 Fremont Avenue, MS 1235, Idaho Falls, Idaho 83415
Email: VTR.EIS@nuclear.energy.gov

Re: "Draft Versatile Test Reactor Environmental Impact Statement"

Dear Mr. Lovejoy,

Please confirm receipt.



Frank N. von Hippel, Senior Research Physicist & Professor of Public and International Affairs emeritus, Program on Science and Global Security, Princeton University, Princeton, NJ 08544[1]
fvhippel@princeton.edu

CORRECTED Comments on the Department of Energy Office of Nuclear Energy's *Draft Versatile Test Reactor Environmental Impact Statement*, DOE/EIS-0542[2]

The need for a Versatile Test Reactor has not been established and its pursuit would undermine US nonproliferation policy

Summary

30-1

Under the Trump Administration, DOE's Office of Nuclear Energy created "a self-licking ice-cream cone." It funded a variety of startups and nuclear companies to design fast-neutron reactors in order to justify the construction of the proposed Versatile Test Reactor (VTR) at Idaho National Lab.

This is reflected in the absence of substance in section 1.3, "Purpose and Need for Agency Action." The "Background" section does cite a Nuclear Energy Advisory Committee report, *Assessment of Missions and Requirements for a New U.S. Test Reactor*, but that report cites support only from recipients of Office of Nuclear Energy funding for design studies and experiments relating to fast-neutron reactors and from the proposed contractors for the construction of the VTR.

There is therefore no indication of a need for the VTR beyond that the Office of Nuclear Energy has generated with its funding of designs and experiments.

The paucity of private funding for developing fast-neutron reactors should not be surprising given 50 years of failed efforts worldwide to commercialize sodium-cooled fast-neutron power reactors in competition with the light-water reactors that dominate the current global power-

[1] Affiliation for identification only.
[2] The Draft EIS is posted on DOE's website: https://www.energy.gov/nepa/downloads/doeeis-0542-draft-environmental-impact-statement

30-1 Chapter 1 of this VTR EIS provides background information and identifies the purpose and need for the VTR. Please refer to Section 2.2, "Purpose and Need," of this CRD for addition perspectives and discussion of this topic.

As discussed in these sections, one of the missions of DOE is to advance the energy, environmental, and nuclear security of the United States and promote scientific and technological innovation in support of that mission. The Office of Nuclear Energy has established research objectives intended to provide research, development, and demonstration activities that enable development of an advanced reactor pipeline. So it is not surprising that DOE has funded advanced reactor development. As the commenter noted, the 2021 Energy and Water Development and Related Agencies appropriations bill (R46384), directed DOE to give the Appropriations Committees "a plan for executing the Versatile Test Reactor project via a public-private partnership with an option for a payment-for-milestones approach." The bill also included the Energy Act of 2020, which, in Section 2003, further directed DOE to proceed with the design and construction of VTR and authorized its funding. DOE plans to continue to work with private sector and foreign governments to establish needed collaborations and partnerships to successfully complete the project.

Commenter No. 30 (cont'd): Frank N. von Hippel, Senior Research Physicist, Princeton University

reactor fleet,. Congressional support also appears to be weakening. In response to a DOE request for $262 million for the project in Fiscal Year 2021, Congress appropriated only $45 million, down from $65 million in FY 2019 and 2020.

The absence of a demonstrated need for the VTR is therefore the first fatal flaw in the DEIS and the preferred alternative should be changed to "No Action".

30-1 cont'd

Secondly, the DEIS ignores the issue of nuclear proliferation that, for the past 40 years, has caused the US Government to discourage countries from doing R&D with fast-neutron reactors and their associated separation, storage, transport and fabrication of plutonium. Indeed, the DEIS quotes (p. 1-4) DOE's Strategic Plan as stating that the objective for DOE's nuclear energy R&D is

> "to explore advanced concepts in nuclear energy that may lead to new types of reactors with further safety improvements and reduced environmental and *nonproliferation* concerns" [emphasis added].

Sodium-cooled plutonium-fueled reactors were rejected by the US Government four decades ago because, in addition to being economically noncompetitive with light water reactors, they required plutonium separation and recycle. The resulting proliferation danger was dramatized in 1974, when India diverted plutonium from its US-supported plutonium fuel cycle to launch its nuclear-weapon program.

30-2

These problems are fundamental objections to the proposed program that cannot be fixed by further work on the DEIS. The Biden administration should abandon the VTR and instead focus the Office of Nuclear Energy's attention on more constructive efforts to assure the safe and economical operation of the existing fleet of US nuclear-power reactors and on reducing the costs of new power reactors operating on a "once-through" fuel cycle not involving plutonium separation from the spent fuel.

30-1 cont'd

The discussion below is organized under the following headings:

- The Office of Nuclear Energy has not established a need for the VTR,
- A half century of efforts to commercialize fast-neutron reactors have failed,
- Plutonium fuel facilitates nuclear-weapons proliferation.

If the EIS process is not shelved – as it should be – I request that the final EIS include responses to all these points.

30-3

The Office of Nuclear Energy has not established a need for the VTR

Section 1.3, "Purpose and Need for Agency Action," simply declares:

> DOE needs to develop this capability to establish the United States' testing capability for next-generation nuclear reactors—many of which require a fast-neutron spectrum for operation—thus enabling the United States to regain technology leadership for the next generation nuclear fuels, materials, and reactors.

No basis is given for the expectation that the next generation of US nuclear power reactors will be fast-neutron reactors.

In Section 1.2, Background, p. I-2, it is suggested that DOE's Nuclear Energy Advisory Committee has established the need:

30-1 cont'd

2

30-2 DOE has not ignored the issue of proliferation and points out that the purpose of the VTR is to serve as a testing capability for development of unspecified advanced reactors (as well as supporting testing that benefits the current fleet of commercial nuclear reactors). The focus of this comment is on a "plutonium economy" and the creation of plutonium in a fast reactor. The VTR EIS is very clear that the purpose of the VTR is to create a test environment and that no nuclear materials (e.g., plutonium) would be recovered from the VTR spent nuclear fuel. The VTR EIS also states that plutonium feedstock for fuel fabrication would come from existing inventories of separated plutonium (i.e., there would be no new plutonium separation from existing spent fuel). Therefore, fabricating VTR fuel would decrease the existing inventories of plutonium. Please see Section 2.3, "Nonproliferation," of this CRD for additional discussion of this topic.

30-3 DOE disagrees that this EIS should be cancelled. In making a decision regarding the VTR, DOE will consider the analysis in this EIS, all comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost. DOE's decision pursuant to the analysis in this VTR EIS will be announced in a Record of Decision(s) that will be issued no sooner than 30 days after the U.S. Environmental Protection Agency Notice of Availability of this Final EIS is published in the Federal Register.

Commenter No. 30 (cont'd): Frank N. von Hippel, Senior Research Physicist, Princeton University

> The Nuclear Energy Advisory Committee (NEAC) report, *Assessment of Missions and Requirements for a New U.S. Test Reactor* (NEAC 2017), confirmed the need for fast-neutron testing capabilities in the United States and acknowledged that no such facility is readily available domestically or internationally.

However, the NEAC report (chapter III, "User Needs") states only that an ad hoc subcommittee invited "potential users from industry and from government to a meeting to obtain their views of the need for a test reactor and to specify desired test reactor capabilities." It states that "[a]ll meeting presentations and letter reports from industry representatives are available at the NEAC website." However, the website displays only five letters supporting the VTR from: Advanced Reactor Concepts (ARC); AREVA, the Fast Test Reactor Working Group, TerraPower and Westinghouse.

Except for Westinghouse, which has a design concept for a lead-cooled reactor, however, it appears that the primary financial support for these companies' fast-neutron reactor design work comes from the Office of Nuclear Energy itself. Below, I summarize and reference the available information on the funding of the fast-neutron reactor R&D behind the five letters of support.

Advanced Reactor Concepts (ARC). In its letter of support for the VTR, ARC states that it

> is developing a small modular fast reactor, the ARC-100, that is a fast-spectrum reactor based upon decades of research in the U.S. We consider this to be an important return on investment for the U.S. and believe that we have sufficient information to develop the initial design. However, a fast-spectrum test reactor would add important capability to our efforts.

ARC reportedly has 25 employees and an annual revenue of $6 million. Eighty percent of that funding appears to be from an Office of Nuclear Energy grant of $25 million over 3.5 years matched by $6 million from other unspecified sources.

AREVA was reorganized by its primary owner, the French government and the successor government-owned company, *Orano,* no longer works on reactor design.

Fast Test Reactor Working Group (FTRWG). The letter, signed by the CEO of Oklo, who also chairs the FTRWG, states that the members of the Working Group are "Oklo, GE Hitachi Nuclear Energy, TerraPower, Advanced Reactor Concepts, Westinghouse, General Atomics, Southern Company, Duke Energy, Exelon ..."

Advanced Reactor Concepts has been discussed above. TerraPower and Westinghouse are discussed separately below. What about the others?

Oklo is a "20-person startup with $25 million" that Idaho National Laboratory (INL) has invited to build a 1.5 MWe microreactor on INL's site. The reactor fuel will be provided by INL. The company hopes the microreactor will be competitive with diesel power in remote and island communities. The venture capital firm that has partnered in the $25 million startup investment notes that it will be necessary to change the Nuclear Regulatory Commission's requirement of "a massive security force around every nuclear plant…in order to make it a reality."

GE Hitachi (GEH) has for decades been trying to sell its PRISM fast-neutron reactor with no takers. The PRISM design is based on INL's Experimental Breeder Reactor II, which was shut down in 1994 after the US ended its fast-neutron reactor development program. GEH finally has a customer, the Office of Nuclear Energy, which plans to base the design of the $2.6 to $5.8 billion VTR on that of the PRISM (see DEIS, p. 2-3).

30-1 cont'd

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Commenter No. 30 (cont'd): Frank N. von Hippel, Senior Research Physicist, Princeton University

General Atomics is being funded by DOE with $25 million, matched by $6 million from other sources, to develop a conceptual design for a 50-MWe "fast modular reactor."

Southern Company leads a consortium funded by DOE with $90 million, matched by $23 million from other sources, "to design, construct, and operate the Molten Chloride Reactor Experiment (MCRE) – the world's first critical fast-spectrum salt reactor." The actual work is being done by Terrapower (see below).

Duke Energy is on an advisory group to TerraPower and GE-Hitachi.

Exelon. I have been unable to find any evidence of Exelon interest in fast-neutron reactors.

TerraPower describes itself as "a nuclear innovation company founded by Bill Gates and other visionaries," but, increasingly, it is being funded by the Office of Nuclear Energy: $40 million in 2016 for "research, design and testing of TerraPower's molten chloride fast reactor project" and $80 million in 2020 "to demonstrate the Natrium™ reactor and integrated energy system with its technology co-developer GE Hitachi Nuclear Energy and engineering and construction partner Bechtel." In addition, as already noted, TerraPower is partnering with GE-Hitachi in seeking funding from the Office of Nuclear Energy to build the $2.6 to $5.8 billion VTR.

Westinghouse. "Westinghouse is currently developing a Lead-cooled Fast Reactor (LFR) concept." This is a paper study that DOE apparently has not funded.

Thus, virtually all of the proposed users of DOE's Versatile Fast Reactor are being funded by DOE to develop fast-neutron-reactor designs. There is no evidence of independent funding to build fast-neutron power reactors in the United States.

The Senate Appropriations Committee has also expressed concern about the absence of private support for the VTR itself. In its *Explanatory Statement for Energy and Water Development and Related Agencies Appropriations Bill, 2021*, it states that **30-1 cont'd**

> The Committee is concerned that the Department is proceeding with plans for the VTR without having secured commitments from private companies or foreign governments for monetary and in-kind contributions. Such a delay significantly undermines the likelihood of success. Therefore, the Committee directs the Department to submit a plan for executing the VTR project via a public-private partnership with an option for a payment-for-milestones approach. The plan shall be submitted to the Committee no later than 30 days after enactment of this act.

On 21 January 2021, in response to the Appropriation Committee requirement, GE Hitachi Nuclear Energy (GEH) and TerraPower, the Office of Nuclear Energy's proposed contractors for constructing the $2.6 to $5.8 billion VTR, announced

> a collaboration to pursue a Public Private Partnership to design and construct the Versatile Test Reactor (VTR) for the U.S. Department of Energy (DOE).

They did not volunteer their own resources for the partnership, however. Rather, they stated that

> Energy Northwest, a utility consortium with nuclear power plant operating experience, will support the joint GEH-TerraPower effort. Additional companies and investors have expressed interest in being part of this effort and, if brought on board, will be named later.

Energy Northwest is a "consortium of 28 public utility districts and municipalities across Washington" that operates a single nuclear power reactor. It had a net operating income of $40 million in 2020 with no reported expenditures on R&D. It does not appear to be in a position to contribute significantly to the construction of the $2.6 to $5.8 billion VTR. Perhaps Energy

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Northwest is a placeholder to satisfy the Senate Appropriations Committee's 30-day deadline, but it is unlikely that GEH and TerraPower will be able to find investors with deeper pockets. 30-1 cont'd

A half century of efforts to commercialize fast-neutron reactors have failed

The Office of Nuclear Energy describes sodium-cooled and molten-salt reactors as "advanced." This conjures up an image of new designs made possible by the advance of technology. But sodium-cooled and molten salt reactors are half a century old. The US even had a commercial sodium-cooled reactor, Fermi 1, which had an operating license from 1966 to 1972 until it was shut down and became the subject of both a book and a song, *We Almost Lost Detroit,* because two of its fuel assemblies had partially melted down due to a sodium flow blockage. During those six years, the amount of electricity Fermi 1 produced was equivalent to two weeks of full power operation for a cumulative capacity factor of 0.9 percent. Fermi 1's steam generator was replaced by an oil-fired boiler and a much larger and more successful light water reactor was built next to it. Fermi 2 has thus far operated for 35 years with a cumulative capacity or load factor of 77 percent, close to the global average for such reactors.

The problems of Fermi 1 proved to be typical of sodium-cooled reactors. Because sodium burns in air or water, refueling, repairs and maintenance are much more problematic for sodium-cooled than for water-cooled reactors. The "father" of the US nuclear navy, Admiral Hyman Rickover, had one installed in the second US nuclear submarine, *Seawolf* (SSN-575, 1957-87). When the submarine returned from its first sea trials, however, he had the reactor replaced with a light-water reactor. His verdict: sodium-cooled reactors are "expensive to build, complex to operate, susceptible to prolonged shutdown as a result of even minor malfunctions, and difficult and time-consuming to repair." 30-4

That verdict has been borne out by global experience. Of the eight sodium-cooled reactor prototypes in addition to Fermi I that have been connected to the grid in five countries,[3] only two have had capacity factors greater than 40 percent. Both of those are in Russia and are currently the world's only two operating sodium-cooled reactors. Russia's nuclear conglomerate, Rosatom, has postponed building another sodium-cooled reactor, however, until it can be convinced that the reactor will be economically competitive with its light-water reactors.

India has been struggling with the construction of a prototype breeder reactor since 2004 and China started building two in 2017 and 2020. There is concern, however, that India and China are building these reactors because they can produce weapon-grade plutonium if uranium "blankets" are placed to absorb the neutrons leaking from their cores.

Globally, an extraordinary amount – about $100 billion in 2020 dollars – has been spent on sodium-cooled fast-neutron-reactor research, development and demonstration without commercial success.

[3] UK Demonstration Fast Reactor (1962-77), France's Phenix (1973-2010), UK Prototype Fast Reactor (1976-94), Russia's BN-600 (1980-), France's Superphénix (1986-98), Japan's Monju (1995-2017), China's Experimental Fast Reactor (2011-), Russia's BN-800 (2011-).

30-4 In assessing the need for a fast-neutron source to advance nuclear technology, DOE reached out to the nuclear community for feedback on the proposal. It is based on the interest expressed during that effort that DOE decided to pursue the VTR project. It is only through a vigorous research and development program that the issues identified by the commenter can be addressed. The VTR project provides that capability to advance fast-neutron research, development, and demonstration. The selection of sodium-cooled technology for the test reactor was based, among other factors, on the successful operation of multiple test and experimental sodium-cooled reactors worldwide. Details of the selection are described in the Analysis of Alternatives, as discussed in Chapter 2, Section 2.7, of this EIS. While the VTR would be a sodium-cooled reactor it would be capable of testing materials for reactor designs other than sodium-cooled reactors. The VTR would provide a test platform for the next-generation nuclear fuels, materials, and reactors; reactors that would include sodium, molten salt, lead/lead-bismuth, and high temperature gas-cooled reactors. See Appendix B, Section B.3, for a discussion of the testing capabilities envisioned for the VTR.

Commenter No. 30 (cont'd): Frank N. von Hippel, Senior Research Physicist, Princeton University

Plutonium fuel facilitates nuclear-weapon proliferation

Not discussed at all in the DEIS are the implications of the US promoting plutonium as a fuel. But it is the ability of sodium-cooled fast-neutron reactors to produce plutonium that attracts so much passionate enthusiasm in the nuclear engineering community.

The reason, as explained by the IAEA, is that,

> Using currently known uranium resources, "fast reactors operating in a closed fuel cycle would be able to provide energy for thousands of years"… says Stefano Monti, Team Leader for the IAEA's Fast Reactor Technology Development Section…
>
> Instead of sending the spent fuel into storage and eventually long-term disposal, the [uranium-238, which constitutes most of the mass of spent light-water reactor fuel but is not chain reacting] can be converted into [chain-reacting plutonium] by exposure to [neutrons] in a reactor [and thereby sodium-cooled fast-neutron plutonium breeder reactors have] "the potential to make the production of energy from uranium 100 times more efficient than with the existing [slow neutron water-cooled] reactor"…says Monti.

This is the dream of a "plutonium economy"[4] that was originally promoted worldwide by the US Atomic Energy Commission (AEC) in the 1960s and early 1970s. At the time, the global resource of uranium in high-grade deposits was believed to be small and nuclear power was expected to grow exponentially to thousands of reactors rather than plateau at about 400 as actually happened. In reality, the price of uranium stayed low – accounting for about 2 percent of the cost of power from a new nuclear power plant today. Liquid-sodium cooled reactors, because of their high capital costs, stayed noncompetitive.

30-2 cont'd

This was serendipitous because plutonium is a nuclear-weapon material and a world with thousands of plutonium breeder reactors and millions of bombs worth of plutonium being separated and shipped and fabricated into fuel annually would have been a nuclear proliferation and terrorism nightmare. This is why, after India launched its nuclear-weapons program with a nuclear explosion in 1974, using plutonium separated out for its breeder reactor program with US "Atoms for Peace" Program assistance, the US turned against separating plutonium from spent nuclear fuel and has been working ever since to persuade other countries to do so as well.

The draft EIS illustrates the problem. It states (p. S-12) that the VTR will require "between 0.4 and 0.54 metric tons of plutonium" annually. Using the IAEA metric, this would be enough for 50 to 70 nuclear bombs annually for a 300-MWt thermal reactor one tenth that of France's full-scale demonstration breeder reactor, Superphénix. This is not the kind of example that the US should be providing for non-weapon states that are interested in a nuclear-weapon option.

There are some within the nuclear engineering community that have made solving humanity's energy problems with sodium-cooled plutonium breeder reactors into a religion, however, and in the US, during the Trump Administration, adherents of that religion at the Idaho National Laboratory were allowed to take over DOE's nuclear energy R&D program, heedless of the fact that they were undermining US nonproliferation policy. Given that it has no foreseeable economic rationale, it should be an easy policy decision to rein this initiative in.

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[4] Glenn T. Seaborg, Chairman of the US Atomic Energy Commission, "The Plutonium Economy of the Future," speech at the Fourth International Conference on Plutonium and Other Actinides, Santa Fe, New Mexico, 5 October 1970, http://fissilematerials.org/library/aec70.pdf.

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Commenter No. 31: Tiffany Drake, Remediation and Radiological Assessment Unit Chief, Missouri Department of Natural Resources

Missouri Department of NATURAL RESOURCES dnr.mo.gov
Michael L. Parson, Governor Carol S. Comer, Director

February 2, 2021

James Lovejoy
Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415

RE: Draft Versatile Test Reactor Environmental Impact Statement (DOE/EIS-0542)

Dear James Lovejoy:

The Missouri Department of Natural Resources appreciates the opportunity to review the Draft Versatile Test Reactor (VTR) Environmental Impact Statement (EIS). We acknowledge that the EIS outlines various locations for the VTR facility and the supporting infrastructure. Based on the potential sites, and the potential for transport of radioactive materials and/or wastes between locations, the Department offers the following comment for consideration.

- Section 4.12 does not currently address radiological or rail safety inspections of the waste. Some states, including Missouri, have statutes that allow for inspections of shipments that exceed a certain level of radioactivity. The EIS should include a discussion of how inspections would occur during transit, who will be responsible for the transportation of the waste, and how that organization will coordinate transportation and inspection plans with states that perform inspections. The EIS should also include a discussion on who is responsible for responding to an incident during transport, should one occur. **31-1** **31-2**

We appreciate the opportunity to provide comments for the Draft Versatile Test Reactor Environmental Impact Statement. If you have any questions or need further clarification, please call me at 573-526-9830. Address any written correspondence to my attention at Missouri Department of Natural Resources, P.O. Box 176, Jefferson City, MO 65102.

Sincerely,

ENVIRONMENTAL REMEDIATION PROGRAM

Tiffany Drake
Remediation and Radiological Assessment Unit Chief

TD:tgr

NOTE: email to VTR.EIS@nuclear.energy.gov

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31-1 As indicated in Section 4.12, only truck transports of the radioactive wastes and nuclear materials are considered in this EIS. Appendix E, Sections E.2.4 and E.3, describe the relevant information on the transportation mode and the regulations on packaging and transportation, respectively. It should be noted that the transport of radioactive materials and wastes occurs daily on the nation's highways, including highways in Missouri, as a result of commercial and government activities (e.g., nuclear wastes and materials for nuclear medicine). Therefore, the transportation activities analyzed in this EIS do not present a new or unique hazard that would require specific inspections beyond which the certified transportation carriers are required to be performed per the Department of Transportation (DOT) applicable regulations in 49 CFR Parts 390 through 397. Safe packaging and transportation of materials is critical to the success of DOE operations. Annually, DOE transports about 5,000 shipments including radioactive, hazardous, and non-hazardous materials (DOE office of packaging and transportation, available at https://www.energy.gov/em/services/waste-management/packaging-and-transportation.)

31-2 Appendix E, Section E.4, discusses the emergency response responsibilities of the various Federal and State agencies in the event of an accident. To mitigate the possibility of an accident, DOE- issued DOE Manual 460.2-1A, "Radioactive Material Transportation Practices Manual for Use with DOE Order 460.2A" (DOE 2008). As specified in this manual, carriers are expected to exercise due caution and care in dispatching shipments. According to the manual, the carrier determines the acceptability of weather and road conditions, whether a shipment should be held before departure, and when actions should be taken while en route. The manual emphasizes that shipments should not be dispatched if severe weather or bad road conditions make travel hazardous. Current weather conditions, the weather forecast, and road conditions would be considered before dispatching a shipment. Conditions at the point of origin and along the entire route would be considered. In addition, the certified carriers are required to have trained individuals and established emergency response procedures and security protocols related to transportation of radioactive and hazardous material, per the DOT regulations in 49 CFR Part 172.

Commenter No. 32: Jennifer Tribble, PhD, Policy Analyst, Tennessee Department of Environment & Conservation

From: Jennifer Tribble
Sent: Wednesday, February 3, 2021 4:35:13 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Cc: Kendra Abkowitz; Matthew K. Taylor
Subject: TDEC Comments DOE) Draft Versatile Test Reactor Environmental Impact Statement (VTR EIS) (DOE/EIS-0542)

Mr. Lovejoy,

The Tennessee Department of Environment and Conservation (TDEC) appreciates the opportunity to provide comments on the U.S. Department of Energy (DOE) *Draft Versatile Test Reactor Environmental Impact Statement* (VTR EIS) (DOE/EIS-0542). Please note that these comments are not indicative of approval or disapproval of the proposed action or its alternatives, nor should they be interpreted as an indication regarding future permitting decisions by TDEC. Please contact me should you have any questions regarding these comments.

Best,
Jenn

TN Department of Environment & Conservation
Jennifer Tribble, PhD | Policy Analyst
Office of Policy and Sustainable Practices
Tennessee Tower, Second Floor
312 Rosa L. Parks Ave., Nashville, TN 37243
[redacted]
We value your feedback! Please complete our customer satisfaction survey.

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Commenter No. 32 (cont'd): Jennifer Tribble, PhD, Policy Analyst, Tennessee Department of Environment & Conservation

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37243-0435

DAVID W. SALYERS, P.E.
COMMISSIONER

BILL LEE
GOVERNOR

February 3, 2021

Via Electronic Mail to VTR.EIS@nuclear.energy.gov
Attn: Mr. James Lovejoy, Document Manager
U.S. Department of Energy, Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415

Dear Mr. Lovejoy:

The Tennessee Department of Environment and Conservation (TDEC) appreciates the opportunity to provide comments on the U.S. Department of Energy (DOE) *Draft Versatile Test Reactor Environmental Impact Statement* (VTR EIS) (DOE/EIS-0542), which considers the potential environmental impacts for the construction and operation of a versatile test reactor (VTR) and its associated facilities across two (2) locations – Idaho National Laboratory (INL) or Oak Ridge National Laboratory (ORNL). The Draft EIS also considers the potential environmental impacts from activities to produce reactor fuel for the VTR, including feedstock preparation and fuel fabrication, at two (2) locations – the Savannah River Site (SRS) or INL. TDEC's comments pertain to the environmental impacts that would arise from siting the VTR at ORNL, recognizing that DOE's preferred alternative is to site the VTR at INL.[1] **32-1**

Actions considered for the construction of a VTR within the Draft EIS include:

- **Alternative A – No Action Alternative.** Under the No Action Alternative, DOE would not pursue construction and operation of a VTR. Instead, DOE would make use of established facilities including the INL Advanced Test Reactor and the ORNL High Flux Isotope Reactor, which provide limited features of a VTR. Under this alternative, DOE would not need to produce VTR driver fuel and therefore would not consider the alternatives below for VTR driver fuel production. DOE notes that this alternative would not meet the need and purpose identified for the VTR.

- **Alternative B – Idaho National Laboratory Versatile Test Reactor.** Alternative B would site the VTR at INL using existing facilities. The VTR is anticipated to use approximately 25 acres of land with a disturbance of 100 acres through construction. DOE notes that this is their preferred alternative.

[1] In an earlier stage of project development, TDEC encouraged DOE to consider the workforce capacity and locational benefits of constructing the VTR at ORNL. Oak Ridge is in the expanding Knoxville metropolitan area with nearly 870,000 residents and near the University of Tennessee – Knoxville, which has a strong nuclear engineering program. Further, ORNL is in geographical proximity to the SRS, which would reduce the environmental impact and risk associated with transport of reactor fuel if the SRS is selected as the site for fuel production. TDEC's previous comments are available at https://tdec.tn.gov/nepaupload/comments/index.

32-1 DOE recognizes the positive aspects of resources available at and around the Oak Ridge National Laboratory (ORNL) and considered them when identifying ORNL as a candidate site for the VTR. In making a decision regarding the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost. DOE's decision pursuant to the analysis in this VTR EIS will be announced in a Record of Decision(s) that will be issued no sooner than 30 days after the U.S. Environmental Protection Agency Notice of Availability of this Final EIS is published in the Federal Register.

Commenter No. 32 (cont'd): Jennifer Tribble, PhD, Policy Analyst, Tennessee Department of Environment & Conservation

- **Alternative C – Oak Ridge National Laboratory Versatile Test Reactor Alternative.** Alternative C would site the VTR at ORNL, using some existing facilities. Under this alternative, DOE would need to construct a new hot cell facility. Construction would disturb approximately 150 acres and the VTR complex, including the new hot cell facility, would use less than 50 acres of land.

Actions considered to produce VTR reactor fuel within the Draft EIS include:

- **Alternative A – Idaho National Laboratory Reactor Fuel Production Options.** Alternative A would allocate responsibilities for fuel production at INL, including for feedstock preparation, fuel fabrication, or both.

- **Alternative B – Savannah River Site Reactor Fuel Production Options**. Alternative B would site feedstock preparation, fuel fabrication, or both activities at SRS.

TDEC has reviewed the Draft EIS and provides the following comments:

Air Resources

If the ORNL alternative is chosen, Tennessee Air Pollution Control Regulations (TAPCR)[2] require that application for a construction permit be made not less than 90 days prior to the estimated start date of construction. Since this facility has existing Title V operating permits, some construction activities may be eligible for Title V permit modifications that do not require a construction permit. TDEC recommends that the Final EIS reflect these considerations and contact be made early if DOE would like assistance in determining the correct permitting options for this project.[3] **32-2**

TDEC recommends that DOE consider the use of idle restrictions for heavy construction equipment and dump trucks in use and on site to minimize emissions from these activities. Additionally, TDEC recommends that all construction equipment employed on site be well maintained and equipped with the latest emissions control equipment. TDEC encourages DOE to incorporate these considerations in the Final EIS. **32-3**

The Draft EIS acknowledges that fugitive dust will be generated during construction and states that they "would implement protective measures to minimize the generation of fugitive dust during construction." TDEC recommends DOE consider the application of asphalt, water, or suitable chemicals on dirt roads, material stockpiles, and other surfaces which can create airborne dusts as mitigating measures.[4] **32-4**

Site clearing activities include the potential disposal of cleared material through open burning. It is recommended that other disposal methods also be considered (other than open burning) and, if found to be practical, employed for disposal actions. Additionally, it is recommended that good smoke management practices be followed during any open burning activity. TDEC encourages DOE to reflect these considerations in the Final EIS. **32-5**

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[2] Reference TDEC TAPCR 1200-03-09-.01(1)(b), http://sos.tn.gov/effective-rules.

[3] For more information on the correct permitting options for this project, please contact Lacey Hardin, Environmental Consultant 4, Division of Air Pollution Control, at (615) 532-0545 or Lacey.Hardin@tn.gov.

[4] Reference TDEC TAPCR 1200-03-08, http://sos.tn.gov/effective-rules.

32-2 Chapter 4, Section 4.4.2.2, of this Final EIS was revised to indicate that any new stationary source associated with the VTR project would comply with the air permitting requirements of the Tennessee Department of Environment and Conservation (TDEC).

32-3 The Final EIS was revised to include Section 4.4.5, which describes the air quality protective measures that the DOE would implement to minimize air emissions from proposed construction and operations activities. Section 4.4.5 includes the measures suggested in the comment.

32-4 Please refer to the response to comment 32-3. Section 4.4.5 includes the measures suggested in the comment.

32-5 The construction contractor would determine the best approach to dispose of vegetation cleared from the ORNL project site. However, the DOE would consider other methods besides open burning for the disposal of cleared vegetation. The VTR EIS air quality analysis evaluated a scenario that would generate worst-case emissions from site clearing. The analysis assumes that marketable timber would be transported to an offsite location for sale. The remaining slash vegetation could be chipped and used on site or hauled off site. However, the analysis conservatively assumed that all slash would be burned instead of chipped. As requested in the comment, Final EIS Section 4.4.5 includes a measure that would require good smoke management practices during open burning.

Commenter No. 32 (cont'd): Jennifer Tribble, PhD, Policy Analyst, Tennessee Department of Environment & Conservation

Specific comments on the EIS:

- On pages 7-2 to 7-15, Table 6-1, Applicable Laws, Regulations, Orders, and Other Requirements, should be Table 7-1.
  - On page 7-5, The Tennessee Air Quality Act is incorrectly referenced in this table as TCA 53-3408 et seq. This reference is obsolete and should be replaced with at Tenn. Code Ann. §§ 68-201-101 to -121.
  - This table includes TAPCR 1200-3-1-.01 et seq. The table should also include TAPCR 0400-30-01-.01 et seq. The TAPCR are correctly written, for example, as 1200-03-09, not 1200-3-9.

32-6

Cultural Resources

TDEC finds that any impact to cultural resources at ORNL will be addressed through a programmatic agreement between the DOE and the State Historic Preservation Office.

32-7

Remediation – Oak Ridge

TDEC comments that, if the VTR is sited at ORNL, it should be built above grade and with easy and safe removal in mind. Additionally, details of the waste management plan should be shared with regulators for review prior to construction. TDEC encourages DOE to reflect these considerations in the Final EIS.

32-8

TDEC specifically notes that, since the established nuclear facilities were built at ORNL, there has been commercial development to the East on Bethel Valley Rd. on public property and residential development south of the Clinch River. TDEC asks that these commercial and residential properties be evaluated for the DOE Hazard Categories and for vulnerable facilities if they have not yet been, and notes that pursuing the ORNL alternative could revise the existing Tennessee Emergency Management Agency evacuations zones. TDEC encourages DOE to reflect these considerations in the Final EIS.

32-9

Solid Waste

TDEC acknowledges the preferred alternative, to site the VTR at INL, would generate approximately 3,100 cubic meters less of construction waste compared to construction of the VTR at ORNL. TDEC recommends that the Final EIS consider and note that any wastes, save for those wastes that are excluded or conditionally-exempt such as mixed low level waste, associated with project construction and/or operations be managed in accordance with the Solid and Hazardous Wastes Rules and Regulations of the State of Tennessee.[5]

32-10

Water Resources

TDEC concurs with the Draft EIS that the ORNL alternative would require a construction stormwater permit (CGP). If the ORNL alternative is selected, the constructed facility would fall under the Tennessee National Pollutant Discharge Elimination System (NPDES) Multi-Sector Permit (TMSP) for Stormwater for Industrial Activities and would require a TMSP permit, which would include a Surface Water Pollution Prevention Plan. The existing NPDES discharge permit (TN0002941), which expires on December 31, 2023, would likely need to be amended to include the new facility. A hydrologic determination by a certified professional would need to be conducted on the 150 acres of planned disturbance to assess the impact and need for an Aquatic Resource Alteration Permit (ARAP). The project could require mitigation depending on the impacts to streams and wetlands. TDEC encourages DOE to include these considerations in the Final EIS.

32-11

32-12

[5] Reference TDEC Solid Waste Management Rule 0400 Chapter 11 for Solid Waste and Chapter 12 for Hazardous Waste, http://sos.tn.gov/effective-rules.

32-6 The Final EIS includes the revisions requested in the comment.

32-7 The last sentence of Section 4.6.2.2 was revised to include that DOE would resolve any adverse effects through a programmatic agreement between the DOE and the State Historic Preservation Office.

32-8 The final reactor design and construction would be consistent with applicable regulatory requirements and other considerations. Decontamination, decommissioning, and dismantling (DD&D) would be included in those considerations. National Environmental Policy Act (NEPA) evaluations are performed at the conceptual design phase of a project so that the potential impacts on the environment and public and worker health and safety can be estimated and included in the decision process before the expenditure of substantial funds and resources. While DD&D is a consideration, there are many other factors that would dictate the final design. It is premature to make any commitments relative to the final design of the VTR. Many operational and readiness review plans and procedures would be required and prepared in preparation for construction and operation of the VTR. These plans and procedures would be prepared and provided to regulators consistent with regulatory and applicable permit requirements.

32-9 As described in Chapter 3, Section 3.2.11, DOE Order 151.1D, "Comprehensive Emergency Management System" (DOE 2016b), describes detailed requirements for emergency management that all DOE sites must implement. Each DOE site, facility, and activity, including ORNL, establishes and maintains a documented emergency management program that implements the requirements of applicable Federal, State, and local laws, regulations, and ordinances, as well as DOE orders, for fundamental worker safety programs (e.g., fire, safety, and security). Should the VTR be located at ORNL, the ORNL site emergency plan would be updated to reflect changes mandated by the addition of VTR activities, including any change to the evacuation zones.

32-10 The increased volume of construction wastes estimated for the VTR project at ORNL arises from new facilities that would be built at ORNL compared to use of existing infrastructure at the Idaho National Laboratory (INL) Site to provide the same functions. All construction wastes would be transferred to the appropriate recycle or disposal facilities. Chapter 3, Sections 3.1.9, 3.2.9, and 3.3.9, of the VTR EIS state that all waste disposition actions would comply with the licenses, permits, and/or approvals applicable to the INL, ORNL, and SRS sites and their facilities, respectively. Section 4.9 of the VTR EIS discusses that wastes would be managed

Commenter No. 32 (cont'd): Jennifer Tribble, PhD, Policy Analyst, Tennessee Department of Environment & Conservation

Underground Storage Tanks

If there are any plans to relocate or disturb known petroleum underground storage tanks during construction, DOE will need to contact TDEC.[6] Any required paperwork will need to be submitted at least 30 days prior to activity. If any unexpected underground storage tanks that contain petroleum are encountered, DOE will need to contact TDEC as soon as possible for instructions of how to proceed.[7] For tanks containing hazardous materials other than petroleum, DOE would need to contact TDEC's Division of Remediation. TDEC encourages DOE to reflect these considerations in the Final EIS. ***32-13***

TDEC appreciates the opportunity to comment on this Draft EIS. Please note that these comments are not indicative of approval or disapproval of the proposed action or its alternatives, nor should they be interpreted as an indication regarding future permitting decisions by TDEC. Please contact me should you have any questions regarding these comments.

Sincerely,

Jennifer Tribble, PhD
Policy Analyst, Office of Policy and Sustainable Practices
Tennessee Department of Environment and Conservation
[redacted]

cc: Kendra Abkowitz, PhD, TDEC, OPSP
Benjamin Almassi, TDEC, DSWM
Daniel Brock, TDEC, DA
Lacey Hardin, TDEC, APC
William Miller, TDEC, OGC
Tom Moss, TDEC, DWR
Michelle Pruett, TDEC, UST
Matthew Taylor, TDEC, OPSP
Courtney Thomason, PhD, TDEC, DOR-OR

[6] For additional information, please contact TDEC's Knoxville Environmental Field Office at 865-594-6035 and ask to speak to someone in the Division of Underground Storage Tanks.
[7] For additional information, please contact TDEC's Knoxville Environmental Field Office at 865-594-6035 and ask to speak to someone in the Division of Underground Storage Tanks.

within the current waste management systems and capabilities, Chapter 7, Table 7-1, "Applicable Laws, Regulations, Orders, and Other Requirements," specifically includes the Tennessee Hazardous Waste Management Act, TCA 68-212; Hazardous Waste Management, Tennessee Rules 0400-12-01; Tennessee Solid Waste Management Act of 1919, TCA 68-211-101 et. seq.; and Tennessee Solid Waste Processing and Disposal Regulations, Tennessee Rules, 1200-1-7 as some of the applicable requirements at ORNL.

32-11 Chapter 7, Section 7.2.2, of this VTR EIS, notes that National Pollutant Discharge Elimination System (NPDES) permit TN0002941 would likely need to be modified to include the VTR and associated facilities if constructed at ORNL. DOE revised the existing statement: "An NPDES general permit for point-source stormwater discharges associated with industrial activity would be required for operation of the proposed facilities. The ORNL SWPPP would be revised to include the new stormwater sources" to instead reflect a Tennessee NPDES Multi-Sector Permit for Stormwater for Industrial Activities.

32-12 Chapter 7, Section 7.2.2, of this VTR EIS, was updated to reflect the considerations provided by the commenter.

32-13 As described in Chapter 2, Section 2.5, of the Draft EIS (Oak Ridge National Laboratory Versatile Test Reactor Alternative), the ORNL VTR proposed site location is in a relatively undeveloped area that has previously been considered for other projects, but contains almost no existing infrastructure. Based on the location and history of the proposed site, DOE does not expect to find or disturb any underground storage tanks. Should an underground storage tank be discovered, or is there is need to install a new tank, or relocate an existing tank, DOE would contact TDEC and address the issue in accordance with applicable regulations. Chapter 7, Section 7.1 ("Applicable Federal and State Laws and Regulations"), of this EIS lists such regulations: Tennessee Petroleum Underground Storage Tank Act, TCA 68-53-101 et seq., and Tennessee Underground Storage Tank Program Regulations, Tennessee Rules, 1200-1-15. Text was added to Chapter 4, Section 4.7.2.1 (ORNL VTR Alternative, Construction) indicating that DOE would consult with TDEC in the event a tank is found, needs relocation, or requires installation.

Commenter No. 33: C. Nicole Denham

February 05, 2021

Mr. James Lovejoy, Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415

Re: Public Comments for draft Versatile Test Reactor Environmental Impact Statement (EIS-0542)

Dear Mr. Lovejoy:

The need for a $3 to $6 billion Versatile Test Reactor (VTR) is ill defined and seems to rest primarily on Department of Energy (DOE) assertions. DOE claims to need a fast-neutron reactor for experimentation, but this need is merely asserted, not demonstrated. DOE suggests the only way to satisfy the unproven need is to construct and operate this particular reactor. If DOE ever establishes a need, an alternative would be to modify existing facilities – not build new ones. **33-1**

While fuel for all nuclear reactors is dangerous, the proposed use of uranium and plutonium is especially concerning. The proposed use of plutonium fuel presents **typical risks of contamination and hazardous waste**, but also the additional danger of nuclear proliferation and the threat of terrorism. **33-2**

The massive amount of fuel that would be used over the lifetime of the VTR is also of concern. Based on the draft EIS, an estimated 34 metric tons of plutonium would be fabricated into fuel over the 60-year lifespan of the reactor. Processing this much plutonium will lead to an elevated risk of worker exposure and increased environmental impacts, and could result in plutonium being stranded at the fuel fabrication site at the Idaho National Laboratory (INL) or the Savannah River Site (SRS) if the project were halted. **33-3**

The transportation of fuel (uranium and plutonium) is a massive risk to public safety. If the fuel were sourced domestically, thousands of miles of overland transportation would be required to deliver it to either SRS or INL for fabrication, and (if produced at SRS) from there to the VTR site at INL. **33-4**

If the VTR were to be constructed and operated at INL, the burden of all waste produced from operations would fall on the shoulders of current and future Idahoans. An estimated 34 metric tons of plutonium, and 120 metric tons of uranium would be needed to fuel the VTR over its lifespan. **33-5**

The amount of transuranic waste (TRU) produced as a result of fuel fabrication and operation of the VTR could be as much as 24,000 cubic meters. **Disposal of this waste in the Waste Isolation Pilot Plant (WIPP) in New Mexico will unnecessarily challenge the legal volume cap of WIPP and could negatively impact TRU disposal plans by DOE.** **33-6**

As DOE has not clearly demonstrated the need for the Versatile Test Reactor as required by the National Environmental Policy Act (NEPA), this proposal must be stopped. **33-1 cont'd**

Thank you for your careful consideration of my comments.

Sincerely,

C. Nicole Denham
Albuquerque NM
Coeur d'Alene ID

33-1 Information about the lack of a domestic fast-neutron testing capability and the purpose and need for a VTR is presented in Chapter 1 of this VTR EIS. DOE is pursuing the VTR to provide a test capability that supports the fulfillment of its mission of advancing the energy, environmental, and nuclear security of the United States and promoting scientific and technological innovation in support of that mission. Refer to Section 2.2 of this CRD for additional discussion of the purpose and need for the VTR.

Chapter 2, Section 2.7, of this VTR EIS addresses alternatives considered and dismissed from detailed analysis. This section summarizes the reason that a number of other reactors (including existing reactors) or technologies would not meet the mission need and schedule for a VTR. It includes reference to a DOE Analysis of Alternatives that evaluated options other than the VTR described in this EIS.

33-2 DOE acknowledges your concern regarding nuclear proliferation. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic. The proposed VTR is a one-of-a-kind reactor where the neutron production over a desired test volume is maximized while minimizing the size of the reactor. To achieve the desired performance, VTR proposes to use plutonium in a metal alloy fuel. The use of plutonium in VTR fuel does not mean that future advanced reactors would use fuel containing plutonium; the advanced reactors currently under development would use non-plutonium fuels such as high-assay, low-enriched uranium (HALEU) or thorium fuels.

33-3 Please see Section 2.4, "Plutonium Use and Disposition," of this CRD for additional information. The environmental impacts and worker exposure related to the VTR alternatives and fuel production options have been evaluated in this EIS. Results of the impact analyses are presented in Chapter 4, (worker impacts are discussed in Sections 4.10.1, 4.10.2, and 4.10.3, and 4.10.4), with summaries in Chapter 2, Section 2.9.

33-4 The transportation of the reactor fuel (e.g., uranium and plutonium) would be carried out by the DOE Office of Secure Transportation (OST). OST is responsible for the safe and secure transport of government-owned nuclear materials in the contiguous United States. Even though this EIS identifies representative routes, specific information on the routes and dates of material movement are classified to ensure operational security. These materials are transported in highly modified secure tractor-trailers and escorted by armed Federal agents in accompanying vehicles for additional security, as needed. Appendix E, Section E.2.4, describes

Commenter No. 33 (cont'd): C. Nicole Denham

the key elements of the secure transportation asset, which emphasizes the various aspects of the transportation. It should be noted that secure transportation is an ongoing activity within the United States. As indicated in this EIS, the overall risks of transporting these materials are very small.

33-5 DOE acknowledges the commenter's concerns regarding nuclear waste. Regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as spent nuclear fuel (SNF) annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. Please refer to 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

33-6 Transuranic (TRU) wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico. If the DOE defense plutonium were used to produce VTR driver fuel, the TRU waste generated as part of the reactor fuel production options would meet the criterion of being defense related. The WIPP Land Withdrawal Act (LWA) (P.L. 102-579 as amended by P.L., 104-201) requires waste disposed at WIPP to (1) meet the definition of "transuranic waste" (WIPP LWA Section 2(18)) and (2) be generated by atomic energy defense activities (WIPP LWA Section 2(19)). Additionally, waste must meet the WIPP LWA, WIPP Hazardous Waste Facility Permit, WIPP waste acceptance criteria, and other applicable requirements. Compliance with these requirements may be demonstrated by acceptable knowledge, non-destructive assay, and other established methods. The waste stream must comply with the WIPP Waste Acceptance Criteria and the WIPP Permit Waste Analysis Plan by passing a TRU waste certification audit, an inspection by the U.S. Environmental Protection Agency, and New Mexico Environment Department (NMED) approval of the final audit report.

The WIPP LWA stipulates that the transuranic waste capacity of the WIPP facility is a total TRU waste volume capacity limit of 175,600 cubic meters (6.2 million cubic feet). As of April 3, 2021, the WIPP facility has disposed of 70,115 cubic meters of TRU waste. This TRU waste disposal volume is about 40 percent of the total TRU waste volume allowed by Public Law 102-579 as amended by Public Law 104-201. TRU waste volume estimates such as those provided in National Environmental Policy Act (NEPA) documents, are not intended to demonstrate compliance with the WIPP Land Withdrawal Act TRU waste volume capacity limit. TRU waste volumes projected in NEPA documents will be incorporated, as appropriate, into future ATWIR [Annual Transuranic Waste Inventory Report] TRU waste inventory estimates.

DOE is conducting preliminary planning to evaluate options to be able to continue uninterrupted TRU waste disposal operations up to the total transuranic waste volume capacity limit. Additional TRU waste disposal panels that would provide capacity to dispose of TRU waste up to the WIPP LWA total TRU waste volume capacity limit may be authorized under a future permit modification. The WIPP Permit, consistent with the RCRA regulations at 40 CFR 270.42, can be modified by submittal of a Permit Modification Request (PMR) and decision by NMED to approve the PMR. Both Class 2 and Class 3 PMRs include a public comment period as a step in the regulatory process. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

Commenter No. 34: Cletus Stein

From: Cletus
Sent: Monday, February 8, 2021 3:33:49 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] reacters

Mr. James Lovejoy, Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415

Re: Public Comments for draft Versatile Test Reactor Environmental Impact Statement (EIS-0542)

Dear Mr. Lovejoy:

As you know, what we all are concerned about here is the health and safety of our country and its people, now and into the future. If we don't handle all these concerns with the utmost care and something goes wrong, the results will be forever, whether catastrophic or nearly so. Please care. **34-1**

The need for a $3 to $6 billion Versatile Test Reactor (VTR) is ill defined and seems to rest primarily on Department of Energy (DOE) assertions. DOE claims to need a fast-neutron reactor for experimentation, but this need is merely asserted, not demonstrated. DOE suggests the only way to satisfy the unproven need is to construct and operate this particular reactor. If DOE ever establishes a need, an alternative would be to modify existing facilities – not build new ones. **34-2**

While fuel for all nuclear reactors is dangerous, the proposed use of uranium and plutonium is especially concerning.The proposed use of plutonium fuel presents typical risks of contamination and hazardous waste, but also the additional danger of nuclear proliferation and the threat of terrorism. Plutonium is a key component of nuclear bombs, and its proposed use as fuel for the VTR will set a dangerous precedent for the nuclear energy industry in the future. **34-3**

The massive amount of fuel that would be used over the lifetime of the VTR is also of concern. Based on the draft EIS, an estimated 34 metric tons of plutonium would be fabricated into fuel over the 60-year lifespan of the reactor. Processing this much plutonium will lead to an elevated risk of worker exposure and increased environmental impacts, and could result in plutonium being stranded at the fuel fabrication site at the Idaho National Laboratory (INL) or the Savannah River Site(SRS) if the project were halted. **34-4**

The transportation of fuel (uranium and plutonium) is a massive risk to public safety. If the fuel were sourced domestically, thousands of miles of overland transportation would be required to deliver it to either SRS or INL for fabrication, and (if produced at SRS) from there to the VTR site at INL. **34-5**

If the VTR were to be constructed and operated at INL, the burden of all waste produced from operations would fall on the shoulders of current and future Idahoans. An estimated 34 metric tons of plutonium, and 120 metric tons of uranium would be needed to fuel the VTR over its lifespan. **34-6**

The amount of transuranic waste (TRU) produced as a result of fuel fabrication and operation of the VTR could be as much as 24,000 cubic meters. Disposal of this waste in the Waste Isolation Pilot Plant (WIPP) in New Mexico will unnecessarily challenge the legal volume cap of WIPP and could negatively impact TRU disposal plans by DOE. **34-7**

34-1 The health and safety of workers and the public are a high priority in the design and operation of DOE facilities, including the proposed VTR. Refer to Section 2.7, "VTR Facility Accidents," of this CRD for additional discussion of this topic.

34-2 Information about lack of a domestic fast-neutron testing capability and the purpose and need for a VTR is discussed in Chapter 1 of this VTR EIS. DOE is pursuing the VTR to provide a test capability that supports the fulfillment of its mission of advancing the energy, environmental, and nuclear security of the United States and promoting scientific and technological innovation in support of that mission. Refer to Section 2.2 of this CRD for additional discussion of the purpose and need for the VTR.

Chapter 2, Section 2.7, of this VTR EIS addresses alternatives considered and dismissed from detailed analysis. This section summarizes the reason that a number of other reactors (including existing reactors) or technologies would not meet the mission need and schedule for a VTR. It includes reference to a DOE Analysis of Alternatives that evaluated options other than the VTR described in this EIS.

34-3 DOE acknowledges your concern regarding nuclear proliferation. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic. The proposed VTR is a one-of-a-kind reactor where the neutron production over a desired test volume is maximized while minimizing the size of the reactor. To achieve the desired performance, VTR proposes to use plutonium in a metal alloy fuel. The use of plutonium in VTR fuel does not mean that future advanced reactors would use fuel containing plutonium; the advanced reactors currently under development would use non-plutonium fuels such as high-assay, low-enriched uranium (HALEU) or thorium fuels.

34-4 Please see Section 2.4, "Plutonium Use and Disposition," of this CRD for additional information. The environmental impacts and worker exposure related to the VTR alternatives and fuel production options have been evaluated in this EIS. Results of the impact analyses are presented in Chapter 4, (worker impacts are discussed in Sections 4.10.1, 4.10.2, and 4.10.3, and 4.10.4), with summaries in Chapter 2, Section 2.9.

34-5 The transportation of the reactor fuel (uranium and plutonium) would be carried out by the DOE Office of Secure Transportation (OST). OST is responsible for the safe and secure transport of government-owned nuclear materials in the contiguous United States. Even though the EIS identifies representative routes, specific information on the routes and dates of material movement are classified

Commenter No. 34 (cont'd): Cletus Stein

As DOE has not clearly demonstrated the need for the Versatile Test Reactor as required by the National Environmental Policy Act (NEPA), this proposal must be stopped. 34-2 cont'd

Thank you for your careful consideration of my comments.

Sincerely,

Cletus Stein
[redacted]
Amarillo TX 79106

to ensure operational security. These materials are transported in highly modified secure tractor-trailers and escorted by armed Federal agents in accompanying vehicles for additional security, as needed. Appendix E, Section E.2.4, describes the key elements of the secure transportation asset, which emphasizes the various aspects of the transportation. It should be noted that secure transportation is an ongoing activity within the United States. As indicated in this EIS, the overall risks of transporting these materials are very small.

34-6 DOE acknowledges the commenter's concerns regarding nuclear waste. Regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as spent nuclear fuel (SNF) annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at an interim storage facility or permanent repository. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide estimated waste inventories, along with their management and/or disposal options.

34-7 Transuranic (TRU) wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico. If the DOE defense plutonium were used to produce VTR driver fuel, the TRU waste generated as part of the reactor fuel production options would meet the criterion of being defense related. The WIPP Land Withdrawal Act (LWA) (P.L. 102-579 as amended by P.L., 104-201) requires waste disposed at WIPP to (1) meet the definition of "transuranic waste" (WIPP LWA Section 2(18)) and (2) be generated by atomic energy defense activities (WIPP LWA Section 2(19)). Additionally, waste must meet the WIPP LWA, WIPP Hazardous Waste Facility Permit, WIPP waste acceptance criteria, and other applicable requirements. Compliance with these requirements may be demonstrated by acceptable knowledge, non-destructive assay, and other established methods. The waste stream must comply with the WIPP Waste

Commenter No. 34 (cont'd): Cletus Stein

Acceptance Criteria and the WIPP Permit Waste Analysis Plan by passing a TRU waste certification audit, an inspection by the U.S. Environmental Protection Agency, and New Mexico Environment Department (NMED) approval of the final audit report.

The WIPP LWA stipulates that the TRU waste capacity of the WIPP facility is a total TRU waste volume capacity limit of 175,600 cubic meters (6.2 million cubic feet). As of April 3, 2021, the WIPP facility has disposed of 70,115 cubic meters of TRU waste. This TRU waste disposal volume is about 40 percent of the total TRU waste volume allowed by Public Law 102-579 as amended by Public Law 104-201. TRU waste volume estimates such as those provided in National Environmental Policy Act (NEPA) documents, are not intended to demonstrate compliance with the WIPP Land Withdrawal Act TRU waste volume capacity limit. TRU waste volumes projected in NEPA documents will be incorporated, as appropriate, into future ATWIR [Annual Transuranic Waste Inventory Report] TRU waste inventory estimates.

DOE is conducting preliminary planning to evaluate options to be able to continue uninterrupted TRU waste disposal operations up to the total TRU waste volume capacity limit. Additional TRU waste disposal panels that would provide capacity to dispose of TRU waste up to the WIPP LWA total TRU waste volume capacity limit may be authorized under a future permit modification. The WIPP Permit, consistent with Resource Conservation and Recovery Act regulations at 40 CFR 270.42, can be modified by submittal of a Permit Modification Request (PMR) and decision by NMED to approve the PMR. Both Class 2 and Class 3 PMRs include a public comment period as a step in the regulatory process. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

Commenter No. 35: Buck Drew

From: Buck Drew
Sent: Tuesday, February 9, 2021 2:16:20 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
[redacted]
Subject: [EXTERNAL] MARVEL Microreactor

Mr. Lovejoy,

Hello. I am a retired dentist. I spent my career trying to reduce the impacts of radiation on my staff and patients. I do believe with technological advances we kept the office safe for everyone.

The DOE has proposed that the Microreactor could operate for 60 years. This information tells me that one VTR at INL could produce 30 metric tons of spent nuclear fuel over its lifetime.

My objection to a new reactor facility would be the radioactive waste. There is no safe long term solution. *35-1*

Idaho is too pristine to pollute at this level. *35-2*

Thanks for you consideration,

Buck Drew, DDS

35-1 The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as spent nuclear fuel (SNF) annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

35-2 As indicated in Section 2.9 and Chapter 4 of this VTR EIS, the proposed activities would result in minimal impacts on the environment.

Commenter No. 36: Dr. Laura Rushing-Raynes, Associate Professor of Voice, Boise State University Department of Music

From: Laura Rushing-Raynes
Sent: Tuesday, February 9, 2021 2:38:31 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Versatile Test Reactor

Hello. There are many reasons why I oppose bringing the VTR to Idaho. But the biggest is this, **36-1**

Operating one VTR at INL for 60 years could produce 30 metric tons of spent nuclear fuel over its lifetime. Why would we do this when we have no viable disposal method for the waste? I do not think we should saddle future generations with the problem. **36-2** And, for present generations, the risks are too great. There is no room for error and since we are human, sooner or later there will be error. **36-3**

The risk is unacceptable, especially given the many renewable energy solutions that continue to evolve rapidly. **36-4**

Keep our state safe, beautiful and livable for generations to come. Nuclear energy is not worth the risks. Thank you. Laura R-R **36-1 cont'd**

--
Dr. Laura Rushing-Raynes
Associate Professor of Voice
Head, Voice Studies
Boise State University Department of Music
1910 University Drive
Boise, ID 83725
[redacted]
http://music.boisestate.edu/dr-laura-rushing-raynes/VTR.EIS@nuclear.energy.gov

36-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1 "Support and Opposition," and Section 2.7, "VTR Facility Accidents," of this CRD for additional information.

36-2 The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as spent nuclear fuel (SNF) annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

36-3 The purpose of this EIS is to assess the environmental impacts of the proposed action. The calculated impacts also allow a fair comparison between alternatives and options. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact.

36-4 DOE acknowledges your preference for development of renewable energy resources. In this VTR EIS, DOE has evaluated the potential environmental consequences of constructing and operating the VTR, as well as producing the fuel necessary to power the reactor. Based on this evaluation, DOE does not consider the risks to be unacceptable. The potential impacts are summarized in Chapter 2, Section 2.9, of this VTR EIS.

Commenter No. 37: John Sinsky

From: John JS
Sent: Tuesday, February 9, 2021 4:41:24 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Versatile Test Reactor

I would like to submit my disapproval of the construction of the VTR. Please no more nuclear waste in Idaho. Thank you. ***37-1***

John Sinsky
Boise, Idaho

37-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition," and Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD for additional information.

Commenter No. 38: Tim Andreae

From: Tim Andreae
Sent: Tuesday, February 9, 2021 9:23:43 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Versatile Test Reactor comments

I stand in opposition to the Versatile Test Reactor for numerous reasons. I have attended various meetings where this new reactor was discussed and I have noticed an underlying assumption with the designers that in the near future there will be a long-term repository for nuclear waste. Let's be clear, there is currently no long term repository for nuclear waste and there is no likelihood of there being one in the near future. And so, the waste stream from this new reactor has nowhere to go except to sit above the Snake River Aquifer, where the INL has already spent billions on clean-up efforts. The Snake River Aquifer is priceless. Further risking its integrity should not be an option. As I understand it, the VTR is a test reactor whose main purpose is to test materials for a new class of reactors that is yet to exist. The proposed VTR will require plutonium for fuel and because of the liquid sodium coolant used as a coolant and the fact that liquid sodium burns when it touches water, the fuel must be pyro processed, a relatively new and highly expensive endeavor. At the INL's current level of throughput, to pyroprocess one year's worth of VTR fuel would cost 100 million dollars. While they say this is not a "breeder" reactor, as a plutonium producing reactor there is a risk of this kind of reactor being used to proliferate nuclear weapons. As the risk and the great expense starts to add up, it becomes abundantly clear that now is not the time to throw billions of dollars at an untested technology that may or may not pan out. Instead of gambling away tax-payer dollars on pie-in-the-sky technology that will produce incredibly long-lived toxic waste as a byproduct, I suggest a more conservative route - one that uses renewable and readily available sources of energy such as sun and wind.

38-1
38-2
38-3
38-4
38-5
38-6

Thank you
Tim Andreae

38-1 DOE acknowledges your opposition to the VTR project and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

38-2 DOE acknowledges that there is not a geological repository for the disposition of the spent nuclear fuel and high-level radioactive wastes in the United States. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of spent nuclear fuel and high-level wastes. However, how DOE will meet this commitment is outside of the scope of this EIS. Spent nuclear fuel generated by the VTR would be safely managed in dry cask storage until it could be transported off site to an interim storage facility or a permanent repository.

38-3 Please refer to Section 2.6, "Snake River Plain Aquifer," of this CRD for a discussion of this topic and DOE's response.

38-4 Thank you for your comment. The VTR is intended to provide a test platform for the next generation of advanced reactors, reactors operating with a fast-neutron spectrum, and nuclear technology innovation in general. These reactor designs are in various stages of development, with a few already in operation. While the techniques DOE proposes for fuel production and spent fuel treatment would need to be modified for application to the VTR project they are not new. DOE has extensive experience in all of the processes being considered for the VTR project. For example, the fuel fabrication process is the result of years of operation at Experimental Breeder Reactor (EBR)-I and EBR-II and has been demonstrated at EBR-II and the Fast Flux Test Facility (FFTF), and the spent fuel treatment process would utilize equipment like that currently being used at Idaho National Laboratory (INL) in the Fuel Conditioning Facility (FCF). However, in making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost.

38-5 DOE acknowledges your concern regarding nuclear proliferation. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic. The proposed VTR is a one-of-a-kind reactor where the neutron production over a desired test volume is maximized while minimizing the size of the reactor. To achieve the desired performance, VTR proposes to use plutonium in a metal alloy fuel. Existing inventories of plutonium would be used in producing VTR fuel, and the

Commenter No. 38 (cont'd): Tim Andreae

VTR would be a consumer of the material. The use of plutonium in VTR fuel does not mean that future advanced reactors would use fuel containing plutonium; the advanced reactors currently under development would use non-plutonium fuels such as high-assay, low-enriched uranium (HALEU) or thorium fuels.

38-6 DOE acknowledges your preference for development of renewable energy resources and your position that funds should not be expended on the proposed VTR. DOE believes there is a potential societal benefit from the development of advanced reactors and that nuclear energy should be part of the overall mix of energy sources in the United States. Refer to Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic. Support and funding for renewable energy, and the prioritization of funding for climate change solutions, is outside the scope of this VTR EIS.

Commenter No. 39: Margaret Macdonald Stewart

From: Maggie May Stewart
Sent: Tuesday, February 9, 2021 11:03:05 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Public comment on VTR

My name is Margaret Macdonald Stewart and I have lived 65 air miles from the Idaho National Laboratory for 50 years. My address is [redacted].

I am completely against the proposed development, construction and operation of the versatile test reactor. **39-1** The nuclear industry is dying from lack of transparency, massive budget overruns on every project, no reasonable way to deal with nuclear waste (and the mantra of 'waste being disposed of when a suitable location is found' is NOT an acceptable solution) and the continued denial of alternative and sustainable energy generation...that doesn't create nuclear waste. **39-2**

As for the VTR, a proposed budget of 2.6 and 6 billion dollars is an absurd dream. I cannot think of even one nuclear project that has ever come in under or on budget. And where will the money to dump into this project come from? The US taxpayers, that's who. And they know nothing of this idea because the DOE doesn't advertise it except in nuclear energy propaganda. **39-3**

The proposed VTR is to use liquid sodium as a coolant. Brilliant! Liquid sodium is extremely volatile, exploding when exposed to water and burns fiercely when exposed to air. What is the guarantee that this coolant will not accidentally be exposed to either air or water? **39-4**

This proposed VTR will use plutonium and uranium as fuel. PU is a key part of a nuclear weapon and the uranium used will be more highly enriched that that used in current reactors. Use of both these elements vastly increased the risk of nuclear proliferation. **39-5**

This reactor is proposed to operate for 60 years, producing at least 30 metric tons of nuclear waste...again with no means of waste storage. And all this is to happen directly above the Snake River Plain aquifer, Idaho's lifeblood for our agricultural and trout industries and the drinking water for 1/3 of all Idahoans. **39-6**

And what is the insurance policy used if there is an accident of fire, explosion or leakage? The Price-Anderson Act puts the burden on the taxpayers in the event of such events. NOT ACCEPTABLE. **39-7**
What on earth is the DOE thinking other than to dream up more fantasies to prop up the dying nuclear industry??!! Even giant fossil fuel corporations are admitting that a change to non nuclear waste producing energy is the future. **39-2 cont'd**

Please adopt the NO ACTION ALTERNATIVE
for the sake of Idaho's future generations, our water, our land and wildlife. **39-1 cont'd**
Thank you,
Margaret Macdonald Stewart

Sent from my iPhone

39-1 DOE acknowledges your opposition to the Idaho National Laboratory (INL) VTR Alternative and support for the No Action Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1 "Support and Opposition," of this CRD for additional information.

39-2 DOE acknowledges your preference for development of non-nuclear waste producing energy. DOE believes there is a potential societal benefit from the development of advanced reactors and that nuclear energy should be part of the overall mix of energy sources in the United States. Refer to Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic. The prioritization of support and funding for energy generating technologies is outside the scope of this VTR EIS. For information on spent fuel storage and disposal, please see Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

39-3 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost. The U.S. Government would provide funding for the VTR and associated facilities through congressional appropriation. Congressional appropriations and funding priorities are outside the scope of this VTR EIS.

DOE has performed all notifications related to the VTR EIS as required by the National Environmental Policy Act (NEPA) and implementing regulations. The Notice of Intent to prepare the VTR EIS was published in the Federal Register on August 5, 2019 (84 FR 38021). DOE notified the public of the availability of the Draft VTR EIS on December 21, 2020. DOE held public meetings during the scoping period and public hearings on the Draft VTR EIS. The meetings and hearings were announced on DOE websites and in local news media. All members of the public are invited to be added to the VTR EIS mailing list by submitting a request to VTR.EIS@nuclear.energy.gov.

39-4 DOE takes its responsibility for the safety and health of the workers and the public seriously. The Experimental Breeder Reactor (EBR)-II and the Fast Flux Test Facility

(FFTF) demonstrated safe operation with sodium as the coolant. Using past reactor operating experience and knowledge gained from extensive inherent safety testing at EBR-II and FFTF, along with advanced analysis tools, the VTR is being designed to safely operate with sodium as the coolant. Appendix D, Section D.3.3.1, reviews the history of sodium-cooled reactor operations and accidents. Sodium-cooled reactors have been operated for a number of years. The discussion in Appendix D considers events and tests at EBR-I, Fermi-I, Phenix, SuperPhenix, MONJU, FFTF, and EBR-II. The discussion provided in Appendix D acknowledges the concerns mentioned in the comments as well as other information related to tests in FFTF and EBR-II. Evaluating past performance and tests provides valuable information that is considered in the design of the VTR. Appendix D, Section D.3.3.2, discusses safety analyses that have been performed for the VTR. Appendix D discusses how the VTR is being designed to ensure safety throughout proposed operating conditions. The VTR design is also resilient under potential accident or upset conditions. DOE guidance for design of the VTR focuses on reducing or eliminating hazards, with a bias towards preventive, as opposed to mitigative, design features and a preference for passive over active safety systems. This general approach creates a design, which is reliable, resilient to upset, and has low potential consequences of accidents. Safe operation of the VTR is ensured by reliable systems design to ensure preservation of the key reactor safety functions. These key safety functions are (1) reactivity control, (2) fission- and decay-heat removal, (3) protection of engineered fission product boundaries, and (4) shielding.

39-5 DOE acknowledges your concern regarding nuclear proliferation. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic. The proposed driver fuel for the VTR would contain plutonium and uranium. Uranium would be enriched in the isotope uranium-235 to levels comparable to those in commercial nuclear fuel or possibly higher, but would not meet the definition of highly enriched uranium (20 percent and greater).

39-6 The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as spent nuclear fuel (SNF) annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR EIS includes an evaluation of the construction and operation of a SNF storage facility that could safely store the entire 60 year inventory of SNF generated under the VTR alternatives. Storage would be an active process that includes monitoring and inspections, and if necessary, maintenance actions to ensure that the SNF does not pose a threat to workers, the public, or environment. Over the time it is stored at the INL Site, the goal would be

Commenter No. 39 (cont'd): Margaret Macdonald Stewart

to maintain it in a manner that it is ready for offsite shipment whenever an offsite option becomes available. The storage of SNF has been evaluated in this VTR EIS and is projected to have minimal impacts (i.e., once packaged, there would be no releases to the air, water, or soil and radiation doses would be low). Therefore, there would be no expected impacts on the Snake River Plain Aquifer. Refer to Sections 2.5 and 2.6 of this CRD for additional discussion regarding waste and SNF management and disposal and the Snake River Plain Aquifer, respectively.

39-7 DOE acknowledges that you find indemnification under the Price-Anderson Act to be unacceptable. However, the Price-Anderson Act, as amended, ensures the public that prompt and equitable compensation will be available in the event of a nuclear incident or precautionary evacuation. With respect to activities conducted for DOE, the Price-Anderson Act achieves its objectives by requiring DOE to include an indemnification clause in each contract that involves the risk of a nuclear incident. The Department of Energy Acquisition Regulation (DEAR) sets forth standard nuclear indemnification clauses that are incorporated into all DOE contracts and subcontracts involving source, special nuclear, or by-product material (nuclear material).

Commenter No. 40: Carol Sperry

From: carol sperry
Sent: Wednesday, February 10, 2021 7:09:50 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Proposal to site new nuclear power projects in Idaho

Production of energy by means of nuclear power Needs to be abandoned. There is still no way to make the by products of nuclear generated power harmless or to store them safely for an indefinite period. Idaho is the last place it would be reasonable to site nuclear power production because of its location over one of the largest aquifers on the country. The funds set aside for this project need to be diverted into clean, renewable energy projects.

40-1 *40-2* *40-3* *40-1 cont'd*

Carol Sperry

40-1 DOE acknowledges your preference for development of renewable energy resources and your position that funds should not be expended on nuclear energy. DOE believes there is a potential societal benefit from the development of advanced reactors and that nuclear energy should be part of the overall mix of energy sources in the United States. Note that the VTR is a testing facility and would not produce electricity. Refer to Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic. Support and funding for renewable energy projects is outside the scope of this VTR EIS.

40-2 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR spent nuclear fuel (SNF) would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS.

40-3 VTR would be a test reactor and would not produce electricity. Chapter 2 of this VTR EIS describes the extensive alternative selection process undertaken for siting this proposed VTR, including other alternatives considered, alternatives initially considered but dismissed from detailed analysis by DOE, and the rationale for selecting the INL VTR Alternative as the DOE's preferred alternative. Regarding concerns related to the Snake River Plain Aquifer, please refer to Section 2.6, "Snake River Plain Aquifer," of this CRD for a discussion of this topic and DOE's response.

Commenter No. 41: Chad Worth

From: Chad Worth
Sent: Thursday, February 11, 2021 4:34:07 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] No VTR until waste solution is resolved

Hello,

My name is Chad and I live in Boise Idaho.

My main comment is that I believe it is highly irresponsible for DOE to continue to put billions of $$ towards new nuclear technologies with no plan in place for the waste. Where will the waste from this project go? Idaho? TBD?

This $3-6 billion should instead be put towards a long-term storage solution. Until storage is figured out, this project should not move forward.

41-1

Thank you,
Chad

41-1 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). For information on spent fuel storage and disposal, please see Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

Commenter No. 42: Lon Stewart

From: Lon Stewart
Sent: Friday, February 12, 2021 12:03:37 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] VTR EIS Comment

I urge INL to pursue a NO-ACTION alternative to the construction and operation of a Versatile Test Reactor.

Nuclear reactors of any size do not have a viable means of deactivating the spent nuclear fuel. We should not be adding to the existing quantity of spent fuel that is dangerous to human health and the environment for thousands of years, even if it is just small amounts. **42-1**

Just because we have the technology and resources to create electricity from nuclear energy does not mean we should continue research and development of the resource. **42-2** The world has lots of coal left but we are weening ourselves away from that resource, The world has lots of petroleum remaining and we are weening ourselves away from that resource as well. We should ween ourselves away from nuclear too. All of these have human and environmental affects. INL should consider research in advancing renewable forms of energy such as solar and wind or energy storage, not on forms of energy that have seen their day. **42-2 cont'd**

INL has been storing different levels of nuclear waste for years, much still waiting to be processed and sent off for final storage, not deactivation. **42-3** Some of this research and production waste has created explosive incidents while being prepared for shipment. **42-4** There is no guarantee that if the VTR project was to commence that its waste would not be stored on site for years nor create similar incidents causing exposure to humans or the environment. Devising foolproof methods of handling new experimental wastes, especially wastes that can be dangerous for thousands of years, is a nearly impossible task to identify all of the dangers. Even if procedures are in place for handling these wastes, the human factor still exists and unfavorable incidents will occur.

A final repository for spent nuclear fuel does not exist within the United States. Even though a work was put into such a place, Yucca Mountain, it has been canceled and a new site has not been developed. **42-5**

Even if it did exist, storing the waste for "eternity" does not solve the problem of the waste, it only hides it. How would we know if our modeling of the storage disposal site would be accurate for the thousands of years for the waste to become non-harmful.

Idaho National Laboratory should spend their time and resources on moving the world forward into the 21st Century with research and development of systems that support the needs of making renewable energy more reliable. INL should pursue the NO-ACTION alternative to the Versatile Test Reactor Environmental Impact Statement. **42-2 cont'd**

Respectfully submitted,

Lon Stewart

[redacted]

Eagle, ID 83616

42-1 The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as spent nuclear fuel (SNF) annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

42-2 DOE acknowledges your preference for development of renewable energy resources and your position that funds should not be expended on nuclear energy. DOE believes there is a potential societal benefit from the development of advanced reactors and that nuclear energy should be part of the overall mix of energy sources in the United States. Refer to Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic. Support and funding for renewable energy projects is outside the scope of this VTR EIS.

42-3 Low-level, mixed low-level, transuranic, and/or greater-than-Class-C-like wastes, could be generated under the VTR Alternatives and Reactor Fuel Production Options. All wastes would be shipped off site for treatment and disposal. SNF would be generated under the VTR alternatives. The SNF assemblies would be stored within the VTR reactor vessel until decay heat generation is reduced to a level that would allow fuel transfer and storage of the fuel assemblies with passive cooling. After allowing time for additional radioactive decay, the SNF would be transferred to a fuel treatment facility. Following treatment, the SNF would be placed in dry storage casks and stored on site in compliance with all regulatory requirements and agreements until it is transported to an offsite interim storage facility or a permanent repository. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which provides a detailed discussion of the sites' current radioactive waste and spent nuclear

Commenter No. 42 (cont'd): Lon Stewart

fuel management programs, the inventories that are estimated to be generated as a result of the VTR Alternatives and Reactor Fuel Production Options, and the management and/or disposal of those inventories. Also, please refer to Sections 2.4, "Plutonium Use and Disposition," and 2.10, "Ongoing INL Site Cleanup."

42-4 As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR SNF would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository.

42-5 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR SNF would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS.

Commenter No. 43: Joyce A. Stanley, MPA, Regional Environmental Officer, US Department of the Interior

From: Stanley, Joyce A
Sent: Friday, February 12, 2021 2:14:46 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: Comments and Recommendations on the Department of Energy Versatile Test Reactor (VTR) Draft Environmental Impact Statement - ER 20/0535

Hello Mr. Lovejoy,

Please find attached comments from the US Department of the Interior on the Department of Energy Versatile Test Reactor (VTR) Draft Environmental Impact Statement.

Thanks,

Joyce A. Stanley, MPA
Regional Environmental Officer
US Department of the Interior
Office of Environmental Policy and Compliance
South Atlantic-Gulf & Mississippi-Basin
[redacted]
http://www.doi.gov/oepc/atlanta.html

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Commenter No. 43 (cont'd): Joyce A. Stanley, MPA, Regional Environmental Officer, US Department of the Interior

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Richard B. Russell Federal Building
75 Ted Turner Drive S.W., Suite 1144
Atlanta, Georgia 30303

ER 20/0535
9043.1

February 12, 2021

Mr. James Lovejoy
Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415

RE: Comments and Recommendations on the Department of Energy Versatile Test Reactor (VTR) Draft Environmental Impact Statement

The US Department of the Interior (Department) appreciates the opportunity to comment on the proposed Versatile Test Reactor (VTR) at the Idaho National Lab (INL). This letter addresses National Park Service (NPS) resources that may be impacted by the VTR facility. First, the letter describes the significance of the dark skies at Craters of the Moon National Monument and Preserve (Craters of the Moon) in Idaho. Second, the letter examines cumulative effects on the nightscape at Craters of the Moon as related to INL facilities. Third, the letter elucidates our primary concerns about the proposed VTR and its anticipated effects, and it requests mitigation strategies for this project and existing INL infrastructure. **43-1** **43-2** **43-3** **43-4**

Dark Sky Resources at Craters of the Moon National Monument and Preserve

Craters of the Moon National Monument and Preserve protects 753,000 acres of the Great Rift volcanic zone and associated features. President Calvin Coolidge established the original monument in 1924, which has since been expanded numerous times, for the purpose of protecting the unusual landscapes of the Craters of the Moon Lava Field. This "lunar" landscape was thought to resemble that of the moon and was described in the presidential proclamation as "a weird and scenic landscape peculiar to itself," and it was granted silver-tier International Dark Sky Park status by the International Dark-Sky Association in 2017. **43-1 cont'd**

Craters of the Moon is the only NPS unit named for a celestial body and one of the few used to train this nation's astronauts. It can be considered, with its distinctive features and history, a meditation on cosmos, sky, earth, and exploration of the unfamiliar. Given its remote location and efforts to minimize its own light pollution, Craters of the Moon is one of the few locations

43-1 Text was added in Chapter 3, Section 3.1 ("INL Land Use and Aesthetics"), of this VTR EIS to summarize the significance of the dark skies at Craters of the Moon National Monument and Preserve as outlined in DOI's letter.

43-2 DOE has revised Chapter 5, "Cumulative Impacts," of this VTR EIS to address the potential cumulative effects of the VTR and other sources on the dark sky. Due to the early stage of project development, DOE does not have the details of the lighting plan and therefore, cannot perform a quantitative analysis. However, the lighting plan would be developed in accordance with site design guidelines for sustainability and would also factor in dark sky considerations, while meeting the lighting requirements for life safety and security. DOE appreciates the offer of assistance and may ask the National Park Service, Natural Sounds and Night Skies Division to provide more information.

43-3 New construction projects at Idaho National Laboratory (INL), including the VTR, will continue to be guided by INL Engineering Standards and the *INL High-Performance and Sustainable Building Strategy* (INL 2019). This strategy incorporates the latest Federal and DOE orders and directives including Executive Order (EO) 13834, "Efficient Federal Operations," and its associated implementing instructions; DOE Order 436.1, "Departmental Sustainability;" the DOE 2020 Sustainability Report and Implementation Plan (SRIP); the *INL Site Sustainability Plan* (DOE 2019); and Federal regulations. The SRIP states: "DOE will work with its programs to ensure the [Guiding Principles] requirements are well understood and implemented into all new construction and major renovation projects…." Each LEED rating system measures the building's sustainable performance by focusing on five areas of sustainable design (Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Quality), which includes reducing light pollution. Best management practices for artificial outdoor lighting include limiting outdoor lighting to safety and security requirements and using Illuminating Engineering Society's design guidelines in concert with International Dark-Sky Association approved fixtures. These guidelines include the following:

- Designing lighting for energy efficiency and to have daylight sensors or be timed with an on/off program.
- Employing shielding on lights along pathways and safety lighting at building entrances and loading areas to minimize offsite light spill and glare.
- Installing lighting to minimize the impact on the surrounding environment.

Commenter No. 43 (cont'd): Joyce A. Stanley, MPA, Regional Environmental Officer, US Department of the Interior

NE Versatile Test Reactor DEIS – ER 20-0535

left in the lower 48 with exceptional darkness with the majestic sweep of the Milky Way regularly evident over the sere landscape. The photos below illustrate the beauty and power of the dark skies above Craters of the Moon.

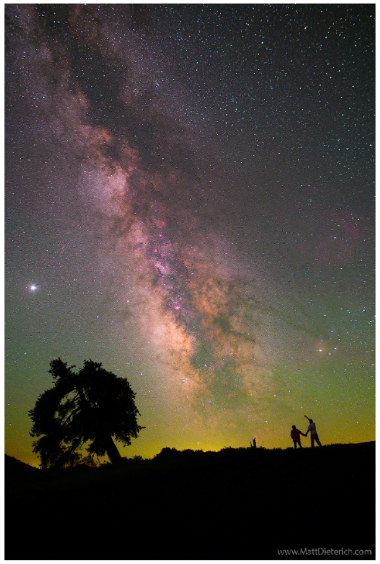

Photo 1. A photo from Artist-in-Residence Matt Dieterich of the celebrated stargazing potential at Craters of the Moon.

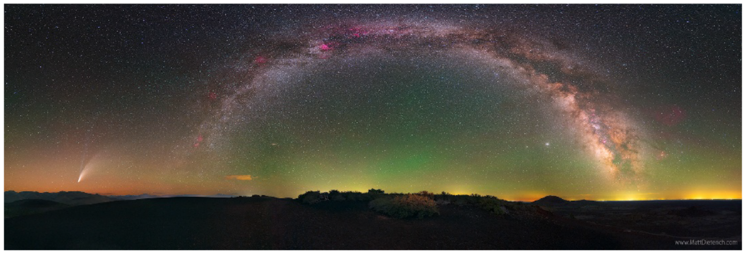

Photo 2. A photo from Artist-in-Residence Matt Dieterich of the Comet Neowise and our Milky Way galaxy as seen from Craters of the Moon.

2

43-1 cont'd

- Installing lighting at the lowest allowable height and cast low-angle illumination while minimizing incidental light spill onto adjacent properties, open spaces, or backscatter into the nighttime sky.
- Minimizing the number of nighttime lights needed to light an area.
- Utilizing downcast, cut-off type fixtures that are shielded and direct the light only towards objects requiring illumination.
- Utilizing the lowest allowable wattage.

Technologies to reduce light pollution evolve over time and design measures that are presently available may not be the most effective means of controlling light pollution at the time of facility construction and operation. Therefore, design measures to reduce light pollution would employ the technologies available at the time of construction to allow for the maximum reduction in light pollution. Text was added in Chapter 4, Section 4.1.1 ("Land Use and Aesthetics"), of this VTR EIS to identify potential impacts on the dark sky, include the identification of LEED principles, and refer to best management practices as discussed above.

43-4 Development of a lighting plan is part of the standard INL design process and one would be developed in the later stages of VTR design (likely 2 to 3 years after completion of this EIS). The lighting plan would be developed in accordance with site design guidelines for sustainability (see the response to comment 43-3) and would also factor in dark sky considerations, while meeting the lighting requirements for life safety and security. The plan would include the inventory and specifications listed in the DOI comment. Text was added to Section 4.1.1 ("Land Use and Aesthetics") of this VTR EIS to identify that a VTR lighting plan would be developed as part of the design process and to discuss other practices designed to minimize the impact of new construction (including best management practices, as discussed in the response to comment 43-3).

DOE appreciates DOI's offer to assist with the light pollution measurements, associated analysis, and development of the VTR Lighting Plan. A determination of a potential collaborative effort would be made during the early stages of building design.

Commenter No. 43 (cont'd): Joyce A. Stanley, MPA, Regional Environmental Officer, US Department of the Interior

NE Versatile Test Reactor DEIS – ER 20-0535

In addition to the unique nightscape and network of lava flows, the Monument holds sagebrush steppe and forests at elevations from 4,000 to 7,500 feet. Over 200 species of birds, 60 species of mammals (including the Townsend's Big-Eared Bat), and 10 species of reptiles are known to use the Monument and Preserve. The Monument and Preserve are co-managed by the Bureau of Land Management (BLM) and the NPS, with treaty rights exercised by the Eastern Band of Shoshone and Bannock Tribes. Bands of Shoshone, Bannock, and Paiute have a long history of use of the area and participate in monthly consultation meetings with the management agencies.

Craters of the Moon also serves as an important destination for Idahoans and other recreationalists, hosting over 270,000 visitors who spent an estimated $9.6 million in the local economy in 2019. Many of these visitors enjoy the park's dark sky, and a significant component of the visitor education program focuses on it. For example, an astronomy ranger hosts "star gazing parties" and sky-related evening activities every summer. **43-1 cont'd**

Cumulative Adverse Effects from INL Facilities on Dark Skies

To frame the forthcoming mitigation requests, we would like to take this opportunity to address the cumulative effects of existing INL infrastructure.

We strongly encourage night sky impacts to Craters of the Moon to be included in Chapter 5: Cumulative Impacts in the final EIS. Calibrated hemispheric light pollution measurements taken from near Craters of the Moon headquarters detail the exact location and impact of anthropogenic lights as observed from the park (Figure 1). Data from the National Park Service Natural Sounds and Night Skies Division (NSNSD) show that, overall, Craters of the Moon has excellent night sky conditions. When considering the entire hemisphere as observed from the park, average sky brightness is just 19.5% brighter than natural conditions. Overhead, sky brightness is truly natural, but conditions degrade closer to the horizon.

Current INL operations have a significant and negative impact on the nightscapes of Craters of the Moon and multiple data sources demonstrate the extent of these impacts. One of the largest light domes (concentrations of unnatural light) visible near the park's visitor center stems from INL facilities. The aggregate light dome spans 20 degrees across the horizon and is 5 degrees in height. The measured vertical illuminance (integrated light striking a vertical surface) measured between 60 and 80 degrees azimuth and ranged between .109 mlux to .124 mlux, which is between 25% and 30% brighter than natural condition. Maximum sky brightness, or luminance, created by INL facilities measured 4.01 milli-candela/m^2, which is 2300% brighter than natural sky brightness. The images below show that lights from existing INL facilities are directly visible from park viewpoints (Figure 2). These combined measurements indicate that light from INL facilities extends beyond the intended task area and negatively impacts the park.

Calibrated satellite data can also be used to map the extent of skyglow at a landscape scale. Using data from the New World Atlas of Light Pollution, we can measure the all-sky light pollution ratio (ratio of artificial to natural light for the whole hemisphere for one observation point). When assessing regional light pollution around Craters of the Moon, the contribution of light from INL facilities is readily apparent (Figure 3). The all-sky light pollution ratio over INL **43-2 cont'd**

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properties measures between 0.6 to 0.8, which is between 60 and 80% brighter than average natural conditions. This indicates reflected light scattering into the environment and anthropogenic light pollution visible for many kilometers.

Finally, color photographs such as Photo 3 taken within the park illustrate the impact that light domes have on the visual scene. The Milky Way shines in the southern horizon but is lost to the light domes of Arco. Taken together, the data and images document the incredible night sky resources of Craters of the Moon but also highlight resource degradation. In such a naturally dark region, even very small sources of anthropogenic light can dramatically change the landscape. The topography of the area is such that unshielded lights and scattered light can travel for hundreds of kilometers.

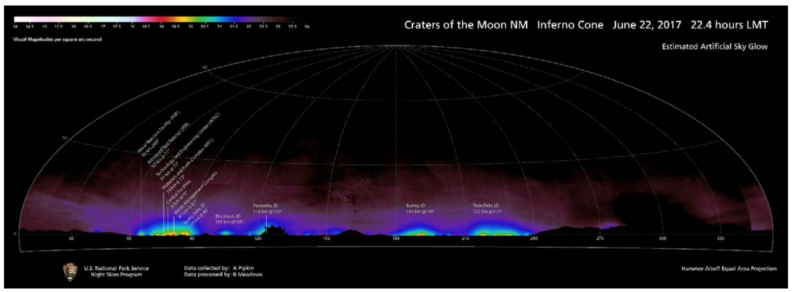

Figure 1. A calibrated hemispheric panorama taken from Inferno Cone (near the Craters of the Moon Visitor Center) mapping light pollution across the landscape. Natural light sources have been subtracted, and the landscape masked below true the horizon. Light domes between 63° and 83° azimuth originate from existing INL facilities between 41km and 74km away from the park.

43-2 cont'd

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Commenter No. 43 (cont'd): Joyce A. Stanley, MPA, Regional Environmental Officer, US Department of the Interior

NE Versatile Test Reactor DEIS – ER 20-0535

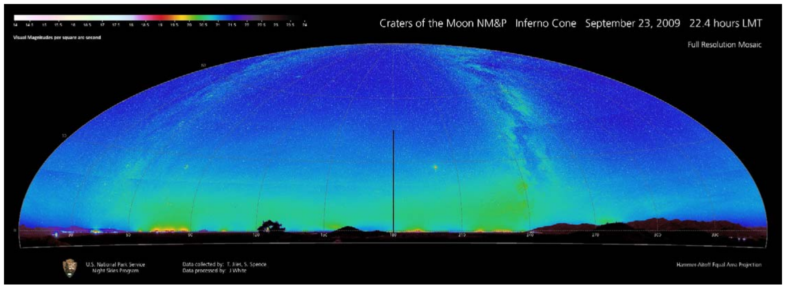

Figure 2. A calibrated hemispheric panorama taken from Inferno Cone mapping all natural and anthropogenic light sources.

43-2 cont'd

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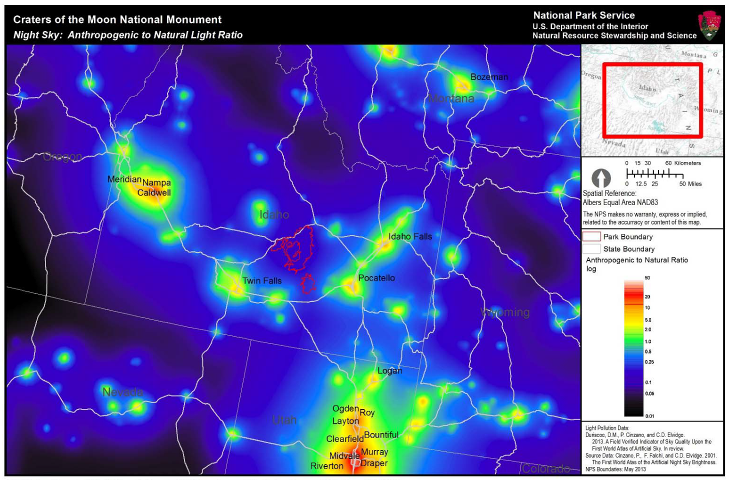
Commenter No. 43 (cont'd): Joyce A. Stanley, MPA, Regional Environmental Officer, US Department of the Interior

NE Versatile Test Reactor DEIS – ER 20-0535



NPS Natural Sounds & Night Skies Division and NPS Inventory and Monitoring Program MAS Group 20140924

Figure 3. A regional map of anthropogenic light ratio (ALR) derived from visible infrared imaging radiometer suite (VIIRS) satellite data illustrating the spatial distribution and intensity of light pollution, expressed in a ratio over natural conditions, around Craters of the Moon.

43-2 cont'd

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Commenter No. 43 (cont'd): Joyce A. Stanley, MPA, Regional Environmental Officer, US Department of the Interior

NE Versatile Test Reactor DEIS – ER 20-0535

Photo 3. A photo from Artist-in-Residence Matt Dieterich of the Milky Way and visible light domes that can be seen from Craters of the Moon, which includes light that originates from the INL.

If more information about any of these data sources would be helpful, the subject matter experts within the NPS NSNSD are available to assist and provide additional context.

43-2 cont'd

Comments on the Proposed Versatile Test Reactor and Requests for Mitigations

The Aesthetics analysis in the Draft EIS concludes that "impacts would not be expected by additional exterior lighting required for the VTR." However, the analysis in Section 4.1.1.1 of the preliminary draft EIS indicates that impacts from exterior lighting required for the construction and operation of the VTR, "in the [INL] region, including [Craters], would be *minimal"* [emphasis added]. This indicates potential impact to the night sky there. We are concerned with how the proposed 25-acre complex of facilities related to the VTR would adversely affect the dark night skies at Craters of the Moon, adding additional light impacts to what already exists.

43-3 cont'd

Accordingly, the Department has two specific requests for the VTR permitting process: (1) that the INL collaborate with NPS to develop the lighting plan, and (2) that the INL commit to zero new impacts given modern and widely available technologies. More broadly, the NPS also requests that the INL use these modern technologies to mitigate the cumulative effects of INL on Craters of the Moon as described above.

43-4 cont'd

43-5

7

43-5 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). Mitigation of light originating from existing sources at INL is outside the scope of the VTR EIS.

Commenter No. 43 (cont'd): Joyce A. Stanley, MPA, Regional Environmental Officer, US Department of the Interior

Requests for VTR Lighting Plan Specifics and Commitments

We request a chance to collaborate with INL on the development of an outdoor lighting plan for all facilities related to the VTR Project. The Department requests the VTR Lighting Plan include an inventory for all outdoor lights, photometric specifications for each fixture including correlated color temperature (CCT), lumen output, light distribution, and lighting controls (e.g., motion sensors, timers). The VTR Lighting Plan should also include all mitigation strategies that will be used to prevent anthropogenic light trespass.

We also request that photometric measurements at the boundary of the INL facility be collected before and after new VTR lighting installations occur to confirm no increase in vertical illuminance beyond the footprint of the facility. Given the plan and the monitoring, we request that the INL commit to a light pollution mitigation strategy that eliminates additional impacts. Contemporary technology makes this well within reach.

With the information from the lighting plan and a better understanding of the INL's commitment to light pollution mitigation including monitoring on-site, our subject matter experts can help understand and analyze the proposed impacts. Staff from the NPS Natural Sounds and Night Skies Division can assist with the light pollution measurements, associated analysis, and development of the VTR Lighting Plan if that would be useful.

43-4 cont'd

Opportunities and Requests for Additional INL Mitigations

Given the magnitude of the existing cumulative impacts from anthropogenic light, we also request that the INL use this proposal as an opportunity to take advantage of newer technologies and undertake actions to mitigate anthropogenic negative effects from its current facilities. Committing to the following standards, which are endorsed by the Illuminating Engineering Society and the International Dark Sky Association, would allow INL to capitalize on advancements in relevant research and reduce the consequences associated with the light pollution and light domes:

Useful – All light should have a clear purpose
Targeted – light should be directed only to where needed
Low Light Levels – Light should be no brighter than necessary
Controlled – Light should be used only when it is useful
Color – Use warmer color lights where possible

43-5 cont'd

Invitations and Next Steps

Given the significance of Craters of the Moon and its proximity to INL, Craters of the Moon invites the project team to visit during the next six months for a personal tour with appropriate COVID-19 precautions. We hope the visit will highlight the concerns raised in this letter and underscore our primary requests: share specifics for a lighting plan, commit to zero additional impacts for the proposal, and use this opportunity to mitigate broader impacts associated with INL infrastructure. If you have any questions, please feel free to contact Craters of the Moon Superintendent Wade M. Vagias, PhD (wade_vagias@nps.gov, (406) 581-1367); his

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Commenter No. 43 (cont'd): Joyce A. Stanley, MPA, Regional Environmental Officer, US Department of the Interior

NE Versatile Test Reactor DEIS – ER 20-0535

Management Assistant, Eve Barnett (eve_barnett@nps.gov, (208) 427-1321); or the Interior Region 9 NPS External Energy & Minerals Representative, Lara Rozzell (lara_rozzell@nps.gov, (41) 672-7356).

43-6 In addition, our records indicate the federally endangered gray bat (*Myotis grisescens*) and Indiana bat (*Myotis sodalis*), and the threatened Northern long-eared bat (*Myotis septentrionalis*) occur on the Oak Ridge Reservation (ORR) in Tennessee. The gray bat has also been documented roosting in industrial facilities on both the National Nuclear Security Administration Y-12 facility and the Heritage Center (K-25 site). If the ORR is selected for the proposed VTR facility, buildings proposed for demolition should be surveyed. Any bats found should be relocated away from proposed construction areas.

We appreciate the opportunity to comment and will conduct a subsequent review of the final EIS. If you have any questions concerning or comments, please contact Steve Alexander at (931) 260-3527 or via e-mail at steven_alexander@fws.gov. Thank you for your time and consideration. I can be reached on (404) 331-4524 or via email at joyce_stanley@ios.doi.gov.

Sincerely,

Joyce Stanley, MPA
Regional Environmental Officer

cc: Chester McGhee – BIA
Christine Willis - FWS
Jon Janowicz- USGS
Steven M. Wright – NPS
Stephanie Hamlett - OSMRE
OEPC – WASH

43-6 As stated in the VTR EIS, Section 4.5.2.1., there would be a number of actions implemented if the ORNL VTR Alternative were selected. For example, additional species-specific surveys would be conducted within the proposed project area to account for season patterns of various wildlife species (federally and State-listed) to adequately determine the extent and severity of effects to special status species. In-kind mitigation (i.e., protection or enhancement of ecologically similar resources) and monitoring could be required due to impacts on wildlife habitat and sensitive species. DOE would be required to consult with the USFWS Tennessee Ecological Services Field Office under Section 7 Interagency Cooperation regarding potential impacts on federally listed species protected under the ESA. Additionally, DOE would be required to consult with the TWRA and/or TDEC regarding State-listed species of special concern.

Furthermore, additional surveys would be conducted prior to any land-clearing activities, including tree removal and any changes to hydroperiods, that may affect special status bat species and their habitats (such as caves and underlying karst and aquatic subterranean habitat). Species-specific survey protocols could be required as directed through consultations with the USFWS, U.S. Army Corps of Engineers (USACE), Tennessee Wildlife Resources Agency (TWRA), and/or TDEC prior to work. Mitigation for federally and State-listed species, aquatic features and sensitive habitats may also be required. Some species, such as federally and State-listed bats (e.g., Indiana bat, northern long-eared bat, gray bat, little brown bat, tricolored bat, small-footed bat), would require tree removal and other activities to be avoided during certain times of the year. Any tree removal from April 1 to November 15 may impact foraging habitat and roosting sites for federally and State-listed bats.

Commenter No. 44: Blake Hansen

From: BLAKE HANSEN
Sent: Friday, February 12, 2021 11:40:50 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] VTR

As a life long resident of Southeast Idaho I fully support the placement of any or all of this reactor program to Idaho. Nuclear energy is clean, safe and renewable. It will give us a way to be energy independent. It provides a large job stream across several states. *44-1* *44-2* *44-3*

Blake Hansen
Idaho Falls Idaho

44-1 DOE acknowledges your preference for the INL VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

44-2 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). The impacts of nuclear energy development are outside the scope of the VTR EIS.

44-3 Thank you for your comment and acknowledgement of the positive job impacts the project would provide across several states.

Commenter No. 45: Scott H. Carey, AICP, State Lands Planner, Nevada Division of State Lands, Department of Conservation and Natural Resources

From: NevadaClearinghouse
Sent: Friday, February 12, 2021 11:41:43 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Nevada State Clearinghouse Comments for Versatile Test Reactor EIS

James,

Attached please find a copy of the comments received through the Nevada State Clearinghouse for the Versatile Test Reactor. If you have any questions or need any additional information please feel free to contact me.

Thank You,

Scott H. Carey, AICP
State Lands Planner
Nevada Division of State Lands
Department of Conservation and Natural Resources
901 S. Stewart Street, Suite 5003
Carson City, NV 89701
[redacted]

Nevada Division of STATE LANDS | Nevada Department of CONSERVATION & NATURAL RESOURCES
Connect with us:

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Commenter No. 45 (cont'd): Scott H. Carey, AICP, State Lands Planner, Nevada Division of State Lands, Department of Conservation and Natural Resources

Scott Carey

From: NevadaClearinghouse
To: Jim Balderson
Subject: RE: Nevada State Clearinghouse Notice E2021-150 (E2021-150 DOE EIS Versatile Test Reactor - All Counties)

From: Jim Balderson [redacted]
Sent: Friday, January 15, 2021 6:37 PM
To: NevadaClearinghouse <NevadaClearinghouse@lands.nv.gov>
Subject: RE: Nevada State Clearinghouse Notice E2021-150 (E2021-150 DOE EIS Versatile Test Reactor - All Counties)

NEVADA STATE CLEARINGHOUSE
Department of Conservation and Natural Resources, Division of State Lands
901 S. Stewart St., Ste. 5003, Carson City, Nevada 89701-5246
[redacted]

TRANSMISSION DATE: 12/21/2020

U.S. Department of Energy

Nevada State Clearinghouse Notice E2021-150

Project: E2021-150 DOE EIS Versatile Test Reactor - All Counties

The United States Department of Energy (DOE) is releasing the *Draft Versatile Test Reactor Environmental Impact Statement* (Draft VTR EIS) (DOE/EIS-0542). The proposed VTR would be a sodium-cooled, fast-neutron-spectrum test reactor that will enhance and accelerate research, development, and demonstration of innovative nuclear energy technologies.

The Draft VTR EIS, prepared in accordance with the National Environmental Policy Act (NEPA), analyzes potential impacts of the VTR alternatives and options for reactor fuel production on various environmental and community resources. The Draft VTR EIS evaluates: Construction and operation of the VTR at the Idaho National Laboratory (INL) or the Oak Ridge National Laboratory (ORNL). This includes operating and performing experiments in the VTR, post-irradiation examination of irradiated test specimens in hot cell facilities, and spent fuel conditioning and storage pending shipment for interim or permanent disposal. Production of fuel for the VTR at INL and/or the Savannah River Site (SRS), including preparing feedstock for the fuel, fabricating fuel pins, and assembling the fuel pins into reactor fuel. A no-action alternative under which DOE would not pursue the construction and operation of a VTR.

The Draft VTR EIS identifies the construction and operation of the VTR at the INL Site as DOE's Preferred Alternative. For additional information or to view project documents please visit https://www.energy.gov/ne/downloads/public-draft-versatile-test-reactor-environmental-impact-statement-doeeis-0542. Comments due to the Clearinghouse on February 12, 2020.

Follow the link below to find information concerning the above-mentioned project
for your review and comment.

E2021-150 - http://clearinghouse.nv.gov/public/Notice/2021/E2021-150.pdf

- **Please evaluate this project's effects on your agency's plans and programs and any other issues that you are aware of that might be pertinent to applicable laws and regulations.**

1

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Commenter No. 45 (cont'd): Scott H. Carey, AICP, State Lands Planner, Nevada Division of State Lands, Department of Conservation and Natural Resources

- **Please reply directly from this e-mail and attach your comments.**

- **Please submit your comments no later than Friday February 12th, 2021.**

Clearinghouse project archive

Questions? Scott Carey, Program Manager, [redacted] or nevadaclearinghouse@state.nv.us

__X__No comment on this project ____Proposal supported as written **45-1**

AGENCY COMMENTS:

Signature: Jim Balderson P.E.

Date: 01/15/2021

45-1 DOE thanks you for your input.

Commenter No. 46: Dr. Rose O. Hayes, Director, WTT&D

From: Rose Hayes
Sent: Saturday, February 13, 2021 4:30:01 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Comment on VTR development

Mr. Lovejoy,my comment on the VTR plan is as follows:

The United States has wasted tax dollars on a series of mismanaged and incomplete projects involving nuclear materials and waste. Nothing in the VTR plan guards against that. ***46-1***

The U. S. Is already burdened with millions of tons of nuclear waste for which there is no permanent storage or elimination solution. The government should not be funding programs to advance and encourage nuclear production of any kind. ***46-2***

Several renewable energy processes now have proven track records. EPA and DOE should provide support and funding of these promising energy sources and abandon support of any research furthering nuclear production and its resultant radioactive waste. ***46-3***

The DOE and EPA are legally enjoined to protect the public health and safety. They have failed to do so in the past. As a result, America is plagued with dangerous radioactive waste that has been in a suspended state awaiting a final disposition for decades. DOESnd EPA policies and practices should be revised to prevent production of additional such material and elimination of the existing inventory. ***46-2 cont'd***

Dr. Rose O. Hayes
Aiken, South Carolina

Sent from my iPhone

Dr. Rose O. Hayes
Director, WTT&D
[redacted] [redacted]

46-1 DOE is following a disciplined approach to managing the VTR project in accordance with the DOE Order for Program and Project Management for the Acquisition of Capital Assets. It is DOE's intent to define technical, cost, and schedule baselines and work hard to perform work as close to those baselines as practical. DOE is focused on managing those factors under its control that affect cost and schedule. DOE would make adjustments in response to perturbations with the goal of meeting cost and schedule commitments to the extent possible.

46-2 DOE acknowledges the commenter's concerns regarding nuclear waste. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR SNF would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The prevention of additional nuclear wastes and the revision of DOE and U.S. Environmental Protection Agency policies are beyond the scope of this EIS.

46-3 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). Support and funding for renewable energy processes is outside the scope of this VTR EIS.

Commenter No. 47: Jeff Shadley

From: Jeff and Kami Shadley
Sent: Sunday, February 14, 2021 9:27:46 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Comment on VTR EIS

Dear Mr. Lovejoy, I support the analysis of the EIS for the VTR to be located at the INL. INL has the historical knowledge and assigned mission by the Department of Energy as the lead national laboratory for Nuclear Energy research, development and demonstration. The VTR is necessary for the United States to maintain leadership in the deployment of nuclear energy for our energy future. The VTR capabilities will allow for development of new fuel and reactor technologies to sustain nuclear energy as part of a green and sustainable energy future. INL has demonstrated the ability over its lifetime to provide safe, reliable and accountable performance in nuclear R&D and to meet safety and environmental requirements and take effective action with these requirements are at risk.

The VTR located at the INL is a required action to ensure United States energy independence and a reliable green energy future for our citizens, our country and our world.

Jeff Shadley

47-1

47-2

47-1 cont'd

47-1 DOE acknowledges your preference for the Idaho National Laboratory (INL) VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

47-2 Thank you for your comment. Please see Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic.

Commenter No. 48: Tom Clements, Director
Savannah River Site Watch

From: Tom Clements
Sent: Friday, February 12, 2021 3:27:11 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Comment and attachments on Draft VTR EIS, by SRS Watch - please confirm receipt

February 12, 2021

To: Mr. James Lovejoy
Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415
VTR.EIS@nuclear.energy.gov

I hereby submit the attached comments for the record of the draft EIA on the VTR. Please confirm receipt.

I have also attached three documents for the record. Please confirm receipt of them.

The comment has been posted on the SRS Watch website at:

https://srswatch.org/srs-watch-comments-on-plutonium-fueled-versatile-test-reactor-halt-eis-process-for-unjustified-sodium-cooled-reactor/

I will also be mailing the above-mentioned documents.

I may submit other comments before the new comment period deadline of March 2, if I deem such comments to be relevant.

Thank you.

Tom Clements
Director, Savannah River Site Watch
[redacted]
Columbia, SC 29201
srswatch@gmail.com
https://srswatch.org/

Response side of this page intentionally left blank.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

SRS WATCH

Savannah River Site Watch

February 12, 2021

Mr. James Lovejoy
Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415
VTR.EIS@nuclear.energy.gov

Comments by Tom Clements, Director, Savannah River Site Watch, on
***Draft Versatile Test Reactor Environmental Impact Statement (VTR EIS; DOE/EIS-0542)* -**
https://www.energy.gov/nepa/downloads/doeeis-0542-draft-environmental-impact-statement

These scoping comments are being formally submitted for the record in support of the "No Action Alternative" by Savannah River Site Watch (https://srswatch.org/) , a non-profit 501(c)(3*)* organization incorporated in South Carolina, in response to the Federal Register notice on the draft EIS on the Versatile Test Reactor (VTR). I expect that there will be a response in the final Environmental Impact Statement, if it were to be prepared, to each and every comment below. Thank you in advance for that. ***48-1***

I request that all documents referenced in the EIS be made available on line and be made easily available for public review, including via links in references sections.

I also request that all "data call" documents solicited to prepare the EIS be made part of the public record and be made available via the internet. For example, please provide a link to this document and please provide it to me via email: "2020, Savannah River Site Data Call Response for the Versatile Test Reactor Fuel Fabrication Facility*,* SRNS-RP-2020-00286, Rev. 2, Aiken, South Carolina, July 22." ***48-2***

Further, I request that all Critical Decision-0 (*Approve Mission Need*) and Critical Decsion-1 documents related to the VTR be made part of the public NEPA record.

Additionally, I request that all comments be published in the EIS, along with the responses to them.

48-1 DOE acknowledges your support for the No Action Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition," Section 2.2, "Purpose and Need," and Section 2.3, "Nonproliferation," of this CRD for additional information. The environmental impacts associated with the alternatives and options considered in this EIS are presented in Chapter 4. DOE will consider those impacts along with other considerations prior to issuing a Record of Decision.

48-2 The references used in this VTR EIS have been made available on the internet. A link to the references webpage is available on the DOE Office of Nuclear Energy VTR website: https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor. Documents cited in the Summary, main document, and appendices are organized in the same manner as they are listed in the reference sections. The references, including the data call reports, are available unless they contain restricted information or copyrighted information. This VTR EIS includes a CRD that includes the comments received on the Draft VTR EIS and DOE's responses. Chapter 2, Section 2.7, of this VTR EIS addresses alternatives considered and dismissed from detailed analysis. This section summarizes the reason that a number of other reactors or technologies would not meet the mission need and schedule for a VTR. It includes reference to a DOE Analysis of Alternatives that evaluated options other than the VTR described in this EIS. That Analysis of Alternatives is cited in the EIS and is available as a reference on the website. The Critical Decision documents that you refer to are internal management documents. DOE is working on the request you made through the Freedom of Information Act to provide documents.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

Please acknowledge receipt of these comments, which are being emailed and, due to poor handling of emailed comments during the plutonium pit NEPA process, are also being mailed.

It is recognized that the VTR project has not garnered the financial support hoped for by boosters. Though $295 million was requested by DOE of Congress for Fiscal Year 2021, only $45 million was appropriated for Fiscal Year 2021. The estimated overall cost as DOE stated in the FY 2021 budget request that the VTR has "an estimated cost range of $3.0B to $6.0B and an estimated schedule completion range of 2026 to 2030." Especially given flaccid financial support by Congress, and no private financial supporters, there is no way the project will be completed on that schedule.

And, the budget request holds evidence of looming cost overruns: "The VTR is anticipated to follow a design-build project delivery method utilizing a cost plus incentive fee contract, with the incentives contingent upon successfully meeting project deliverables." Plus, low levels of annual funding will mean the overall cost will increase

Please explain how the VTR can be constructed by the end of 2025 and what impact such an unrealistic timeline will have on project costs as well as on the safety of design and construction. How far is the schedule projected to slip given the low federal financing level and, apparently, no funding from private entities? Is the project even finically viable at this point?

48-3

If a final EIS is issued, I support the "No Action Alternative." But, I request that no final EIS be issued. Given severe shortcomings with the project and no justification for it, I request that the entire NEPA process for the VTR be terminated and the project as presented be canceled.

48-1 cont'd

Use of Other Facilities Must be Reexamined, Need for VTR not Established

The need for a VTR is ill-defined in the draft EIS and unconvincing concerning "need." The DOE claims to need a fast-neutron reactor for experimentation purposes, but little documentation is presented that public or private entities would are clamoring for it. Likewise, I am not aware of private entities offering financial support for the VTR. In the event there is a research need for a reactor with the presented VTR capabilities, DOE could modify existing facilities to meet such need. That option must be fully reviewed in the EIS and not dismissed in a few words.

48-4

The EIS must thoroughly reevaluate use of the Advanced Test Reactor or the High Flux Isotope Reactor to generate an adequate flux of fast neutrons for user needs. The draft EIS states on page S-17: "Modifying either of these reactors would create some fast flux testing capability, but could compromise the United States' ability to regain and sustain a technology leadership position. Therefore, these two reactors were dismissed from further evaluation in this EIS." But there is no presentation of facts that other missions will fully occupy these reactors or that they could serve the role that some are pitching for the VTR. Use of these reactors must be reexamined.

48-5

2

48-3 An Environmental Impact Statement (EIS) is a document prepared in accordance with National Environmental Policy Act (NEPA) regulations to disclose and compare the environmental impacts of alternatives for accomplishing a proposed action. If available, cost information may be included in an EIS, but an EIS is not a document to determine the costs of an activity. As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. The U.S. Government would provide funding for the VTR and associated facilities through congressional appropriation. The 2021 Energy and Water Development and Related Agencies appropriations bill (R46384), directed DOE to give the Appropriations Committees "a plan for executing the Versatile Test Reactor project via a public-private partnership with an option for a payment-for-milestones approach." The bill also included the Energy Act of 2020, which, in Section 2003, further directed DOE to proceed with the design and construction of VTR and authorized its funding. DOE plans to continue to work with private sector and foreign governments to establish needed collaborations and partnerships to successfully complete the project. Congressional appropriations and funding priorities are outside the scope of this VTR EIS. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost.

48-4 DOE acknowledges that there are differences of opinion as expressed in this comment, but has identified the background and purpose and need for a fast-neutron source to support research activities as described in Chapter 1 of this VTR EIS. Refer to Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic.

48-5 Elimination of the modification of existing thermal spectrum test reactors from detailed analysis was based on the results of an analysis of potential alternatives. This effort was performed within the framework of DOE Order 413.3B, "Program and Project Management for the Acquisition of Capital Assets," and DOE Guide 413.3-22, "Analysis of Alternatives Guide 3." The purpose of this effort was to provide an assessment of whether proposed candidate approaches would be

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

Please provide a discussion about processed spent fuel meeting the "waste acceptance criteria" for disposal in a geologic repository. Please confirm the irradiated material is high-level nuclear waste under US law. **48-6**

Please provide documents in the references sections, with links to them that demonstrate a thorough science-based and unbiased review of non-VTR options. **48-2 cont'd**

First Step: Final EIS, if it were to be Issued, is Premature as PEIS First Needed on Plutonium Disposal from all DOE Plutonium Projects

Issuance of a final EIS would be premature. A Programmatic EIS on transuranic waste from the VTR project is needed before any VTR EIS is completed. That PEIS would also analyze other TRU streams going into the Waste Isolation Pilot Plant, including large amounts from plutonium pit production and from the plutonium disposition project. To not to fully review WIPP capacity in a PEIS could be setting up projects, like the VTR, for failure for lack of space to dispose of TRU.

On the matter of TRU waste generation, the draft VTR EIS says this:

> Annually, about 710 to 880 cubic meters of LLW, 40 to 42 cubic meters of MLLW, 200 to 400 cubic meters of TRU waste, and 8.2 to 9.2 cubic meters of hazardous and TSCA wastes would be generated The characteristics of most of these wastes would be similar to wastes currently generated from existing activities and would be managed within the current waste management system. The project would provide preparation and packaging capabilities for the 200 to 400 cubic meters of TRU waste that would be generated from fuel production. All wastes would be shipped off site for treatment and/or disposal. Treatment and disposal of these wastes are well within the current capacities of existing offsite facilities. (page S-24)

> The Waste Isolation Pilot Plant (WIPP) is currently the only disposal option for TRU waste. WIPP's Land Withdrawal Act total TRU waste volume limit is 175,564 cubic meters. As of the reporting date for the 2019 *Annual Transuranic Waste Inventory Report* (ATWIR), 67,400 cubic meters of TRU waste were disposed of at the WIPP facility. The alternatives and options evaluated in this EIS would generate an estimated 24,000 cubic meters of TRU waste. TRU waste volume estimates such as those provided in NEPA documents, cannot be used to determine compliance with the WIPP Land Withdrawal Act TRU waste volume capacity limit. These wastes and waste from other actions will be incorporated, as appropriate, into future ATWIR TRU waste inventory estimates. Any GTCC-like waste (e.g., non-defense TRU waste not eligible for disposal at WIPP) generated from the proposed action would be stored at the generator site in accordance with applicable requirements until a disposal capability is available. (page S-40)

48-7

3

technically feasible and have the potential to effectively address capability gaps, desired operational attributes, and associated external dependencies. This analysis was performed by a team independent of the contractor organization responsible for managing the design and construction or constructing any potential capital asset project. It was this study that identified the ongoing missions of the ATR (the main mission of Navy fuel testing, accident transient fuels irradiations, National Science User Facility [NSUF] commitments, and upcoming Pu-238 production missions for NASA) and HFIR (currently heavily used to support its primary missions: neutron scattering and isotope production) as problematic for use of these facilities to meet the need for a fast-neutron test reactor. Additionally, these facilities are thermal neutron test facilities and would require modification to support fast-neutron testing. Such modifications, if technically feasible, would further limit the availability of these reactors (i.e., removing thermal neutron test space) and potentially interfere with thermal tests being performed simultaneously with fast-neutron testing. Finally, even modified, these facilities would not meet the testing criteria (e.g., fast-neutron flux, testing volume, and number of test locations with the needed volume) identified for the fast-neutron test facility. This VTR EIS includes a summary of the information developed in the Analysis of Alternatives. Additional information in the EIS is not needed.

48-6 As discussed in the VTR EIS, Chapter 2, Section 2.2.3, "Other Support Facilities," spent driver fuel would be temporarily stored at the VTR within the reactor vessel for about 1 year. After the fuel radioactively decays and cools sufficiently, driver fuel assemblies would be removed from the vessel, the surface sodium coolant would be washed off the assembly, and the assembly would be transferred in a cask to a new onsite spent fuel pad. After several years (at least 3 years), during which time the radioactive constituents would further decay, the assemblies would be transported in a transfer cask to a spent fuel treatment facility. The sodium that was enclosed within the driver fuel pins to enhance heat transfer would be removed using a melt-distill-package process. The entire spent driver fuel assembly would be chopped. The chopped material would be consolidated, melted, and vacuum distilled to separate the sodium from the fuel. To meet safeguards requirements, the nonfuel elements of the driver fuel assembly would serve as a diluent for the remaining spent fuel to reduce the fissile material concentration. This waste is not a TRU waste to be sent to Waste Isolation Pilot Plant (WIPP). The resulting material would be packaged in containers and temporarily stored in casks on a spent fuel pad, pending transfer to an offsite storage location. The location would be either an interim storage facility or a permanent repository when either becomes available

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

If 34 MT are to go to VTR fuel fabrication, what amount of this, in percentage, weight and cubic meters ends up as waste?

The National Academies of Sciences is supportive of a PEIS on plutonium disposal in WIPP, as recommended in *Review of the Department of Energy's Plans for Disposal of Surplus Plutonium in the Waste Isolation Pilot Plant (2020)*, by the Committee on Disposal of Surplus Plutonium at the Waste Isolation Pilot Plant, Nuclear and Radiation Studies Board, Division on Earth and Life Studies). See pertinent recommendation on page 101 of the report:

> RECOMMENDATION 5-5: The Department of Energy should implement a new comprehensive programmatic environmental impact statement (PEIS) to consider fully the environmental impacts of the total diluted surplus plutonium transuranic (DSP-TRU) waste inventory (up to an additional 48.2 MT) targeted for dilution at the Savannah River Site and disposal at the Waste Isolation Pilot Plant (WIPP). Given the scale and character of the diluted surplus plutonium inventory, the effect it has on redefining the character of the WIPP, the involvement of several facilities at several sites to prepare the plutonium for dilution, a schedule of decades requiring sustained support, and the environmental and programmatic significance of the changes therein, a PEIS for the whole of surplus plutonium that considers all affected sites as a system is appropriate to address the intent and direction of the National Environmental Policy Act and would better support the need for public acceptance and stakeholder engagement by affording all the opportunity to contemplate the full picture.

The *Final Environmental Impact Statement for Plutonium Pit Production at the Savannah River Site in South Carolina (SRS Pit Production EIS)* (DOE/EIS-0541) states this about the significant volume of TRU from pit production for nuclear weapons at SRS and Los Alamos:

> TRU Waste: Under the Proposed Action, significant quantities of TRU waste could be generated at SRS and shipped to WIPP for disposal. It is estimated that approximately 22,950 cubic meters (30,000 cubic yards) of TRU waste could be generated over the life of the project (i.e., 50 years) at SRS, assuming a production rate of 50 pits per year. In addition, approximately 5,350 cubic meters (6,998 cubic yards) of TRU waste could be generated over the life of the project (i.e., 50 years) at LANL, assuming a production rate of 30 pits per year. For NEPA purposes, it is assumed that the available volume capacity of the WIPP facility would accommodate the conservatively estimated TRU waste volume from pit production that could be generated over the next 50 years. (page S-32)

If pit production were to produce 28,300 cubic meters of TRU and VTR fuel fabrication were to produce 24,000 cubic meters of TRU, for a total of 52,300 cubic meters, about 120,000 cubic meters remains in WIPP for all other TRU disposal. As the Land Withdrawal Act volume cap may not be increased, or may not be increased without constraints on the license by the New Mexico Environment Department, there may not be adequate space in WIPP for all TRU from

4

48-7 cont'd

for VTR spent driver fuel. The spent nuclear fuel (SNF) is expected to be compatible with the acceptance criteria for any interim storage facility or permanent repository.

48-7 A programmatic evaluation of transuranic (TRU) waste management and WIPP facility operations are beyond the scope of the VTR EIS. TRU wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for disposal at the WIPP facility in New Mexico. If the DOE defense plutonium were used to produce VTR driver fuel, the TRU waste generated as part of the reactor fuel production options would meet the criterion of being defense related. The WIPP Land Withdrawal Act (LWA) (P.L. 102-579 as amended by P.L., 104-201) requires waste disposed at WIPP to (1) meet the definition of "transuranic waste" (WIPP LWA Section 2(18)) and (2) be generated by atomic energy defense activities (WIPP LWA Section 2(19)). Additionally, waste must meet the WIPP LWA, WIPP Hazardous Waste Facility Permit, WIPP waste acceptance criteria, and other applicable requirements. Compliance with these requirements may be demonstrated by acceptable knowledge, non-destructive assay, and other established methods. The waste stream must comply with the WIPP Waste Acceptance Criteria and the WIPP Permit Waste Analysis Plan by passing a TRU waste certification audit, an inspection by the U.S. Environmental Protection Agency (EPA), and New Mexico Environment Department (NMED) approval of the final audit report.

The WIPP LWA stipulates that the TRU waste capacity of the WIPP facility is a total TRU waste volume capacity limit of 175,600 cubic meters (6.2 million cubic feet). As of April 3, 2021, the WIPP facility has disposed of 70,115 cubic meters of TRU waste. This TRU waste disposal volume is about 40 percent of the total TRU waste volume allowed by Public Law 102-579 as amended by Public Law 104-201. TRU waste volume estimates such as those provided in NEPA documents, are not intended to demonstrate compliance with the WIPP Land Withdrawal Act TRU waste volume capacity limit. TRU waste volumes projected in NEPA documents will be incorporated, as appropriate, into future ATWIR [Annual Transuranic Waste Inventory Report] TRU waste inventory estimates.

The Department is conducting preliminary planning to evaluate options to be able to continue uninterrupted TRU waste disposal operations up to the total TRU waste volume capacity limit. Additional TRU waste disposal panels that would provide capacity to dispose of TRU waste up to the WIPP LWA total TRU waste volume capacity limit may be authorized under a future permit modification. The WIPP Permit, consistent with Resource Conservation Recovery Act regulations at

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

plutonium projects, including the VTR. The EIS on the VTR simply can't assume that more drifts will be added to WIPP to accommodate the vast amount of plutonium slated for disposal in WIPP and can't assume that WIPP volume is endless and that the volume cap under the Land Withdrawal Act (LWA) will be increased.

Taking into account all other TRU planned for disposal in WIPP, <u>the EIS on the VTR, if it goes forward, must decisively prove that there is space for ~6 MT of plutonium waste (TRU) from the VTR in WIPP</u>. Unless the ill-conceived VTR project were to be canceled, which is very possible, or if the proposed and unjustified SRS Plutonium Bomb Plant (PBP) at SRS were to be canceled, a growing possibility, then there may not be volume in WIPP for all the TRU slated for disposal. This underscores the urgent need for preparation of a PEIS addressing all plutonium to WIPP, to be prepared before the final EIS on the VTR goes forward.

To underscore the need for a PEIS on all TRU from plutonium projects (as well as other DOE TRU) going to WIPP, I have include my January 28, 201 "scoping comments" on the plutonium disposition program's NEPA process. Please review this document submitted for the record.

DOE and the draft EIS have ignored the recommendation by the NAS concerning the PEIS on plutonium disposition but it is unknown why the suggested approach has been rejected. Why?

Does DOE, or NE, have a "pecking order" of the various planned plutonium waste streams to WIPP, including from the pit project, the VTR project, surplus plutonium disposition and other TRU? Please discuss.

48-7 cont'd

To reiterate, considering the above, large impacts to WIPP of the three above-named plutonium projects, I request that the PEIS be conducted before any EIS on the VTR is finalized.

A NNSA official has stated that WIPP is a "choke point" for the pit project (for nuclear weapons) and this also may apply to surplus plutonium disposition and disposal of TRU from the VTR project. See Exchange Monitor article of September 10, 2020: *TRU Waste 'Far and Away' Largest Challenge for NNSA Pit Mission, Official Says*: "Far and away the biggest challenge for NNSA is to make sure that the disposal system for transuranic waste is robust enough to not become a choke point for our mission," McConnell said." (James McConnell, NNSA's Associate Administrator for Safety, Infrastructure and Operations) This underscores the need for the PEIS on WIPP volume. Is WIPP also a "choke point" for other TRU-producing projects, like the VTR?

As part of the EIS on the VTR, if it goes forward, a stand-alone review of overall WIPP volume and impacts of other TRU disposal programs must be conducted. An expansion of WIPP to receive more volume that currently specified by the LWA cannot be assumed. Likewise, a New Mexico Environment Department license extension for WIPP, especially with no conditions attached, cannot be assumed. (I note that constraints could be placed on new TRU disposal generated by DOE projects outside New Mexico, as an example.)

5

40 CFR 270.42, can be modified by submittal of a Permit Modification Request (PMR) and decision by NMED to approve the PMR. Both Class 2 and Class 3 PMRs include a public comment period as a step in the regulatory process. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

Please include documents in the references sections demonstrating a full analysis of WIPP volume as discussed above.

What would happen to the VTR project if disposal space at WIPP is limited? Would it slow down or be halted? If WIPP volume were to be a limiting factor, how would space be assigned to TRU from the VTR project?

The PEIS and VTR EIS must consider the need for a second TRU repository. Is the Office of Nuclear Energy counting on either a second repository of an increase by Congress in the volume cap as legally established by the Land Withdrawal Act? Is DOE counting on no constraining conditions being applied by the New Mexico Environment Department on any WIPP license extension, or not? **48-7 cont'd**

I request that the EIS report anticipated TRU waste amounts both in weight and in cubic meters. Thus, how much plutonium in metric tons, would be contained in the projected 24,000 cubic meters of TRU for the VTR project? How much of this is from fuel fabrication and other named processes?

The draft EIS states on page S-30: "The proposed action would provide preparation and packaging capabilities for the 200 to 400 cubic meters of TRU waste that would be generated from fuel production; TRU waste would be shipped to the Waste Isolation Pilot Plant for disposal." Why such a large range in the amount of waste produced by fuel fabrication? This sounds more like a guess than an accurate amount. This must be clarified in the EIS.

How much weight is this and how much plutonium? What percentage of 34 MT of Pu ends up as waste? Around 6 MT? **48-8**

If plutonium pits stored at Panetx were to be used for VTR fuel, please discuss how such pits will be selected.

If plutonium from Europe were to be used, please discuss details about this material, where it came from, its isotopic content, how it would be transported overland in Europe and how it would be transported by sea to the United states. Which shipping company would be used? Which US ports would be considered for importation? Would military facilities or the public port in Charleston, South Carolina be used? Please discuss more details of potential overland shipments impacts, including accident and terrorist attack or diversion. **48-9**

Nuclear Proliferation Concerns of VTR – Not Covered in Draft EIS

From page S-12: "Accounting for additional material that ends up in the waste during the reactor fuel production process, up to 34 metric tons of plutonium could be needed for startup and 60 years of VTR operation. " This 34 MT is enough for a minimum of 4350 nuclear **48-10**

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48-8 As described in Appendix B, Section B.5.2, of this VTR EIS, up to 27 percent or 9 MT of plutonium could end up as reactor fuel production waste. The highest percentage of feedstock material entering the waste stream would be associated with an option where no feedstock preparation would be necessary and no provisions were made to recapture some of the material that could otherwise end up in the waste stream. Other fuel production options could result in less waste.

48-9 At this time, DOE does not know what specific plutonium would be used for reactor fuel feedstock. The potential sources of plutonium for use as feedstock for VTR fuel production are described in Chapter 2, Section 2.6, of this EIS. DOE expects to use DOE plutonium in the VTR. As indicated in Section 2.6, most of the foreign material is reactor-grade plutonium and acceptable, though not preferable, for VTR fuel. Transport and management of plutonium from foreign countries is discussed in Appendix F of this VTR EIS. Transport within the foreign countries is outside the scope of this EIS. As indicated above, the specific plutonium has not yet been determined; however, to enable the analysis in this EIS, an assumed reactor-grade isotopic mix is described in *Recommended Representative Isotopic Compositions for Potential VTR Pu Supplies* (INL 2020b).

48-10 Chapter 2, Section 2.6, of this VTR EIS identifies the possible sources of plutonium as DOE/NNSA excess plutonium or plutonium from foreign sources (this is also noted in the Summary, Section S.6.4). Depending on the source of the plutonium, it may be weapons grade or reactor grade. Regardless of the source, the feedstock preparation capability evaluated in this VTR EIS covers a range of technologies that would prepare the plutonium to meet the specifications required for use in VTR fuel. If the plutonium came from DOE/NNSA sources, it may be pit plutonium, but would not be material that NNSA would use for its pit production activities (i.e., it would be excess or surplus to NNSA's needs). All special nuclear material used by the VTR project would be protected in accordance with DOE safeguards and security requirements, including nuclear material accountability and physical protection of the material. Please refer to Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic.

DOE's intent as evaluated in this EIS is to establish or adapt capabilities to produce fuel for the VTR. The VTR EIS addresses the environmental impacts of using the described facilities for the production of VTR driver fuel and does not speculate as to whether there are other programs to which such capabilities could be applied.

The VTR project is engaged in discussion with NNSA regarding feedstock acquisition. NNSA would not be involved in the fabrication of VTR fuel or VTR operation.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

weapons, using the International Atomic Energy Agency's figure of 8 kilograms for a "significant quantity."

The documents states on page S-12 that between 0.4 and 0.54 MT of plutonium would be used annual for fuel fabrication: "Annual heavy metal requirements would be approximately 1.8 metric tons of fuel material (between 1.3 metric tons and 1.4 metric tons of uranium and between 0.4 and 0.54 metric tons of plutonium, depending on the ratio of uranium to plutonium) (INL 2019a; Pasamehmetoglu 2019). Feedstock for this fuel could be acquired from several existing sources." What is the source of this plutonium and could it be used for nuclear weapons?

Would the VTR plutonium be from pits under the control of NNSA? Is a memorandum of Understanding in place about producing such plutonium, or other NNSA plutonium, to NE for the VTR project? Please include any MOU(s) in references.

Where is the risk analysis of handling these amounts of plutonium, from a proliferation perspective, including diversion and the insider threat? **48-10 cont'd**

To summarize the proliferation risk of the VTR, which must be analyzed in NEPA documents, Gregory Jones states this in his 2019 report entitled *The Versatile Test Reactor: Wasting Money While Undermining Nonproliferation Goals*, which I am submitting for the record:

> In reality, the VTR will be a waste of money and undermine the broader nonproliferation goals of the U.S. The need for the VTR is doubtful as it is very unlikely that any of these advanced technologies will be deployed on a significant scale even by 2050 and they could easily never be deployed. Further, given the low technological maturity of the technology to be used in the VTR, combined with DOE's desire to build the VTR on what it calls "an accelerated schedule," it is very likely that there will be significant delays and cost overruns. In addition, DOE needs to examine the safety risks of fast reactors, including the VTR, in a realistic and even-handed manner. Finally, the use of plutonium fuel in the VTR will undermine U.S. nonproliferation goals to eliminate the separation of plutonium, plutonium stockpiles and plutonium fuels in non-nuclear weapon states.

The points raised in the paper cited above, which is attached, must be considered in the EIS, if it were to proceed. **48-11**

Does establishment of facilities for VTR fuel fabrication have implications for future plutonium proliferation? Could such facilities be used for non-VTR programs? **48-10 cont'd**

Why is 60 years being presented for the length of operation? Will the U.S. Nuclear Regulatory Commission or any other agency, such as the defense nuclear Facilities Safety Board (DNFSB), provide any oversight at any stage of the VTR project? **48-12**

48-11 Please refer to the discussion in Section 2.3, "Nonproliferation," of this CRD and the response to comment 48-10.

48-12 The DOE reached out to vendors and developers working to bring new reactor designs to the market as part of a user needs assessment. Sixty years was selected as the operational lifetime for the VTR based on feedback from these vendors and developers. A 60-year lifetime for the VTR provides the capability to test mature technologies that possibly can be deployed in the short-term and for more testing to improve performance in the long-term. Conversely, for less-mature technologies, the VTR provides the capability for testing needed for these designs to advance to the prototype and deployment stage. In summary, the need for a test reactor currently exists and extends well into the foreseeable future.

The VTR is not a DOE defense-related facility and therefore would not meet the definition of a facility that would require Defense Nuclear Facilities Safety Board oversight. The U.S. NRC also would not provide oversight. While the VTR would not be an NRC-licensed facility, DOE would construct and operate the VTR in close collaborations with the NRC. In September of 2019, DOE and the NRC entered into a memorandum of understanding (MOU) on the VTR. This MOU sets the framework for the sharing of information and expertise between the two organizations for construction and operation of the VTR. Among other items, the NRC's engagement, consistent with its role as an independent safety and security regulator, would provide DOE with information on NRC's regulations, guidance, and licensing processes and provide a senior staff member to provide technical and regulatory expertise to the DOE Safety Basis Approval Authority regarding the applicability, interpretation, and use of NRC Regulatory Guides and other NRC guidance or documentation. It is anticipated that DOE would use NRC staff to augment DOE's safety review team on a cost-reimbursable basis.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

DOE has stated that the VTR would not be operated as a plutonium "breeder" reactor. Where is this written into VTR documents, law or regulation? What is to guarantee that the reactor will never be operated in breeding mode? Please provide any document that reviewed the VTR's breeding capabilities. Has operating in a non-breeding mode been made for non-proliferation or other reasons? Please provide documentation analyzing not operating the reactor as a breeder.

It has been stated that the spent fuel would not be reprocessed to remove uranium and plutonium. Is this written into law or regulation? What constraint is there on reprocessing of VTR spent fuel? Please provide an analysis of this and any documents analyzing reprocessing of the spent VTR fuel. 48-13

Please see the attached document submitted for the record: "The Versatile Test Reactor: Wasting Money While Undermining Nonproliferation Goals." I requested this document be reviewed and the points raised in it be responded to. Please confirm if NE has prepared a rebuttal to this document or not; if so, please provide it for the record. 48-14

Will the DOE's National Nuclear Security Administration (NNSA) have a role in any aspect of VTR fuel fabrication, operation or transport? Will NNSA interface with the IAEA on safeguards issues? Is NNSA reviewing proliferation aspects of the project? If not, why not? 48-10 cont'd

Need for IAEA Safeguards Overlooked in Draft EIS

The draft EIS fails to discuss the issue of safeguards by DOE or the International Atomic Energy Agency of plutonium to be processed into fuel or plutonium to be disposed of as TRU in WIPP. This must be addressed in the final EIS. Please full address safeguards in plutonium handling, processing and disposal.

Is terrorism a risk in the transport, handling or processing of materials for VTR fuel fabrication or in fuel transport? Please fully discuss.

I note that the NAS *Review of the Department of Energy's Plans for Disposal of Surplus Plutonium in the Waste Isolation Pilot Plant* underscores the importance of IAEA safeguards for the processing of plutonium and emplacement in WIPP of plutonium containers, see page 82: 48-15

> **5.1.1 Uncertain Protocols for International Inspection and Verification for Emplaced Waste**
> IAEA monitoring and inspections are an important component of the PMDA requirements and they could also provide enhanced public and international confidence that the material is properly accounted for and emplaced in WIPP. As noted in Chapter 2, the director of the Office of International Nuclear Safeguards at the DOE-NNSA reported to the committee that the DOE-NNSA is in the process of working with the IAEA to discuss what role, if any, IAEA involvement might play in

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48-13 There is no requirement for the VTR not to operate as a breeder. However, the reactor and core design, the fuel fabrication facility, and the spent fuel treatment facility are being designed with the intent to run a test reactor and to dispose of SNF. Significant design changes would be required to modify these facilities to support breeder operation. Any such changes would negatively impact the ability of the VTR to perform its function as a test reactor. Any change in the VTR project that could potentially impact the environmental analysis and its conclusions would be subject to additional NEPA analysis. That being said, the commitment not to separate, purify, or recover fissile material from the VTR driver fuel is not subject to change. Since there are no plans to reprocess VTR fuel, an analysis of reprocessing VTR fuel is not required. The VTR project has had discussions with NNSA on any role that agency might play in feedstock acquisition. These discussions are ongoing. NNSA would not be involved in the fabrication of VTR fuel or VTR operation. The design of VTR as a plutonium burner has been effectively formalized in an October 15, 2020, action memorandum signed by the Secretary of Energy on December 11, 2020, approving VTR's use of a uranium/plutonium/zirconium metal alloy driver fuel.

48-14 DOE did review and consider the document. Where appropriate, DOE has responded to the technical elements of the document. Please refer to the responses to comments 48-29 through 48-35.

48-15 The feedstock materials, fuel, spent fuel, and TRU waste from the VTR would be transported and handled in accordance with DOE safeguards and security requirements. In addition, potential shipments of plutonium from abroad to the United States would comply with requirements of the host country and the International Atomic Energy Agency (IAEA). The IAEA safeguards measures include a multilayered combination of activities that take into account potential diversion strategies. Throughout handling, transporting, and processing of plutonium, the risk of diversion, terrorism, and intentional destructive acts are major security and operations considerations for the VTR project. An analysis of physical and cyber vulnerabilities and defenses is a security function that would be performed independently of the VTR EIS. These vulnerability analyses would be performed throughout the design, construction, and operation phases to ensure that appropriate security features would be present to protect the plutonium-bearing material for all phases of the VTR project. Appendix F, Section F.3, of the VTR EIS discusses activities to receive, handle, and process plutonium from foreign sources while Section F.6 discusses the potential threats and steps DOE would take to prevent or mitigate such threats from intentional destructive acts.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

the disposition of DOE-EM's 6 MT (Veal, 2019). Typical international safeguards (monitoring and verification) use accountancy to ensure that declared nuclear material is present as intended, coupled with a containment and surveillance system to ensure that no changes occur between inspections. Implementation of IAEA protocols for verification and monitoring of materials for pre-disposal are well established, but IAEA verification protocols for material emplacement in any repository are still under development. Inspection and verification protocols for repository emplacement, where access for monitoring may be a challenge and remote devices may compromise required passive safety measures, could have a significant impact on both repository operations and design (Haddal et al., 2014).

The DOE-NNSA dilute and dispose Master Schedule for the 34 MT (see Figure 3-1; DOE-NNSA, 2018a) indicates verification protocols for the activities at SRS are to be in-place in in FY 2022 and for WIPP in FY 2023, yet the DOE-NNSA may emplace DSP-TRU waste with or without IAEA inspection protocols in place. Therefore, substantial uncertainty remains on the applicability and possible implementation of IAEA monitoring and verification protocols. Resolution of this uncertainty holds substantial implications for WIPP operations and future design changes (such as the new shaft and panels now under development), and therefore this issue remains a significant system vulnerability.

48-15 cont'd

DOE is currently engaging a NEPA process on plutonium disposition that focuses on the dilute & dispose method, with disposal of the resulting TRU to undergo termination of safeguards, with disposal of the TRU in WIPP. The draft VTR EIS does not say in what form the TRU from the VTR project will be disposed of in WIPP. The final EIS must discuss this. Will VTR TRU containers go directly to WIPP? Will any VTR TRU undergo dilute & dispose or any other processing? Please give details of preparation of VTR TRU for disposal in WIPP. The final EIS can't dodge this issue given environmental impacts at INL and/or SRS and WIPP in handling and disposal of the VTR TRU.

48-16

The VTR draft EIS states on page S-1: "Specifically, "DOE will continue to explore advanced concepts in nuclear energy that may lead to new types of reactors with further safety improvements and reduced environmental and nonproliferation concerns." Where is proof that "nonproliferation concerns" are being reviewed in this NEPA process?

Along with any final EIS, please include a non-proliferation risk assessment for the VTR project. If NE does not prepare such documents this must be tasked to another office in DOE.

48-17

Would any plutonium stored at SRS that is under IAEA safeguards be used for VTR fuel? Please discuss.

48-18

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48-16 The VTR fuel production activities would produce two types of TRU waste—the primary waste that require dilution and secondary wastes (e.g., job control waste) that would not. Appendix E of this VTR EIS details the various plutonium contaminated TRU wastes and their disposal packaging.

48-17 The text referred to in the comment is not specific to the VTR, but to a part of DOE's larger mission. As indicated in the response to comment 48-10, DOE would coordinate with NNSA on the preparation of a Nuclear Proliferation Assessment Statement. Refer to Section 2.3, "Nonproliferation," of this CRD for additional discussion of this topic.

48-18 Decisions on specific feedstock for the VTR fuel would not be made until the VTR is under construction. DOE's potential sources of plutonium for use as feedstock for VTR fuel production are presented in Chapter 2, Section 2.6, of this EIS. DOE expects to use DOE plutonium in the VTR. As indicated in Section 2.6, most of the foreign material is reactor-grade plutonium and acceptable, though not preferable, for VTR fuel.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

Risks of Using Sodium as a Coolant" Fires and Explosions

I note what Greg Jones states in his earlier-cited paper on the VTR, about the risks of lower melting point of VTR fuel and potential threat of post-accident criticality. The risks of metallic fuel with a lower melting point, as well as risks posed by use of a sodium coolant, must be more thoroughly analyzed in the EIS.

> A major meltdown in a fast reactor would have consequences more serious than those from a similar meltdown in an LWR. As was discussed above, thermal reactors use a moderator and sustaining the nuclear chain reaction requires that the fuel and the moderator be interwoven. If the fuel in a thermal reactor melts, then the moderator is excluded and the nuclear chain reaction stops. In a fast reactor, the melting of the fuel would lead to the exclusion of the coolant, increasing the rate of the chain reaction complicating efforts to bring the accident under control.
>
> There are a number of other safety concerns. The decrease in the delayed neutron fraction associated with the use of plutonium fuel makes the control of the reactor more delicate. The chemical reactivity of the sodium coolant if it leaks out of the reactor as happened in the accident at Monju, can damage equipment and generate toxic fumes. The fast neutrons in the reactor damage structural materials in a much shorter time than do thermal neutrons.

The risks of using sodium as a coolant are well known, as we can see from breeder reactor accidents at the Fermi plant in Michigan and the problem-plagued Moju reactor in Japan, which suffered a debilitating sodium fire in 1995, leading to its eventual shutdown. Fully discuss the risk of sodium leakage and sodium fires. Please discuss risk of a sodium explosion, with possible criticality. Would a criticality and nuclear explosion be possible in a VTR accident?

48-19

Re: "Savannah River Site Reactor Fuel Production Options" & VTR Fuel Risks

The section of fuel fabrication is cursory and speculative at best. Any final EIS must include details so that we can analyze potential worker, public and environmental impacts at SRS or off site.

48-20

The draft EIS says:

> Existing sources of U.S. excess plutonium14 managed by DOE and the National Nuclear Security Administration (NNSA) would be sufficient to meet the needs of the VTR project. Potential DOE/NNSA plutonium materials include surplus pit plutonium (metal), other plutonium metal, oxide, and plutonium from other sources (DOE 2015). If the U.S. sources cannot be made available for the VTR project or to supplement the domestic supply, DOE has identified potential sources of plutonium in Europe. (page S-12)

48-21

10

48-19 DOE takes its responsibility for the safety and health of the workers and the public seriously. The Experimental Breeder Reactor (EBR)-II and the Fast Flux Test Facility (FFTF) demonstrated safe operation with sodium as the coolant. These two reactors provided about 40 years of successful operation as test facilities. The experience included a set of tests (Shutdown Heat Removal Test program) conducted at EBR-II that culminated in tests that demonstrated that this technology can be designed to provide inherent and passive safety. Using past reactor operating experience and knowledge gained from extensive inherent safety testing at EBR-II and FFTF, along with advanced analysis tools, the VTR is being designed to safely operate with sodium as the coolant.

Appendix D, Section D.3.3.1, reviews the history of sodium-cooled reactor operations and accidents. Sodium-cooled reactors have been operated for a number of years. The discussion in Appendix D considers events and tests at EBR-I, Fermi-I, Phenix, SuperPhenix, MONJU, FFTF, and EBR-II. Because of the rapid oxidation of sodium in contact with air, sodium leaks must be minimized or eliminated. Previous U.S. sodium test reactors, EBR-II and FFTF, experienced operational sodium leaks that were properly addressed. Experience with international sodium reactors is similar. It must be noted that while Japan's MONJU reactor experienced a sodium leak, the leak did not affect the reactor core. The reactor was not restarted due to a number of economic and political factors. The discussion provided in Appendix D acknowledges the concerns mentioned in the comments as well as other information related to tests in FFTF and EBR-II. Evaluating past performance and tests provides valuable information that is considered in the design of the VTR.

Appendix D, Section D.3.3.2, discusses safety analyses that have been performed for the VTR. Appendix D discusses how the VTR is being designed to ensure safety throughout proposed operating conditions. The VTR design is also resilient under potential accident or upset conditions. DOE guidance for design of the VTR focuses on reducing or eliminating hazards, with a bias towards preventive, as opposed to mitigative, design features and a preference for passive over active safety systems. This general approach creates a design, which is reliable, resilient to upset, and has low potential consequences of accidents. Safe operation of the VTR is ensured by reliable systems design to ensure preservation of the key reactor safety functions. These key safety functions are (1) reactivity control, (2) fission- and decay-heat removal, (3) protection of engineered fission product boundaries, and (4) shielding.

48-20 As discussed in Chapter 2, Section 2.6, of this VTR EIS, the VTR project is evaluating the potential sources for plutonium feedstock for reactor fuel production.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

Please explain exactly which NNSA plutonium might be used for VTR fuel. As stated earlier, lease provide for the NEPA record copies of any "memorandum of understanding" (MOU) between NNSA and the DOE's Office of Nuclear Energy concerning plutonium supply. If NNSA were to provide plutonium who would own it - NE or NNSA? What role would the Office of Environmental Management have in any aspect of fuel fabrication or disposal of resulting TRU waste?

Exactly which European plutonium would be considered for VTR fuel fabrication and how much?

48-21 cont'd

How much plutonium would be at SRS or INL at any one time? What would happen if fuel fabrication began and was halted? Would plutonium be stranded at the fuel fabrication sites or returned to the site of origin? Will NE guarantee to the State of South Carolina that no additional plutonium will be stranded in the state?

It is accurate to say that the K-Reactor is used for "material storage," that being plutonium. But it is also designated to be used for "plutonium disposition." That project, currently at the start of an EIS process, is not mentioned in the draft EIS.

See attached document confirming that 11.5 metric tons of plutonium are stored in the K-Reactor at SRS. Would any of this material be used for VTR fuel fabrication? Would plutonium for VTR fuel fabrication be stored in the same manner as the existing plutonium?

Could there be an overlap in any space or equipment between feedstock preparation for the VTR and plutonium preparation for the dilute & dispose technique for plutonium disposition? If so, why isn't this discussed? Could the ARIES process be common to both projects? If so, could ARIES for the VTR be located at Los Alamos or Pantex?

48-20 cont'd

What would be the impact of an accident in the VTR fuel fabrication on facility on other operations at the K-Reactor, especially the dilute & dispose project? Please provide this analysis.

48-22

How would much fresh fuel be stored at the fuel fabrication site at any one time and where would it be stored?

Given that SRS has no recent history of fuel fabrication, no history of metallic fuel fabrication, no history of working with sodium-bonded fuel, and little recent experience with plutonium handling and processing (beyond small-scale D&D operations in the K-Reactor), the learning curve for VTR fuel fabrication would be very steep and thus could be problematic. Especially given the lack of experience at SRS, please more fully explain and justify this conclusion in the draft EIS: "DOE has no preferred option at this time for where it would perform reactor fuel production (feedstock preparation or driver fuel fabrication) for the VTR."

48-23

Plutonium currently stored at SRS is one of the possible sources being investigated. DOE has not selected the process for feedstock preparation. This selection would depend upon several factors, including the source of the plutonium, as the best process for impurity removal depends upon the impurities in the feedstock material. Therefore, the analysis utilizes the best available information regarding the potential processes and no single feedstock preparation process was used in the assessment of impacts for this process. Fuel production impacts were developed based on the range of impurities found in both domestic and foreign inventories of plutonium. The most bounding impacts were used in the EIS analysis.

There are no overlaps in space or equipment used between any plutonium disposition facilities and the VTR fuel production facilities at K-Area at SRS. Sufficient space has been identified for both projects within K-Area without designating any of the same space for both projects. Also, L-Area is being considered for the VTR fuel production activities and there are currently no surplus plutonium disposition activities identified for that location. As noted in Appendix B of the EIS, the plutonium feedstock shipped to SRS would be temporarily stored within the space allocated for VTR fuel production and would not be stored with existing stockpiles. The VTR fuel production would not use the ARIES process. Plutonium disposition using SRS facilities is discussed in Chapter 5, Cumulative Impacts, of this VTR EIS.

In addition, refer to the discussion in Section 2.4, "Plutonium Use and Disposition," of this CRD.

48-21 At this time, DOE is evaluating the specific plutonium that would be used for VTR fuel feedstock. DOE's potential sources of plutonium for use as feedstock for VTR fuel production are described in Chapter 2, Section 2.6, of this EIS. DOE expects to use DOE plutonium in the VTR. As indicated in Section 2.6, most of the foreign material is reactor-grade plutonium and acceptable, though not preferable, for VTR fuel. Plutonium transferred from NNSA to DOE's Office of Nuclear Energy would become the responsibility of the Office of Nuclear Energy. Transuranic waste from reactor fuel production that meets the acceptance criteria of the WIPP facility, managed by the Office of Environmental Management, would be disposed at that site.

48-22 The impacts of accidents associated with reactor fuel production at SRS are presented in Sections 4.11.3.2, D.4.3, and Table D–25 of the EIS. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology,

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

The draft EIS states this on page S-18 : "SRS and Savannah River National Laboratory (SRNL) have extensive history in nuclear reactor operation and offer a full range of supporting infrastructure for transportation, construction and operation, safety, security, nuclear material management, and regulatory compliance." This statement is very misleading, as current SRS staff likely have almost no experience in reactor operation as the last on-going reactor operation at SRS ended in the mid-1980s. Likewise, the "supporting infrastructure" for reactor operation was deactivated. Please clarify this misleading statement in the draft EIS.

The draft EIS says "aqueous or pyrochemical" processes could be used. The document must present a clear chosen option so that it can be fully analyzed. **48-23 cont'd**

What is, as the title of this document in references reflects, "*VTR Add-on Processing Capability?"* at SRS? What would be the waste streams form this processing? Please provide a link to this document. **48-24**

On page S-15 it is stated: "If the aqueous processing were to be selected, an estimated 10 glovebox lines may be necessary. Glovebox lines would be constructed for feed preparation, plutonium dissolution, plutonium extraction, oxide conversion, waste processing, and acid recycling. This scenario considers the most equipment-intensive process under consideration. Other processes would be expected to require fewer gloveboxes and less operational space. All feedstock preparation equipment would be newly installed equipment (SRNL 2020)."

This description of fuel fabrication at SRS is woefully inadequate and speculative and must be fully explained and expanded: "The description that follows assumes installation of reactor fuel production capabilities at K Area. A notional equipment configuration was developed to assess the capability to house the fuel production equipment within the identified structures. But, the equipment layout that would be used has not been determined and would be finalized during the detailed design of the fuel production facility." (page B-78) **48-23 cont'd**

The purification process must be named, not just include in a list of options: "The identified area would be suitable for pretreatment operations like molten salt removal of the americium from plutonium (polishing), electrorefining, and direct oxide reduction to convert fuel compounds (e.g., fuel oxides) into their metallic form." (page B-78) Which pretreatment of purification option would be used and what are potential health and environmental impacts? What is the criticality risk? **48-25**

On page S-15, the draft EIS states: "Due to its use as a special nuclear material storage facility, the K-Reactor Building is a Hazard Category 1 nuclear facility. K-Reactor, constructed in the 1950s was shut down in 1996, and subsequently deactivated. Nuclear fuel and equipment needed for reactor operation were removed. The building was later modified for nuclear material storage (DNFSB 2003)." What impact would VTR fuel fabrication have on the hard category of the old K-Reactor? **48-23 cont'd**

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and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. Many of the accidents evaluated in this EIS would have minimal and/or temporary impacts on any SRS operations. A severe accident could affect SRS site operations, including other operations in K-Area. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons.

48-23 Please refer to the discussion in Section 2.4, "Plutonium Use and Disposition," of this CRD. The EIS does state that the SRS site has an extensive history of reactor operations. But it also says in the Summary, Section S.8, and in Chapter 2, Section 2.7 "SRS has no test reactor experience and the last of the onsite operating reactors shut down in 1992. This means that the organizational infrastructure needed to support operation of a test reactor does not exist at SRS. … has more limited capability (primarily located at SRNL) to support experiment fabrication and fuel and experiment disassembly and inspection." For these reasons SRS was not considered as a site for the VTR. SRS is one of the few DOE sites that does have experience in the handling of plutonium in multiple forms. SRS does have extensive experience with the processes needed for feedstock preparation. While a learning curve would be expected regardless of where the fuel production occurs (Note that at both sites being considered all of the equipment for fuel production is new.) it would not be as steep at SRS as at other sites. It is because both SRS and INL possess expertise related to fuel production that both sites are being considered for the VTR fuel production options, and a preferred alternative was not identified in the Draft EIS.

DOE has not selected the process for feedstock preparation. This selection would depend upon several factors, including the source of the plutonium as the best process for impurity removal depends upon the impurities in the feedstock material. Therefore, the analysis utilizes the best available information regarding the potential processes and no single feedstock preparation process was used in the assessment of impacts for this process. VTR fuel production impacts were developed based on the range of impurities found in both domestic and foreign inventories of plutonium. See the response to comment 48-20, for a discussion of the relationship between VTR fuel production and plutonium disposition at SRS. VTR fuel production would not change the hazard category of the K-Reactor Building.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

The draft EIS ill defines where purification and fuel fabrication facilities would be located in the K-Reactor. Likewise, the relationship to other activities in the K-Reactor are not included in the draft EIS, specifically plutonium storage and the dilute & dispose facilities (current or expanded). **48-23 cont'd**

Surprisingly, there is no mention of the development of a draft EIS on plutonium disposition and its relationship to the VTR project as far as plutonium purification goes. Could the two projects share purification activities? The relationship must be explained if an EIS goes forward.

What is the relationship between the VTR NEPA process and 1) the pit production EIS and 2) the surplus plutonium disposition NEPA process that is now underway? The overlaps could be numerous. Please discuss in detail. **48-26**

In conclusion, given the unpredictably high cost of the project, the lack of need for it and the associated environmental and proliferation risks of the VTR, I support the "No Action Alternative." I further request that no final EIS be issued and that, accordingly, no Record of Decision be issued. **48-1 cont'd**

Attachments to these comments, to be considered in full in any EIS, if it is issued:

1. SRS Watch scoping comments on plutonium disposition, January 28, 2021, underscores the overlap with the VTR project and other projects with large amounts of plutonium waste and presents the need for PEIS on plutonium waste (TRU) to WIPP; posted on SRS Watch website: https://srswatch.org/wp-content/uploads/2021/01/SRS-Watch-scoping-comments-plutonium-disposition-Jan-28-2021.pdf

2. Paper *The Versatile Test Reactor: Wasting Money While Undermining Nonproliferation Goals*, by Gregory S. Jones, November 19, 2019, https://nebula.wsimg.com/36cfc0b60c4368a263ec13569e054b0e?AccessKeyId=40C80D0B51471CD86975&disposition=0&alloworigin=1

3. Document from SRS, obtained by SRS Watch via a Freedom of Information Act request, documenting 11.5 metric tons of plutonium now stored in the K-Reactor, *2020 Savannah River Site Plutonium Inventory Update*, posted on SRS Watch website: https://srswatch.org/wp-content/uploads/2020/09/plutonium-inventory-SRS-2020-FOIA-rcvd-Sep-22-2020.pdf

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48-24 The full reference for this document is: SRNL (Savannah River National Laboratory), 2020, Conceptual Assessment of VTR Add-on Processing Capability, SRNL-TR-2020-00171, Rev. 2, Aiken, South Carolina, July 22. The references used in this VTR EIS have been made available on the internet. A link to the references webpage is available on the DOE Office of Nuclear Energy VTR website: https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor. The document describes the conceptual activities, processes, and associated products and byproducts of feedstock preparation. Feedstock preparation addresses the first two steps in fuel production: conversion of feedstock from non-metallic forms to metals and polishing (removal of impurities). Preparation is not anticipated to be required for uranium fuel feeds since metallic uranium fuel of the appropriate enrichment is commercially available. The waste streams are discussed in Appendix B, Section B.5, "Reactor Fuel Production" and evaluated in Section 4.9.3, "Reactor Fuel Production Options of the VTR EIS."

48-25 Please refer to the response to comment 48-23. The environmental impacts associated with the VTR alternatives and VTR fuel production options considered in this EIS, are presented in Chapter 4.

48-26 DOE does not believe the relationship of the VTR project, the Surplus Plutonium Disposition Program and pit production at SRS needs to be addressed in any more detail in the body of this VTR EIS; however, they are addressed here. Note that the purpose of each of the programs is different, so even though they each deal with plutonium, their plans for that plutonium are completely different. The comment refers to the relationship between plutonium disposition and the VTR project with respect to "plutonium purification." This VTR EIS evaluates the potential environmental impacts that would occur from various processes that may be necessary to prepare plutonium feedstock for VTR driver fuel production. Among the processes are those that would remove contaminants (e.g., americium-241) so the plutonium would meet specifications for use as fuel. Conversely, the Notice of Intent to Prepare an EIS for the Surplus Plutonium Disposition Program states that under the preferred alternative, "NNSA would convert pit and non-pit metal plutonium to oxide, blend surplus plutonium in oxide form with an adulterant," and dispose of the resulting TRU waste in the WIPP facility. Thus, there are no "plutonium purification" activities involved in the current Surplus Plutonium Disposition Program that are similar to activities proposed by the VTR project. As discussed in Chapter 2, Section 2.6, one possible source of plutonium for VTR driver fuel is DOE/NNSA excess plutonium managed by the Surplus Plutonium Disposition

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Program. If this material were used for fuel, there would be coordination between the two programs. As discussed in Section 2.6, DOE/NNSA could propose in the future to make a portion of the excess plutonium available as feedstock for VTR driver fuel. Such a decision to allow use of excess plutonium as feedstock for VTR fuel production would be subject to future NEPA analysis. That analysis would evaluate the different activities that would be required to make excess plutonium available as feedstock as opposed to preparing it for disposition in accordance with current planning. Because the end point of each program is different—one focused on a high-quality metal to be used in fuel fabrication and the other a diluted oxide intended for disposal—the processes to reach those end points are different. There is no relationship between the activities evaluated in the SRS Pit Production EIS and those proposed in this VTR EIS other than contributing to potential cumulative impacts at SRS. DOE/NNSA is fulfilling a national security mission with a proposed Savannah River Plutonium Processing Facility (SRPPF) evaluated in the *Final EIS for Pit Production at the Savannah River Site in South Carolina*. The VTR project is considering use of excess plutonium that has been determined to be surplus to defense needs; it would not use the plutonium that is needed to maintain the nuclear weapons stockpile that would be processed at the SRPPF. Additionally, to avoid potential conflict or impact on the SRPPF national security mission, there are no plans to use space in the SRPPF for any of the VTR activities.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

SRS WATCH

Savannah River Site Watch

January 28, 2021

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Comments by Tom Clements, Director of Savannah River Site Watch (SRS Watch) in response to Federal Register Notice of December 16, 2020: "Notice of Intent To Prepare an Environmental Impact Statement for the Surplus Plutonium Disposition Program"
(https://www.govinfo.gov/content/pkg/FR-2020-12-16/pdf/2020-27674.pdf)

Programmatic Environmental Impact Statement (PEIS) Needed on Plutonium Disposition and All Plutonium Waste Streams Designated for the Waste Isolation Pilot Plant (WIPP) - including from Plutonium Disposition, Proposed SRS Plutonium Bomb Plant (PBP) & Fuel Fabrication for Versatile Test Reactor (VTR)

These scoping comments are being formally submitted by Savannah River Site Watch (https://srswatch.org/) for the record in response to the Federal Register notice on surplus plutonium disposition. I expect that there will be a response in the draft Environmental Impact Statement to each and every comment below. Thank you in advance for that.

These scoping comments are being submitted based on the knowledge gained from having been involved from the public-interest perspective in DOE's plutonium disposition efforts since 1995, when the first National Academies of Sciences reports on the matter were released. From the start of the plutonium disposition efforts, I supported immobilization of plutonium as waste. It was a colossal and costly mistake on DOE's part to terminate that effort, influenced by self-serving pro-MOX forces inside and outside DOE, underscoring that wisdom on the matter at hand was with public interest groups that supported immobilization and that opposed the MOX boondoggle. (The MOX debacle still merits investigation by Congress and other entities.)

I request that all documents referenced in the draft EIS will be made available on line and easily available for public review. **48-27**

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48-27 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF.

The Surplus Plutonium Disposition Program is outside the scope of this VTR EIS. Therefore, most of the comments in the document *Comments by Tom Clements, Director of Savannah River Site Watch (SRS Watch) in response to Federal Register Notice of December 16, 2020: "Notice of Intent To Prepare an Environmental Impact Statement for the Surplus Plutonium Disposition Program"* are not responded to because they are outside the scope of this VTR EIS. Portions of this comment document related to the VTR EIS are addressed in the response to comment 48-28.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

I also request that all "data call" documents solicited to prepare the draft EIS be made part of the public record and be made available via the internet. Further, I request that all Critical Decision-0 and Critical Decsion-1 documents related to the expanded plutonium disposition facilities in the K-Area at SRS be made part of the public NEPA record.

Additionally, I request that all scoping comments be published in the draft EIS, along with the responses to them.

The on-line scoping webinar on January 25, 2021 posed problems due to a broken link in an email notice sent by NNSA and due to an incorrect link printed in The State newspaper in Columbia, SC. The transcript of that meeting will show that I made an oral comment about this during the meeting. The problem with the links is simply unacceptable given the NNSA financial resources and personnel involved in the scoping process. When the draft EIS is announced, much better performance will be expected.

Please acknowledge receipt of these comments, which are being emailed and, due to poor handling of emailed comments during the plutonium pit NEPA process, are also being mailed.

Claims have been made that disposal of plutonium is being done for nuclear non-proliferation reasons. While plutonium undergoing disposal might not be readily available for nuclear weapons use, what impact does plutonium disposition have on the maintenance of around 4000 active and reserve weapons and plans for several new weapon designs? Is there any connection or impact?

Amount of plutonium covered in the NOI needs clarification

The Notice of Intent states that "in August 2020 NNSA prepared a Supplement Analysis (SA) based on the analysis presented in the 2015 SPD SEIS to evaluate using dilute and dispose for disposition of 7.1 MT of non-pit plutonium that comprises a part of the 34 MT (DOE/EIS–0283–SA–4, August 2020)" and "This same dilute and dispose process is being proposed to disposition the full 34 MT of surplus plutonium that is the responsibility of the Surplus Plutonium Disposition Program."

Thus, will the draft EIS apply to an additional 26.9 MT of surplus plutonium or not? Please clarify the amount of plutonium to be covered by the draft EIS and why the NOI was issued for 34 MT when the actual amount appears to be 26.9 MT.

How does the 6 MT of plutonium designed for dilute & dispose in 2016 relate to the 34 metric tons covered in the NOI? (See Record of Decision, April 5, 2016: https://www.govinfo.gov/content/pkg/FR-2016-04-05/pdf/2016-07738.pdf) Is D&D now proposed for 40 MT (34 MT + 6 MT) of surplus plutonium?

48-27 cont'd

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Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

How much plutonium designated for disposition is now managed and will be managed during storage, processing and disposal by DOE's National Nuclear Security Administration and/or DOE's Office of Environmental Management? What is the relationship between the offices of NNSA, EM and WIPP site management in the D&D project?

The National Academies of Sciences indicates in its plutonium disposition report that 48.2 MT of plutonium could go to WIPP. From the report: "Therefore, this report reviews and assesses the viability of DOE's plans to process up to 48.2 MT of surplus plutonium—the amount that is under consideration or slated for disposal—as diluted surplus plutonium transuranic (DSP-TRU) waste in WIPP." Does DOE/NNSA agree that 48.2 MT would eventually be processed for disposal in WIPP? Does that mean that an additional 8.2 MT would eventually go to WIPP (40 MT now apparently designated by DOE to go to WIPP + 8.2 MT not yet designated)?

How much plutonium is currently surplus? In total, how much surplus plutonium will eventually be disposed of? How does plutonium not yet designated for future disposition impact current planned development of facilities? How would the draft EIS and final EIS before us now relate to or impact preparation of future NEPA documents on plutonium disposition?

If more plutonium than mentioned in the NOI were to be formally considered for disposition, which appears to be the plan, what type of NEPA document(s) would be prepared? Why isn't the full amount of surplus plutonium being considered now? If more plutonium is added later and reviewed under NEPA how does that not comprise "segmentation" under NEPA?

Programmatic Environmental Impact Statements (PEISs) Required

Concerning plutonium processing and disposition, at least two Programmatic Environmental Impact Statements (PEISs) are needed.

The first PEIS that is needed, as has been communicated several times to NNSA by the lawyer for Savannah River Site Watch, Nuclear Watch New Mexico and Tri-Valley CAREs, concerns system-wide impacts of plutonium pit production. Though a PEIS is legally required, NNSA went immediately to preparation of site-specific NEPA documents for Los Alamos National Lab and the Savannah River Site (SRS) and skipped the required PEIS. The mandated PEIS would include an overview of all DOE sites that would have pit-production impacts, then the site-specific documents would be prepared. The PEIS would review capacity of the Waste Isolation Pilot Plant to receive TRU from pit production and that document would thus be integrally related to other plutonium and TRU waste streams designated for WIPP.

48-27 cont'd

The second PEIS that is needed and hereby requested would be on generation and disposal of transuranic waste (TRU) from the various plutonium-related programs in the Waste isolation Pilot Plant (WIPP) or a second TRU repository. Three plutonium-centered projects will generate large volumes of TRU which, along with existing TRU, may cause the WIPP capacity to be over subscribed. Those projects are: 1) plutonium disposal as discussed in the NOI now at hand (plus future amounts of plutonium designated for disposal), 2) TRU from fabrication of plutonium

48-28

48-28 A programmatic evaluation of TRU waste management and WIPP facility operations, including the need for a second TRU waste repository, are outside the scope of this VTR EIS. Please refer to the response to comment 48-7 for more information.

In addition, Please refer the discussion in Section 2.4, "Plutonium Use and Disposition," of this CRD for a discussion of the issue of "stranded plutonium."

The VTR fuel preparation activities would produce two types of TRU waste—the primary waste that requires dilution and secondary wastes (e.g., job control waste) that would not. Appendix E of this VTR EIS details the various plutonium contaminated TRU wastes and their disposal packaging.

There are no overlaps in space or equipment between any surplus plutonium disposition facilities and the proposed VTR fuel production facilities at K-Area at SRS. Please refer to the response to comment 48-20 for more information.

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

pits for nuclear warheads and 3) TRU from fabrication of fuel for the Versatile Test Reactor (VTR), either at SRS or Idaho National Lab. None of those three plutonium projects can be analyzed in a stand-alone manner so as to ignore the significant amounts of TRU waste generated and the impacts of such generation and disposal by all the projects. Thus, a PEIS on overall plutonium management and disposal issues is needed. That PEIS would include a full review of WIPP and planned and future TRU going to that facility, with the 2024 New Mexico Environment Department license renewal date in mind.

Given WIPP license renewal complications and the volume cap of WIPP under the Land Withdrawal Act (LWA), there may well be no place for all TRU to go unless a new repository is constructed or unless TRU generation is curtailed (such as cancellation of the proposed Plutonium Bomb Plant at SRS or termination of the VTR project).

Given WIPP volume pressures, plans for a second TRU waste repository must be considered in the draft EIS.

The National Academies of Sciences is supportive of a PEIS on plutonium disposal in WIPP, as recommended in *Review of the Department of Energy's Plans for Disposal of Surplus Plutonium in the Waste Isolation Pilot Plant (2020)*, by the Committee on Disposal of Surplus Plutonium at the Waste Isolation Pilot Plant, Nuclear and Radiation Studies Board, Division on Earth and Life Studies). See pertinent recommendation on page 101 of the report:

> RECOMMENDATION 5-5: The Department of Energy should implement a new comprehensive programmatic environmental impact statement (PEIS) to consider fully the environmental impacts of the total diluted surplus plutonium transuranic (DSP-TRU) waste inventory (up to an additional 48.2 MT) targeted for dilution at the Savannah River Site and disposal at the Waste Isolation Pilot Plant (WIPP). Given the scale and character of the diluted surplus plutonium inventory, the effect it has on redefining the character of the WIPP, the involvement of several facilities at several sites to prepare the plutonium for dilution, a schedule of decades requiring sustained support, and the environmental and programmatic significance of the changes therein, a PEIS for the whole of surplus plutonium that considers all affected sites as a system is appropriate to address the intent and direction of the National Environmental Policy Act and would better support the need for public acceptance and stakeholder engagement by affording all the opportunity to contemplate the full picture.

The *Final Environmental Impact Statement for Plutonium Pit Production at the Savannah River Site in South Carolina (SRS Pit Production EIS)* (DOE/EIS-0541) states this about the significant volume of TRU from pit production for nuclear weapons at SRS and Los Alamos:

> TRU Waste: Under the Proposed Action, significant quantities of TRU waste could be generated at SRS and shipped to WIPP for disposal. It is estimated that approximately 22,950 cubic meters (30,000 cubic yards) of TRU waste could be

48-28 cont'd

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> generated over the life of the project (i.e., 50 years) at SRS, assuming a production rate of 50 pits per year. In addition, approximately 5,350 cubic meters (6,998 cubic yards) of TRU waste could be generated over the life of the project (i.e., 50 years) at LANL, assuming a production rate of 30 pits per year. For NEPA purposes, it is assumed that the available volume capacity of the WIPP facility would accommodate the conservatively estimated TRU waste volume from pit production that could be generated over the next 50 years. (page S-32)

The *Draft Versatile Test Reactor Environmental Impact Statement (*VTR EIS) (DOE/EIS-0542) also reveals a large amount of TRU as a by-product of fuel fabrication at either SRS or Los Alamos:

> The Waste Isolation Pilot Plant (WIPP) is currently the only disposal option for TRU waste. WIPP's Land Withdrawal Act total TRU waste volume limit is 175,564 cubic meters. As of the reporting date for the 2019 *Annual Transuranic Waste Inventory Report* (ATWIR), 67,400 cubic meters of TRU waste were disposed of at the WIPP facility. The alternatives and options evaluated in this EIS would generate an estimated 24,000 cubic meters of TRU waste. TRU waste volume estimates such as those provided in NEPA documents, cannot be used to determine compliance with the WIPP Land Withdrawal Act TRU waste volume capacity limit. These wastes and waste from other actions will be incorporated, as appropriate, into future ATWIR TRU waste inventory estimates. (page S-40)

If pit production were to produce 28,300 cubic meters of TRU and VTR fuel fabrication were to produce 24,000 cubic meters of TRU, for a total of 52,300 cubic meters, about 120,000 cubic meters remains in WIPP for all other TRU disposal. As the Land Withdrawal Act volume cap may not be increased, or may not be increased without constraints on the license by the New Mexico Environment Department, there may not be adequate space in WIPP for plutonium disposition. The draft EIS on surplus plutonium disposition simply can't assume that more drifts will be added to WIPP to accommodate the vast amount of plutonium slated for disposal in WIPP. **48-28 cont'd**

If about 6 MT of plutonium are TRU waste from VTR fuel fabrication - a figure from an expert on the matter - then this could imply that disposal of 34 MT of plutonium will create a far larger amount of waste than 24,000 cubic meters. Thus, how many cubic meters of TRU would disposal of 34 MT of plutonium in WIPP comprise? How many cubic meters of TRU would be generated by disposal of 40 MT of plutonium in WIPP? What percentage of the LWA volume cap would plutonium disposal compromise?

Taking into account all other TRU planned for disposal in WIPP, the draft EIS on surplus plutonium disposition must decisively prove that there is space for 34 MT or 40 MT of surplus plutonium in WIPP. Unless the ill-conceived VTR project were to be canceled, which is very possible, or if the proposed and unjustified SRS Plutonium Bomb Plant (PBP) were to be canceled, a growing possibility, there simply isn't volume in WIPP for all the surplus plutonium slated for disposal. This underscores the urgent need for preparation of a PEIS addressing all

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plutonium to WIPP, to be prepared before the *Environmental Impact Statement for the Surplus Plutonium Disposition Program* is prepared.

DOE has ignored the recommendation by the NAS concerning the PEIS but it is unknown why the suggested approach has been rejected. The NOI failed to explain this but the draft EIS must do so.

Does DOE have a "pecking order" of the various planned plutonium waste streams to WIPP, including from the pit project, the VTR project, surplus plutonium disposition and other TRU?

To reiterate, considering the above, large impacts to WIPP of the three above-named plutonium projects, I request that the PEIS be conducted before any site-specific EIS for plutonium disposition is conducted.

A NNSA official has stated that WIPP is a "choke point" for the pit project (for nuclear weapons) and this also may apply to surplus plutonium disposition and disposal of TRU from the VTR project. See Exchange Monitor article of September 10, 2020: *TRU Waste 'Far and Away' Largest Challenge for NNSA Pit Mission, Official Says*: "Far and away the biggest challenge for NNSA is to make sure that the disposal system for transuranic waste is robust enough to not become a choke point for our mission," McConnell said." (James McConnell, NNSA's Associate Administrator for Safety, Infrastructure and Operations) This underscores the need for the PEIS on WIPP volume. Is WIPP also a "choke point" for the 34 MT of plutonium covered in the NOI?

48-28 cont'd

As part of the draft EIS on "plutonium disposition," a stand-alone review of overall WIPP volume and impacts of other TRU disposal programs must be conducted. 34 metric tons or more of plutonium, when downblended, will take up a huge volume in WIPP and put pressure on the legal volume cap as stipulated in the LWA. An expansion of WIPP to receive more volume that currently specified by the LWA cannot be assumed. Likewise, a NMED license extension for WIPP, especially with no conditions attached, cannot be assumed.

What would happen to the surplus plutonium disposition project if disposal space at WIPP is limited? Would the SRS project slow down or be halted? Would shipments of plutonium or storage of plutonium at SRS or other sites be impacted? If WIPP volume were to be a limiting factor, how would space be assigned to plutonium from the surplus plutonium disposition project (and the other plutonium TRU-generating projects, such as plutonium pits for nuclear weapons and from the VTR project)? These issues would be covered in the requested PEIS as well as the draft EIS at hand.

The PEIS and draft EIS must consider the need for a second TRU repository. For plutonium disposition, is NNSA counting on either a second repository of an increase by Congress in the volume cap as legally established by the Land Withdrawal Act? Is DOE counting on no constraining conditions being applied by the New Mexico Environment Department on any WIPP license extension, or not?

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Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

I request that the draft EIS report anticipated TRU waste amounts both in weight and in cubic meters. 48-28 cont'd

Sources of plutonium to be disposed of?

Where is the plutonium stored that is slated to undergo disposition? Does it primarily consist of plutonium pits now stored in bunkers at Pantex? How will the plutonium scheduled for disposition be selected? Are some pits unable to be used again in a nuclear warhead and therefor at the top of the list for disposition?

How much of the approximately 11.5 metric tons of plutonium now stored at SRS - see attached DOE document confirming this amount - will undergo disposition? Will this material already at SRS be processed before more plutonium is brought into South Carolina? What is the schedule for bringing more plutonium into South Carolina, processing it and shipping it out?

I request that no more plutonium be brought to SRS until the 11.5 MT now at the site are removed. Is this the plan or not? 48-27 cont'd

What are the amounts of plutonium to be shipped to SRS and processed on an annual basis and cumulative basis and in what form will the incoming plutonium be?

Will more plutonium be declared surplus?

How will such plutonium be shipped to SRS? Will pits or other plutonium need to be processed into unclassified forms before transport? Will intact pits be transported to SRS? (Have any pits ever been shipped to SRS or stored or processed at SRS?) How much plutonium slated for disposition will be at SRS at any given time? Please present plutonium amounts to be at SRS from now to the end of the plutonium disposition n project.

What firm guarantee can DOE give that "new" plutonium brought into South Carolina will not be stranded at SRS? What would be the environmental impacts be of additional "stranded" plutonium at SRS? Will DOE/NNSA agree to a formal agreement with the State of South Carolina concerning removal of all plutonium imported for D&D (as well as for VTR fuel fabrication and pit production)? As this has environmental impacts, these matters must be discussed in the draft EIS. 48-28 cont'd

As the VTR would operate for 60 years and use about 0.5 MT of plutonium per year, likely from surplus pits, for fuel fabrication, it could create around 6 MT of TRU in fuel fabrication. Would any of this TRU from VTR fuel fabrication be counted as part of the 34 MT covered in the NOI? Would that VTR TRU undergo dilute & dispose? If not, what process would prepare that waste for disposition?

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Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

Please explain the role of TA55 and PF4 at LANL in plutonium disposition. Which facilities or equipment would be located there? How much plutonium could be staged at those facilities, for plutonium disposition as well as for pits and what is the relationship between the pit and disposition programs? For example, is any facility or any equipment common to both programs? If there are common facilities and/or equipment which project gets priority in their use?

How much plutonium has undergone "dilute & dispose" at SRS and how much of that has been disposed of it WIPP?

The "dilute & dispose" process for surplus plutonium has been underway at SRS at low processing rates for a numbers of years. When did it begin? What has the performance of this project been? How much plutonium has been processed via this manner? In what type of containers has disposal taken place, and in what amounts, such as via Pipe Overpack Containers or Criticality Control Overpacks? How many POCs and CCOs from SRS have been disposed of it WIPP? How much plutonium from SRS been disposed of in WIPP?

Are there plans as plutonium disposition expands at SRS for use of containers with larger amounts of plutonium? In the past, SRS officials have said that containers with 1 kilogram of D&D plutonium had been considered. Is this still the case? Are plans for direct disposal of plutonium metal being considered, including pits? Are plans for direct disposal of plutonium-bearing 3013 cans being considered? Would these forms meet the WIPP WAC?

What type of safeguards are in place or will be put in place to monitor the amount of plutonium that goes into WIPP? Will such safeguards be part of the US-Russia plutonium disposition agreement (which Russia has abrogated)? Will the International Atomic Energy Agency (IAEA) monitor disposal of plutonium in WIPP and verify the amounts of plutonium processed at SRS going into WIPP? What will be the steps used for termination of safeguards at SRS, or upon disposal in WIPP? How will implementation of IAEA safeguards impact processing and packaging of plutonium at SRS and will there be associated environmental impacts?

I note that the NAS *Review of the Department of Energy's Plans for Disposal of Surplus Plutonium in the Waste Isolation Pilot Plant* underscores the importance of IAEA safeguards for the processing of plutonium and emplacement in WIPP of plutonium containers, see page 82:

> **5.1.1 Uncertain Protocols for International Inspection and Verification for Emplaced Waste**
> IAEA monitoring and inspections are an important component of the PMDA requirements and they could also provide enhanced public and international confidence that the material is properly accounted for and emplaced in WIPP. As noted in Chapter 2, the director of the Office of International Nuclear Safeguards at

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the DOE-NNSA reported to the committee that the DOE-NNSA is in the process of working with the IAEA to discuss what role, if any, IAEA involvement might play in the disposition of DOE-EM's 6 MT (Veal, 2019). Typical international safeguards (monitoring and verification) use accountancy to ensure that declared nuclear material is present as intended, coupled with a containment and surveillance system to ensure that no changes occur between inspections. Implementation of IAEA protocols for verification and monitoring of materials for pre-disposal are well established, but IAEA verification protocols for material emplacement in any repository are still under development. Inspection and verification protocols for repository emplacement, where access for monitoring may be a challenge and remote devices may compromise required passive safety measures, could have a significant impact on both repository operations and design (Haddal et al., 2014).

The DOE-NNSA dilute and dispose Master Schedule for the 34 MT (see Figure 3-1; DOE-NNSA, 2018a) indicates verification protocols for the activities at SRS are to be in-place in in FY 2022 and for WIPP in FY 2023, yet the DOE-NNSA may emplace DSP-TRU waste with or without IAEA inspection protocols in place. Therefore, substantial uncertainty remains on the applicability and possible implementation of IAEA monitoring and verification protocols. Resolution of this uncertainty holds substantial implications for WIPP operations and future design changes (such as the new shaft and panels now under development), and therefore this issue remains a significant system vulnerability.

The issues raised by the NAS about impacts at SRS and to WIPP of IAEA monitoring and verification must be addressed in the draft EIS. Have comments in response to the NOI been solicited from the IAEA?

Additionally, as some plutonium already stored at SRS is under IAEA monitoring, will processing and packaging of this material be handled in any special way?

I request that the IAEA be involved in safeguards matters concerning plutonium disposition and that such a role be discussed in the draft EIS.

What facilities at SRS are involved in plutonium receipt storage and processing?

All the facilities at SRS that are currently being used or that have been used for plutonium receipt, storage and processing must be discussed in the draft EIS. Facilities that might be involved in the future obviously need full discussion.

At the "category 1" facility at the K-Reactor, are there plans to expand category 1 security in the K-Area or beyond the K Area? Would this include any new plutonium container storage pad outside the K-Reactor building? Would the E-Area continue to be used for staging of CCOs?

48-27 cont'd

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Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

Are there low-level waste streams or chemical waste streams from the D&D process? The status of creation of any chemical or nuclear waste streams during the D&D process and how they will be disposed of needs discussion. Would D&D result in any on-site disposal of waste at SRS or disposal at other DOE or private waste disposal sites? Would there be disposal of D&D waste in unlined trenches at SRS? Which federal laws would apply to disposal of this waste?

It has been stated that the goal at SRS is to increase the number of gloveboxes involved in dilute and dispose. Please discuss how many gloveboxes would be installed, where they would be installed and discuss the capacity and schedule and timetable of ramping up the D&D process in them. How many kilograms of plutonium would be processed per year in the gloveboxes until the 34 MT or 40 MT have been disposed of?

How many jobs would be involved at SRS as the D&D rate increases? How many jobs would D&D entail at WIPP and at other sites or DOE offices (such as transport, via the Office of Secure Transportation)? How much would D&D cost on an annual basis from start to finish?

Could the shell of the mixed oxide fuel plant at SRS be considered for the D&D process or plutonium feedstock preparation? It is not a given that the proposed SRS Plutonium Bomb Plant (PBP), for pit production for old and new nuclear warheads, would be located in the old MOX plant, thus making it potentially available for other uses. Could the MOX building be used for staging of D&D containers before shipment off site?

Could the mothballed Waste Solidification Building (WSB) at SRS, built as part of the failed MOX project, have a role in the D&D projects, such as staging for D&D containers or other waste?

What are risks, including corrosion and gas generation, to plutonium storage containers over lengthy periods of storage? What is the monitoring program of the inner and outer containers holding plutonium slated for D&D?

Plutonium for Dilute & Dispose process?

From which site(s) and which processes would plutonium oxide or pulverized plutonium originate? Will the ARIES process be used to prepare plutonium for disposal?

Could the ARIES process or other processes to prepare plutonium for D&D be located at Los Alamos, SRS and/or Pantex? Would the entire D&D process itself be located at Los Alamos, Pantex or another site? A full evaluation of locating all the D&D process at LANL or Pantex, in addition to SRS, must be included in the draft EIS. (See attached paper for more discussion about the Pantex-only option.)

48-27 cont'd

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Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

How is ARIES adopted to process plutonium with different levels of impurities, e.g. pits vs non-pit "alternate feedstock?" What level of plutonium purity is needed for the dilute & dispose process? How much impurities are allowed in plutonium feedstock?

Are there plans for the ARIES process to be made more efficient or improved? If the ARIES process is modified in any way, will this be communicated to the public as part of a NEPA analysis?
Could an aqueous process be used for plutonium purification? Could the 66-year-old H-Canyon reprocessing plant at SRS be used for this purpose?

As plutonium pits that would be processed for disposal are located at Pantex, does it makes sense to locate the entire D&D program at Pantex? Locating all D&D activities at Pantex, as well as the process to produce plutonium oxide, would mean far less distance that plutonium would be shipped for processing and disposal, resulting in less risk in transport and less security risks. Additionally, security at Pantex is high. I request that an all-Pantex option be considered. **48-27 cont'd**

The Virtual Test Reactor fuel fabrication process at SRS or LANL would produce a large amount of plutonium waste and this material might have to be downblended and under safeguards. Would the D&D process for surplus plutonium disposition be applied to VTR TRU and would there be any overlap with D&D and management of VTR TRU waste? **48-28 cont'd**

The nature of the "inert material" known as "stardust" (also called a "multicomponent adulterant" by NNSA) used in the dilute & dispose process needs full discussion. What is the nature of the "inert material" into which the plutonium would be downblended? Has the make-up of the stardust material changed since the initial D&D was implemented? What is the "proliferation resistance" of this material to the removal of weapon-grade plutonium, via reprocessing or other techniques? Does the material itself pose health or environmental risks in handling or disposal? Could the formulation of stardust change in the future?

The plutonium currently undergoing D&D at SRS is going into CCOs, which may hold 300-380 grams of plutonium per container. How many grams/container will be analyzed in the draft EIS? Will larger amounts of plutonium be considered for loading into CCOs or larger containers? Will plutonium be approximately 10% or less of the material in the D&D container? How will the amount of plutonium per container be verified by DOE/NNSA (and the IAEA)? What will be the "attractiveness level" of plutonium containers going into WIPP? **48-27 cont'd**

For plutonium already disposed of in WIPP, whether from Rocky Flats or in POCs or CCOs from SRS, have there been shown to be risks of such disposal in WIPP? Such as heat or gas generation of concern or chemical reactions of concern? How is placement of plutonium POCs or CCOs taken into consideration in WIPP? Is such placement near to containers that could be at risk of explosion?

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Will containers additional new plutonium brought into SRS for disposal undergo "destructive examination" or "non-destructive examination" during storage? What are the environmental impacts of this? Will SRS have the capacity to weld shut the 3013 cans that might be examined via DE, for long-term storage? Will cans that are not welded shut be stored and for how long?

Does dilute & dispose meet the "spent fuel standard" or "stored weapons standard" as established by the National Academies of Sciences in 1995 and in the DOE's initial plutonium disposition EIS process? If not, why not? Has DOE/NNSA established an equivalent of the "spent fuel standard" or "stored weapons standard" with the D&D process now being deployed? Have the "spent fuel standard" and "stored weapons standard" been abandoned?

Will some form of proliferation risk assessment of disposing of D&D container of plutonium in WIPP be prepared and made a part of the draft EIS record? If not, why not? I request preparation of this proliferation assessment as part of this NEPA process. Is WIPP at risk of becoming a "plutonium mine?"

What happens if the D&D project for 34 MT/40 MT is begun and stops midstream? How will the plutonium already at SRS be managed? Will it be returned to the site of origin? How long can such plutonium safely be stored at SRS and in which type of container?

What are the criticality risks of operating various gloveboxes for D&D? What are risks to workers and the environment in case of an accidental release of plutonium or unanticipated nuclear criticality? Would a plutonium fire be possible and what would be the impacts?

How many shipments of both pure plutonium and downblended plutonium and how many shipment miles would be involved in the various disposition options?

Immobilization

The most promising method to process and dispose of plutonium was immobilization of ceramic pucks containing plutonium in vitrified high-level waste as SRS. The process evidently was killed for political reasons in 2002, by those backing the failed, mismanaged plutonium fuel (MOX) project.

Discuss why the can-in-canister immobilization project was killed. Discuss the possibility of reviving such immobilization at SRS.

Another approach to immobilization was transfer to high-level waste tanks of plutonium, for direct vitrification along with high-level waste. In 2009, DOE issued an "Interim Action Determination" *- Processing of Plutonium Materials in H-Canyon at the Savannah River Site -*

48-27 cont'd

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authorizing disposal of 420 kg of plutonium materials via H-Canyon into the SRS tank system. How much plutonium was vitrified in this manner and what were the results of such vitrification? What was the impact to systems at the Defense Waste Processing Facility (DWPF) with this program? Was a criticality risk posed at DWPF or any other point in the tank-waste system? How much of that plutonium transferred to HLW tanks remains there? Why was that approach terminated? Can it be revived? There must be a full discussion of this in the draft EIS.

Other processes for plutonium processing?

Other processes for the plutonium downblending process should be considered, such as mixing into a stainless steel matrix or using a ceramic form, such as the Hot Isostatic Pressing (HIP) process that has been developed in the United Kingdom.

For unique surplus plutonium materials, is processing directly through the H-Canyon into the SRS waste tanks being considered? For example, SRS is evidently planning to process the stainless-steel-clad Fast Critical Assemblies (FCAs) from Japan, containing about 331 kilograms of plutonium, directly into the waste tanks, as part of the 6 MT designated for disposal. Would other such unique materials, such as plutonium from Europe, be part of the 34 MT being considered for disposal in this NEPA process?

48-27 cont'd

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Attachments submitted into the record and for consideration and response in the draft EIS:

#1 "Charting the Best Path Forward for Surplus Plutonium Disposition," paper presented at the July 2020 meeting of the Institute for Nuclear Materials Management (INMM), by Dr. Edwin S. Lyman, Director of Nuclear Power Safety, Climate and Energy Program, Union of Concerned Scientists, Washington, DC.

#2 DOE document "2020 Savannah River Site Plutonium Inventory Update"

Thank you for consideration of these comments submitted by:

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Gregory S. Jones[1]
November 18, 2019

The Versatile Test Reactor: Wasting Money While Undermining Nonproliferation Goals

In February 2019, U.S. Secretary of Energy Rick Perry announced the start of a project to build the Versatile Test Reactor (VTR). The VTR will be a type of research reactor known as a "materials testing reactor." The VTR will "produce neutrons to test how fuels, materials, components and instrumentation will perform if used in commercial power reactors."[2] The current project will develop the reactor's design, cost and construction schedule but the final decision to proceed with the VTR will not be made until 2022.[3]

When neutrons are released by fission, they have a high energy and are traveling at high speed. These are said to be "fast" neutrons. All commercial nuclear power reactors, as well as most research reactors contain a light material known as a moderator (usually either water, graphite, heavy water or zirconium hydride) which slows the neutrons. Such reactors are known as "thermal" reactors.[4] The VTR will not contain any moderator resulting in the reactor using fast neutrons and will be a fast reactor.

Fast reactors cannot use water as a coolant and the VTR will use liquid metallic sodium instead. The reactor could be fueled using 20% enriched uranium but the requirements for the VTR have been set in such a way that plutonium will be needed.[5] For the base case it is currently planned to use a metallic alloy as the fuel, which would be 20% plutonium, 10% zirconium and 70% uranium enriched to 5% (i.e. the uranium will be 5% U-235 and 95% U-238).

The U.S. Department of Energy (DOE) has said that the VTR is needed to develop and deploy what it has termed "advanced" nuclear energy technologies. DOE has said that these advanced reactor technologies could be deployed by 2030.[6] It has also said that these advanced nuclear reactor types will be developed "with or without the United States" and if the U.S. does not build

[1] This paper is the product of the author's personal research and the analysis and views contained in it are solely his responsibility. Though the author is also a part-time adjunct staff member at the RAND Corporation, this paper is not related to any RAND project and therefore RAND should not be mentioned in relation to this paper. I can be reached at GregJones@proliferationmatters.com
[2] "Versatile Test Reactor," Office of Nuclear Energy, U.S. Department of Energy, "Frequently Asked Questions: What is a test reactor?" https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor
[3] *Ibid.*, "Frequently Asked Questions: Has a decision been made to build a VTR?"
[4] The thermal agitation of the moderator atoms limits how much the neutrons can be slowed. Neutrons moving at this speed are termed thermal neutrons and hence the term thermal reactors.
[5] Specifically, the reactor must provide a neutron flux of "at least 4×10^{15} neutrons/cm^2-sec." "Notice of Intent To Prepare an Environmental Impact Statement for a Versatile Test Reactor," Office of Nuclear Energy, Department of Energy, *Federal Register*, Vol. 84, No. 150, August 5, 2019, p. 38023. https://www.govinfo.gov/content/pkg/FR-2019-08-05/pdf/2019-16578.pdf This requirement can only be met by using fuel containing plutonium. Kemal Pasamehmetoglu, "Versatile Test Reactor Overview," Advanced Reactors Summit VI, San Diego, California, January 29-31, 2019, p. 4. https://gain.inl.gov/SiteAssets/VersatileTestReactor/VTR_OVERVIEW.pdf
[6] "3 Advanced Reactor Systems to Watch by 2030," Office of Nuclear Energy, U.S. Department of Energy, March 7, 2018. https://www.energy.gov/ne/articles/3-advanced-reactor-systems-watch-2030

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the VTR "U.S. companies will have no choice but to rely on foreign countries like Russia and China to develop their technologies."[7]

In reality, the VTR will be a waste of money and undermine the broader nonproliferation goals of the U.S. The need for the VTR is doubtful as it is very unlikely that any of these advanced technologies will be deployed on a significant scale even by 2050 and they could easily never be deployed. Further, given the low technological maturity of the technology to be used in the VTR, combined with DOE's desire to build the VTR on what it calls "an accelerated schedule," it is very likely that there will be significant delays and cost overruns. In addition, DOE needs to examine the safety risks of fast reactors, including the VTR, in a realistic and even-handed manner. Finally, the use of plutonium fuel in the VTR will undermine U.S. nonproliferation goals to eliminate the separation of plutonium, plutonium stockpiles and plutonium fuels in non-nuclear weapon states. 48-29

"Advanced" Does Not Mean Advanced

Naturally one would want nuclear reactors that are "advanced." The implication that the U.S. is falling behind Russia and China in developing advanced reactors sounds concerning. The VTR is being promoted as being necessary to deal with this problem and help keep pace with Russia and China. However, a 2017 report by the Idaho National Laboratory makes clear that "advanced" does not mean advanced, but rather "reactors that use coolants other than water."[8] Falling behind Russia and China in the development of advanced nuclear reactors is concerning but falling behind in the development of nonaqueous cooled reactors leads to the question, "So what?" Nonaqueous cooled reactors have been around for more than fifty years but they have seen little use. Nor, as will be discussed below, are they likely to come into widespread use soon. 48-30

In the 1970s, the U.S. was considering the development of a passenger jet that could fly faster than the speed of sound, the Supersonic Transport (SST). The Soviet Union and a UK/France consortium were also developing SSTs and a similar argument was made that the U.S. could not afford to fall behind. In the end the U.S. stopped its SST program as being uneconomical. The Soviet Union dropped out as well but the UK/France consortium continued and they developed the Concorde. While in some ways a remarkable airplane, it was not "advanced" in the way that mattered, i.e. providing economical air travel. The Concorde operated for 27 years as a prestige project but it has now ceased operation. Though air travel has greatly expanded since the 1970s, there are no SSTs in operation today.

Similarly, nonaqueous cooled reactors have a number of characteristics that differ when compared to the current type of commercial power reactors which are mainly light water reactors (LWRs). Some of the characteristics are more favorable and some (including some safety 48-30 cont'd

[7] Dan Brouillette, Deputy Secretary, U.S. Department of Energy, "DOE: There's a Definite Need for a Fast Test Reactor," Office of Nuclear Energy, U.S. Department of Energy, March 1, 2019. https://www.energy.gov/ne/articles/doe-theres-definite-need-fast-test-reactor

[8] D. Petti et. al., "Advanced Demonstration and Test Reactor Options Study," INL/EXT-16-37867, Idaho National Laboratory, January 2017, p. viii. https://art.inl.gov/ART%20Document%20Library/Advanced%20Demonstration%20and%20Test%20Reactor%20Options%20Study/ADTR_Options_Study_Rev3.pdf

48-29 Information about lack of a domestic fast-neutron testing capability and the purpose and need for a VTR is discussed in Chapter 1 of this VTR EIS. DOE is pursuing the VTR to provide a test capability that supports the fulfillment of its mission of advancing the energy, environmental, and nuclear security of the United States and promoting scientific and technological innovation in support of that mission. Refer to Section 2.2 of this CRD for additional discussion of the purpose and need for the VTR.

DOE is following a disciplined approach to managing the VTR project in accordance with the DOE Order for Program and Project Management for the Acquisition of Capital Assets. It is DOE's intent to define technical, cost, and schedule baselines and work hard to perform work as close to those baselines as practical. DOE recognizes that it may experience schedule delays as a result of a number of factors, including Federal appropriation and technical challenges associated with the design and construction of a one-of-a-kind reactor. DOE is focused on managing those factors under its control that affect cost and schedule. The process followed by DOE includes contingencies in cost and schedule and DOE would make adjustments in response to perturbations with the goal of meeting cost and schedule commitments to the extent possible.

The impacts of accidents associated with VTR operation are presented in Chapter 4 with details of the accident analyses provided in Appendix D of this VTR EIS. The safety risks of other fast reactors is outside the scope of this VTR EIS.

DOE notes that the VTR project would not result in separation of plutonium or adding to plutonium stockpiles. In fact, it would do just the opposite. VTR driver fuel would be fabricated using existing, separated plutonium (thereby depleting those stockpiles) and, as stated in Chapter 2 of this VTR EIS, DOE does not intend to recover fissile materials from VTR spent fuel. Refer to Section 2.3, "Nonproliferation," of this CRD for additional discussion of this topic.

48-30 DOE supports research in the development of advanced reactors recognizing that such research may lead to the development of new types of commercially viable reactors. As discussed in Chapter 1 of this VTR EIS, the purpose of the VTR is to provide a testing capability in support of such research. In addition, the VTR would provide a valuable test capability that would support advanced thermal reactor research and development and advanced reactor development for non-breeder, non-plutonium fueled reactors (e.g., reactors using high-assay, low-enriched uranium). Refer also to Section 2.2 of this CRD for additional discussion of the purpose and need for a VTR. Refer also to the response to comment 48-29.

characteristics) are less so. But over the last 50 years their unfavorable economics have meant they have not been used commercially. Advocates for the VTR have not provided any evidence that this has or will change. 48-30 cont'd

The Plutonium Fast Breeder Reactor Dream

During World War II the first nuclear reactors were designed to produce plutonium. It was recognized that if these reactors were modified to increase the temperature of the coolant, then useful amounts of electricity could be generated. The problem was that at the time very little uranium was known to exist in concentrations that could be economically mined. What is worse, nuclear power reactors whose design was derived from plutonium production reactors, as well as the LWRs which are in widespread use today, obtain their energy from mainly the U-235 in the uranium. But natural uranium is only 0.7% U-235 (U-238 makes up 99.3%) and with the known uranium resources of the time, nuclear power's contribution to energy production could not be large.

In the early 1950s, the solution to this problem was believed to be the fast breeder reactor. Current LWRs convert some U-238 into plutonium but these reactors produce less plutonium than they consume U-235. However, reactors can be designed that use plutonium fuel and as they operate, actually convert more U-238 to plutonium than is consumed in the process. The nuclear characteristics of plutonium are such that for this to occur, the use of fast neutrons is required. As a result, water cannot be used as a coolant. Instead reactors were designed that used liquid metallic sodium as a coolant which does not slow down the fast neutrons produced by fission. By "breeding" more plutonium than is consumed, this type of reactor has the potential to utilize a large fraction of the U-238 contained in uranium and could increase the amount of energy extracted from uranium by roughly one hundred-fold.

Technologically, the fast breeder reactor is an elegant solution to the problem of the lack of uranium. In the 1960s and 1970s extravagant projections were made as to the fast breeder reactor's future. It was expected that commercial breeder reactors would come into service around 1980 and by 2000 all new reactors would be breeders. Given that oil and natural gas were also expected to be depleted soon, most energy would be produced by breeder reactors. In 1974, the U.S. Atomic Energy Commission estimated that today there would be almost 2,000 gigawatts of breeder reactors in the U.S. alone.[9]

The Reality Behind the Dream

The driving factor behind these plans for the plutonium fueled fast breeder reactor was the belief that supplies of uranium were not very large. However, the only reason that world reserves of uranium were so low in the 1940s and early 1950s is because no one had tried very hard to look for uranium. Before the nuclear age there was no need to do so. In the 1950s, the U.S. used a price incentive program and provided technical information to spur uranium exploration in the

[9] Albert Wohlstetter, Gregory Jones, and Roberta Wohlstetter, "Towards a New Consensus on Nuclear Technology, Volume I, Why the Rules Need Changing," Pan Heuristics, PH-78-04-832-33, July 6, 1979, p. 16. http://www.npolicy.org/files/19790706-TowardsANewConsensus-Vol01.pdf

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U.S. and large quantities of uranium were discovered in the Western U.S.[10] Further oil and natural gas supplies were not nearly so limited as were believed at the time and as energy prices rose it was economical to use less energy more efficiently. As a result, today the total electricity generating capacity of the U.S. is only about 1,100 gigawatts, of which only about 100 gigawatts is from nuclear power. With the greatly reduced demand for nuclear electricity and increased uranium supplies, uranium resources have been more than adequate and the real price of uranium has not increased in 50 years. In this economic environment, there are no commercial breeder reactors in the U.S. or anywhere else in the world.

In 1974 India conducted a nuclear weapon test using plutonium that it had ostensibly produced in anticipation of its use in fast breeder reactors. This event led the U.S. to realize that there were substantial nonproliferation dangers in the use of plutonium as nuclear fuel. Consequently, in 1977 the U.S. adopted a policy against the separation of plutonium, plutonium stockpiles and plutonium fuels in nonnuclear weapon states. The U.S. breeder reactor program ended in 1983. Programs continued in some other countries, most notably France, Japan and the Soviet Union. However, in the twentieth century, little progress was made in developing a commercial breeder reactor.

Still, there were some who could not give up on the breeder reactor dream. In 2000 the DOE initiated the Generation IV International Forum. This was a group of ten countries (now fourteen) which intend to develop what they call "fourth generation" commercial nuclear power systems. In 2002, the forum selected six different types of reactor systems for further development, one of which was a sodium-cooled, plutonium fueled, fast reactor.[11]

The term "Generation IV," like the term "advanced," is a marketing tool rather than a technical description. There is no reason to think that these reactors will produce electricity more economically than current LWRs. There has been no rush to develop and deploy any of these six "Gen IV" reactor types including the sodium-cooled fast reactor. Indeed, a Generation IV International Forum update in 2013 showed that in the eleven years since 2002, little progress had been made in reaching the demonstration phase for any of these six reactor types.[12] For example, the projected demonstration of sodium-cooled fast reactor had slipped nine years from 2021 to 2030.

A slippage of nine years in an eleven year period throws into doubt whether such reactors will ever be built and recent events tend to support this view. In 1994, Japan completed building a small test fast breeder reactor, Monju. This reactor suffered a major accident in 1995 when over three tons of metallic sodium leaked out of the cooling system. Metallic sodium is chemically highly reactive and the oxygen and water in the atmosphere caused the formation of highly caustic fumes. The heat from the reaction was enough to warp several steel structures outside the reactor. In 2016, after various other safety issues, the reactor was shutdown for good. It had

[10] Robert D. Nininger, *Minerals for Atomic Energy*, D. Van Nostrand Company, Inc., 1954.
[11] "A Technology Roadmap for Generation IV Nuclear Energy Systems," GIF-002-00, U.S. DOE Nuclear Energy Research Advisory Committee and the Generation IV International Forum, December 2002. https://www.gen-4.org/gif/upload/docs/application/pdf/2013-09/genivroadmap2002.pdf
[12] "Technology Roadmap Update for Generation IV Nuclear Energy Systems," OECD Nuclear Energy Agency for the Generation IV International Forum, January 2014, p. 9. https://www.gen-4.org/gif/upload/docs/application/pdf/2014-03/gif-tru2014.pdf

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barely operated since it first became critical. Japan does not plan to build another fast breeder reactor but had hoped to be involved in France's ASTRID prototype breeder program.

France had a small prototype breeder reactor, Phenix, which started operation in 1973. France then built a full-scale breeder reactor, the Superphenix. It started operation in 1986 but was shutdown in 1996 due to court challenges. Phenix, which had experienced unexplained power surges was shutdown in 2009. France's breeder program then depended on its plans to build another prototype breeder, ASTRID. However, in August 2019 it announced that it had abandoned these plans. This decision effectively ended the breeder reactor program not only in France but also in Japan.

India is building its Prototype Fast Breeder Reactor (PFBR). It was originally planned to start operation in 2010 but now the PFBR will not start until 2020 at the earliest. Only Russia has two breeder prototypes in operation, the BN-600 and BN-800. Russia had planned to build a full-scale breeder reactor, the BN-1200, which was to start operation in 2030. However, in August 2019, Russia announced that the BN-1200 is now planned to start operation in 2036.

48-30 cont'd

Given the large number of delays and reactor shutdowns, the plutonium fast breeder reactor is no closer to reality today than it was 40 years ago. Yet the sodium-cooled fast reactor has had by far the most development effort of any of the six "Gen IV" reactor types. It is hard to see how the DOE can claim as a justification for the VTR that "Many of the advanced reactor designs that will likely produce power in the future will be fast reactors."[13] If there are not going to be any commercial fast nuclear power reactors, there is no need for the VTR.

Versatile Test Reactor Design Not Technically Mature

48-31

The DOE mission need statement for the VTR has stated that its capability requirements should include:

> An accelerated schedule to regain and sustain U.S. technology leadership and enable the competiveness of U.S-based industry entities in the advanced reactor markets. This can be achieved through use of *mature technologies* for the reactor design (e.g. sodium coolant in a pool-type, metallic-alloy fueled fast reactor) while enabling innovative experimentation.[14] [Emphasis added]

Elsewhere the mission need statement calls for "Use of proven technologies with high technology readiness level (TRL)."[15] Specifically DOE has said, "The current VTR concept

[13] "DOE: There's a Definite Need for a Fast Test Reactor," Office of Nuclear Energy, U.S. DOE, March 1, 2019. https://www.energy.gov/ne/articles/doe-theres-definite-need-fast-test-reactor
[14] "Mission Need Statement for the VERSATILE TEST REACTOR (VTR) PROJECT: A Major Acquisition Project," Office of Nuclear Technology Research and Development, Office of Nuclear Energy, U.S. Department of Energy, December 2018, p. 9. https://s3.amazonaws.com/ucs-documents/nuclear-power/FOIA-Approved-Mission-Need-Statement-for+Versatile-Test-Reactor-Project.pdf
[15] *Ibid.*, p. 10.

5

48-31 As stated in Chapter 2 of the EIS, sodium-cooled fast reactors are the most mature technology available for generating a high flux of fast neutrons. In addition to leveraging design information from the GE Hitachi Nuclear Energy (GEH) PRISM reactor, VTR builds on the designs of both the FFTF (operated from 1982 to 1992) and EBR-II (operated from 1964 to 1994), both are sodium-cooled fast reactors. Although both reactors were deactivated or decommissioned in the early 1990s, the reasons leading to those decisions were not safety nor operational concerns. FFTF was deactivated due to a lack of mission and EBR-II was decommissioned as a result of U.S. energy policy shifts. The purpose proposed for the PRISM reactor evaluated by the United Kingdom's Nuclear Decommissioning Authority (NDA) is significantly different than that proposed for the VTR. The test reactor experience with EBR-II and FFTF is more applicable to the VTR test reactor than the PRISM use in the U.K.-proposed mission. Their assessment that the reactor is not commercially viable was based on their rapid plutonium disposition management program needs.

The commenter extracted accurately from the NDA report, however the study made this point: "Whilst these R&D requirements are extensive, they are also reasonably well understood. However, the work needed for the fuel fabrication facility is considered preliminary and the proposal was based on not requiring further plutonium-active testing prior to scale-up and industrialization." There is no scale up nor industrialization needed for the VTR project. Therefore, direct comparisons to the conclusions of the NDA regarding the PRISM reactor are not appropriate. While the NDA report did identify fuel fabrication work is a risk, DOE has extensive experience in processing plutonium and fabricating metallic fuel. The VTR would use a metal fuel alloy composed of uranium, plutonium, and zirconium. Metallic driver fuels have previously been used as a standard-production driver fuel in EBR-II and demonstrated in FFTF, and uranium-plutonium-zirconium alloy fuel has been tested in EBR-II and FFTF. This fuel has a proven and well understood irradiation performance history. The fuel fabrication process, as described in Appendix B, Section B.5, is similar to that used for fabrication of EBR-II fuel. As part of the VTR project, however, DOE is continuing to assess VTR fuel fabrication techniques. Results of this assessment could impact the fabrication process and the final fuel fabrication process would be validated before VTR fuel fabrication begins. The feedstock preparation processes proposed to remove impurities from feedstock plutonium (e.g., an aqueous process, a pyrochemical process, and a combination of the two), if required, are all processes DOE has used in previous and ongoing plutonium operations. It is also worthwhile to note the different scale of fuel fabrication in the two efforts. The UK's NDA was assessing the ability to disposition

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would make use of the proven, existing technologies incorporated in the small, modular GE Hitachi Power Reactor Innovative Small Module (PRISM) design."[16]

The UK has recently independently evaluated the GE Hitachi PRISM design and found it to be anything but mature. The UK has had an extensive nuclear power program and has extracted a total of about 120 metric tons of plutonium from their reactors' spent fuel. Like most countries, the UK, at one time, planned to use this plutonium in breeder reactors but its breeder reactor program ended in 1994. The task has fallen to the UK Nuclear Decommissioning Authority (NDA) to devise a method to dispose of the vast stockpile of plutonium.

GE Hitachi (GEH) proposed building two PRISM reactors to reuse this plutonium. However, in March 2019, the UK NDA rejected this proposal saying:

> PRISM fast reactors were put forward by GEH as commercially viable, "ready to deploy" and capable of quickly dispositioning the complete plutonium stockpile. However, the studies undertaken by NDA with GEH over the past few years have shown that a major research and development programme would be required, indicating *a low level of technical maturity* for the option with no guarantee of success.[17] [Emphasis added]

48-31 cont'd

UK NDA raised particular concerns about the fabrication of the unusual fuel required by the PRISM design.[18] It considered the work up to now "preliminary" and said that the building of a fuel fabrication facility without "further plutonium-active testing" was a "major technical risk" which GEH intended be borne solely by the UK NDA.

The UK NDA has good reason to be concerned about the fabrication of plutonium fuel. The UK built the Sellafield MOX Plant to produce fuel which was a mixture of plutonium and uranium oxides (MOX). Though there was far more commercial experience producing this kind of fuel compared to the PRISM metallic fuel, the plant was a complete failure. Despite being designed to produce 120 metric tons of MOX fuel per year, during its operational life of ten years (2001-2011) it produced a total of only 13.8 metric tons (only about one percent of its design capacity).[19] Nor has the U.S. had better luck. In October 2018 the U.S. National Nuclear Security Administration terminated work on a partially built facility in South Carolina which was intended to turn former weapons plutonium into oxide fuel to be burned in commercial LWRs.[20]

DOE's plans to produce the fuel for the VTR are very preliminary and non-specific:

48-32

[16] "Notice of Intent To Prepare an Environmental Impact Statement for a Versatile Test Reactor," Office of Nuclear Energy, Department of Energy, *Federal Register*, Vol. 84, No. 150, August 5, 2019, p. 38023. https://www.govinfo.gov/content/pkg/FR-2019-08-05/pdf/2019-16578.pdf

[17] "Progress on Plutonium Consolidation, Storage and Disposition," UK NDA, March 2019, p. 11. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/791046/Progress_on_Plutonium.pdf

[18] The plutonium, uranium, zirconium metal alloy described earlier.

[19] "Sellafield MOX Plant—Lessons Learned Review," Department of Energy and Climate Change, United Kingdom, July 18, 2012. http://fissilematerials.org/library/2012/07/sellafield_mox_plant_lessons_l.html

[20] "NRC terminates US MOX plant authorization," *World Nuclear News*, February 13, 2019. http://world-nuclear-news.org/Articles/NRC-terminates-US-MOX-plant-authorisation

about 140 metric tons of civilian plutonium. The VTR project proposes to use up to 34 metric tons over 60 years to run this test reactor. The difference in fabrication rates significantly impacts the practicality of the fuel fabrication for each effort. The commenter's assessment of the impacts of an accelerated schedule on cost and schedule delays are not within the scope of an EIS.

Regardless of the schedule for development of the VTR, the VTR would be designed, constructed, and operated in accordance with applicable DOE requirements and orders (e.g., 10 CFR Part 830, "Nuclear Safety Management"; DOE Order 413.3B, "Program and Project Management for the Acquisition of Capital Assets"; and DOE Standard DOE-STD-1189-2016, *Integration of Safety into the Design Process*). Critical Design Reviews (which include safety reviews) would be conducted at multiple steps within the design phases (conceptual, preliminary, and final).

48-32 The purpose proposed for the PRISM reactor evaluated by the UK's NDA is significantly different than that proposed for the VTR. The test reactor experience with EBR-II and FFTF is more applicable to the VTR test reactor than the PRISM use in the U.K.-proposed mission. Their assessment that the reactor is not commercially viable was based on a program for rapid plutonium disposition. Please refer to the response to comment 48-31.

DOE is well aware of the issues associated with the construction of the MOX facilities the commenter cites. To the extent practical, that experience can be used to improve the VTR project. DOE has not selected the process for feedstock preparation. Please refer to the response to comment 48-20.

> Nuclear materials for the VTR driver fuel could come from several locations including from within the DOE complex, commercial facilities, or possibly foreign sources. The nuclear materials and zirconium would be alloyed and formed into ingots from which the fuel would be fabricated. The alloy ingots could be produced at one of the locations providing the nuclear materials or the materials could be shipped to a location within the DOE complex for creating the alloy. DOE anticipates fabricating the driver fuel from ingots at the Savanah River site or the Idaho National Laboratory.[21]

48-32 cont'd

DOE is also vague about how the spent fuel will be disposed. It says it will not be reprocessed but rather "conditioned for disposal."[22] DOE has not stated how this will be accomplished given that the more reactive metallic fuel is a less suitable waste form than the stable ceramic oxide fuel that is used in commercial nuclear power reactors.

48-33

Clearly the GEH PRISM technology and especially the technology required to produce the plutonium fuel for the VTR, is nowhere close to being mature. The use of this reactor design, especially on an "accelerated" basis, runs a substantial risk of major delays and cost overruns.

48-31 cont'd

Fast Reactor Safety Issues

The PRISM design has certain safety features that are superior to the design of the current LWR power reactors. In particular the core is submerged in a large pool of metallic sodium. It has a high heat storage capacity and combined with a passive heat removal system, the reactor would be able to survive the loss of emergency power which was the cause of the Fukushima accident. This has led at least one advocate for the VTR to claim "these reactors can't melt down.[23] Unfortunately this is untrue.

One of the problems with the PRISM design is its use of metallic fuel. This fuel has a much lower melting point (about 1,500º C) compared to the melting point of the oxide fuels (about 3,000º C) that are used in LWRs. There are reasons other than just the loss of power that the cooling of the fuel might be interrupted and if it is the metallic fuel will melt far more readily. Such an accident occurred more than 50 years ago at the Enrico Fermi Unit 1 near Detroit. This was a small prototype sodium cooled fast breeder reactor which used a uranium molybdenum alloy fuel similar to the fuel proposed for the VTR. A piece of metal broke off from the interior of the reactor and blocked the coolant flow resulting in the partial melting of two of the reactor's fuel elements. There was no release of radiation off-site but the reactor was shut down for nearly four years as a result of the damage.

48-34

[21] "Notice of Intent To Prepare an Environmental Impact Statement for a Versatile Test Reactor," Office of Nuclear Energy, Department of Energy, *Federal Register*, Vol. 84, No. 150, August 5, 2019, p. 38024. https://www.govinfo.gov/content/pkg/FR-2019-08-05/pdf/2019-16578.pdf
[22] *Ibid.*
[23] James Conca, "Should the U.S. Build a Fast Nuclear Test Reactor or Continue to be Beholden to Russia?" *Forbes.com*, July 26, 2018. https://www.forbes.com/sites/jamesconca/2018/07/26/should-we-build-a-fast-nuclear-test-reactor-or-continue-to-be-beholden-to-russia/#3efccdbc82bb

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48-33 Please refer to the response to comment 48-6 for a description of how the VTR SNF would be processed for storage and disposal. As discussed in the VTR EIS, Chapter 2, Section 2.2.3, following treatment VTR SNF would be managed along with other SNF at the site until transported off site to an interim storage facility or a permanent repository. The SNF is expected to be compatible with the acceptance criteria for any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, for more information.

48-34 DOE takes its responsibility for the safety and health of the workers and the public seriously. EBR-II demonstrated safe operation of a fast reactor with sodium coolant. Using past reactor operating experience and knowledge gained from extensive inherent safety testing at EBR-II and FFTF, along with advanced analysis tools, the VTR is being designed to safely operate with sodium as the coolant. Appendix D, Section D.3.3.1, reviews the history of sodium-cooled reactor operations and accidents. Sodium-cooled reactors have been operated for a number of years. The discussion in Appendix D considers events and tests at EBR-I, Fermi-I, Phenix, SuperPhenix, MONJU, FFTF, and EBR-II. The discussion provided in Appendix D acknowledges the concerns mentioned in the comments as well as other information related to tests in FFTF and EBR-II. Evaluating past performance and tests provides valuable information that is considered in the design of the VTR. The VTR design submerges the reactor core in a large pool of metallic sodium, which has a high heat storage capacity. With the heat capacity of the pool in combination with the passive heat removal system, the VTR would be able to survive the loss of emergency power which was the cause of the Fukushima accident. The experience gained with previous sodium-cooled reactor events are being incorporated in the design of the VTR. The selection of metallic fuel and passive heat removal allows a design that maximizes inherent and passive safety, which puts the emphasis on prevention of high temperatures or sequences that challenge the fuel integrity.

The safety analysis for the VTR considers all relevant physics when determining safety margins. Considering the fuel melting point alone is inadequate. The thermal conductivity of metallic fuel is approximately eight times larger (~0.25 watts per

Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

A major meltdown in a fast reactor would have consequences more serious than those from a similar meltdown in an LWR. As was discussed above, thermal reactors use a moderator and sustaining the nuclear chain reaction requires that the fuel and the moderator be interwoven. If the fuel in a thermal reactor melts, then the moderator is excluded and the nuclear chain reaction stops. In a fast reactor, the melting of the fuel would lead to the exclusion of the coolant, increasing the rate of the chain reaction complicating efforts to bring the accident under control.

There are a number of other safety concerns. The decrease in the delayed neutron fraction associated with the use of plutonium fuel makes the control of the reactor more delicate. The chemical reactivity of the sodium coolant if it leaks out of the reactor as happened in the accident at Monju, can damage equipment and generate toxic fumes. The fast neutrons in the reactor damage structural materials in a much shorter time than do thermal neutrons.

48-34 cont'd

It is clear that fast reactors, including the VTR, have significant safety pluses and minuses that will have to be carefully evaluated. It is not clear that DOE is up to the task. In the mission need statement for the VTR, DOE has claimed "The nuclear industry, which has always provided safe, clean, reliable energy…"[24] This apparent denial of the serious accidents that occurred at Three Mile Island, Chernobyl and Fukushima raises concerns as to whether DOE can get beyond its role as an advocate for nuclear power to examine the safety of fast reactors in a realistic and even-handed manner.

Plutonium Fuel and U.S. Nonproliferation Concerns

48-35

As was discussed above, the requirements for the VTR appear to have been deliberately set so as to require the use of plutonium fuel. Plutonium is a well-known nuclear weapon material. This includes so-called reactor-grade plutonium.[25] In 1974 India conducted a nuclear weapon test using plutonium that it had ostensibly produced to use as fuel in fast breeder reactors. This event led the U.S. to realize that there were substantial nonproliferation dangers in the use of plutonium as nuclear fuel. As a result, in 1977 the U.S. adopted a policy against the use of plutonium separation, plutonium stockpiles and plutonium fuel in nonnuclear weapon states. This U.S. policy has not been universally accepted but the lack of progress in the development of breeder reactors has lessened some of the resistance. Still, there are concerns that countries might use plutonium produced by their commercial power reactors to acquire nuclear weapons and that breeder reactor development might be used as a cover to acquire or retain plutonium that has been separated from commercial reactors' spent fuel. Two countries of current concern are Japan and South Korea.

Japan has already separated large quantities of plutonium for its breeder reactor program. It currently has nine metric tons of separated plutonium (enough for over 1,000 nuclear weapons)

[24] "Mission Need Statement for the VERSATILE TEST REACTOR (VTR) PROJECT: A Major Acquisition Project," Office of Nuclear Technology Research and Development, Office of Nuclear Energy, U.S. Department of Energy, December 2018, p. 5. https://s3.amazonaws.com/ucs-documents/nuclear-power/FOIA-Approved-Mission-Need-Statement-for+Versatile-Test-Reactor-Project.pdf

[25] Gregory S. Jones, *Reactor-Grade Plutonium and Nuclear Weapons: Exploding the Myths*, Nonproliferation Policy Education Center, 2018. https://nebula.wsimg.com/3fd1e3cfbbf101d6c4f562e17bc8604c?AccessKeyId=40C80D0B51471CD86975&disposition=0&alloworigin=1

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centimeter-degree Celsius [W/cm-°C]) than oxide fuel (~0.03 W/cm-°C); therefore, it would operate at a much lower temperature. Metallic fuel thermal conductivity also increases with increasing temperature, whereas oxide fuel thermal conductivity decreases with increasing temperature. As a result of these properties, metallic fuel does not "melt far more readily" than oxide fuel. Both fuels have similar safety margins to melting. The design of the VTR and the use of metallic fuel provides additional safety margins, as demonstrated in EBR-II, because event initiators are unlikely to lead to severe accident conditions that challenge fuel integrity.

With respect to the Fermi I accident, the aggravating factor in that event was an inadequate design of the fuel assembly inlet, which allowed a flow blockage to occur. Following the event, the Detroit Edison Company was able to repair Fermi I and return it to service. This was possible because the highly compatible nature of metallic fuel and liquid sodium did not result in propagating failure or severe consequences. Subsequent sodium-cooled fast reactor designs (e.g., PHENIX, FFTF, MONJU, BN-600, etc.) addressed the deficiency in the Fermi I flow design and have not observed any blockage events. The VTR incorporates these design improvements.

48-35 The proposed VTR is a one-of-a-kind reactor where the neutron production over the desired test volume is maximized and, due to the fuel design, the size of the reactor is minimized. To achieve the desired performance, VTR proposes to use plutonium in a metal fuel alloy. The VTR project would use only existing plutonium, would not reprocess its spent fuel for recovery or separation of fissile material, and would contribute to a reduction in existing inventories of separated plutonium. Use of this fuel to provide the needed testing performance does not mean that future advanced reactors would use the same fuel; advanced reactors currently under development would use non-plutonium fuels such as high-assay, low-enriched uranium (HALEU) or thorium fuels. Refer to Section 2.3, "Nonproliferation," of this CRD for additional discussion of this topic. DOE notes that it is seeking private and foreign partnerships to augment the funding for construction of the VTR.

in Japan and another 36.7 metric tons stored in the UK and France.[26] Though the prospects for Japan's breeder reactor program have faded, pressure on Japan to develop nuclear weapons has grown. In particular, the pressure has come from North Korea's nuclear weapon and ballistic missile tests and candidate Trump's suggestion that Japan and South Korea should develop their own nuclear weapons (a suggestion that has been retracted by President Trump). As a result, there has been increased concern about Japan's large separated plutonium stockpile and calls for Japan to eliminate its stocks of separated plutonium. The use of plutonium fuel in the VTR undermines this effort.

South Korea does not have any stocks of separated plutonium. It does have a large commercial nuclear power program and the spent fuel from these reactors contains about 100 metric tons of plutonium.[27] Candidate Trump's call for South Korea to develop it own nuclear weapons combined with North Korea's nuclear weapon and ballistic missile tests (which threaten South Korea even more than they do Japan) has led to open discussions in South Korea about obtaining its own nuclear weapons. Breeder reactor development could be used as a cover for South Korea to obtain separated plutonium for nuclear weapons. The use of plutonium fuel in the VTR enhances the credibility of this cover.

To make matters worse, the U.S. is taking on both Japan and South Korea as collaborators to perform research in the VTR.[28] In January 2019 a memorandum of understanding with South Korea was in final review and in June 2019, a memorandum of understanding was signed with Japan.

The use of plutonium fuel in the VTR helps provide cover for Japan to retain and for South Korea to obtain separated plutonium which could be used to produce nuclear weapons. This is an additional reason why the VTR should not be built.

48-35 cont'd

Conclusions

The need that the VTR is intended to meet does not exist. Commercial nuclear power reactors that use nonaqueous coolants (so-called advanced reactors), will certainly not start operation by 2030. Though much effort has been taken to develop such reactors in the last 50 years, they are no closer to development today than they were 40 years ago. Given the recent cancellation of fast breeder reactor programs in Japan and France and the delays to the programs in Russia and India, such reactors may well never be deployed commercially.

48-30 cont'd

Despite DOE's claims that the technology to be used in the VTR is mature, an independent evaluation by the UK NDA found "a low level of technical maturity." The UK NDA raised particular concerns about the manufacture of the fuel, calling it a "major technical risk." DOE's

48-31 cont'd

[26] "The Status Report of Plutonium Management in Japan-2018," Japan Office of Atomic Energy Policy, July 30, 2019. http://www.aec.go.jp/jicst/NC/iinkai/teirei/3-3set_20190730.pdf
[27] David Albright et. al., "Civil Plutonium Stocks Worldwide: End of 2014," Institute for Science and International Security, November 16, 2015, p. 4. https://isis-online.org/uploads/isis-reports/documents/Civil_Plutonium_Stocks_Worldwide_November_16_2015_FINAL.pdf
[28] Kemal Pasamehmetoglu, "Versatile Test Reactor Overview," Advanced Reactors Summit VI, San Diego, California, January 29-31, 2019, p. 8. https://gain.inl.gov/SiteAssets/VersatileTestReactor/VTR_OVERVIEW.pdf

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Commenter No. 48 (cont'd): Tom Clements, Director Savannah River Site Watch

plans for the manufacture of this fuel are very preliminary and nonspecific and its plan to build the VTR on an accelerated schedule runs a high risk of major delays and cost overruns. **48-31 cont'd**

Though the technology used in the VTR has some safety advantages, it has some significant disadvantages as well. DOE needs to move beyond its role as an advocate for nuclear power and examine the safety of fast reactor technology options in a realistic and even-handed manner. **48-34 cont'd**

The use of plutonium fuel in the VTR undermines U.S. nonproliferation goals to eliminate the separation of plutonium, plutonium stockpiles and plutonium fuels in non-nuclear weapon states. To make matters worse, the U.S. is taking on both Japan and South Korea as collaborators to perform research in the VTR, which could help provide cover for potential nuclear weapon programs in these two countries. **48-35 cont'd**

The VTR will be a waste of money and undermines U.S. nonproliferation goals. This reactor program should not continue. **48-1 cont'd**

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Commenter No. 49: John E. Wilks, III, Chair, Environmental Committee, Veterans For Peace, Chapter #63 (Albuquerque)

VETERANS FOR PEACE
The Donald & Sally-Alice Thompson Chapter 63
Albuquerque, NM 87106

February 17, 2021

By email to: VTR.EIS@nuclear.energy.gov and by USPS

Mr. James Lovejoy, Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415

Re: Public Comments for draft Versatile Test Reactor Environmental Impact Statement (EIS-0542)

Please respond to John E. Wilks, III, Chair, Environmental Committee, [redacted], NM 87943 or [redacted].

Dear Mr. Lovejoy:

Veterans For Peace, Chapter #63 (Albuquerque) vehemently opposes transporting, manipulating (e.g., "down blending"), or storing surplus plutonium, uranium, and transuranic waste to the state of New Mexico! It also strongly opposes extending the operating life or capacity of the Waste Isolation Pilot Plant (WIPP) in New Mexico. Accordingly, **49-1** the Chapter stands against any proposal to construct or operate a Versatile Test Reactor (VTR), whereever situated, as considered by DOE. **49-2**

While fuel for all nuclear reactors is dangerous, the proposed use of uranium and plutonium is especially concerning. The proposed use of plutonium fuel presents not only risks of contamination and hazardous waste, but also the additional danger of nuclear proliferation and the threat of terrorism.

The massive amount of fuel that would be used over the lifetime of the VTR is also of concern. Based on the draft EIS, an estimated 34 metric tons of plutonium would be fabricated into fuel over the 60-year lifespan of the reactor. Processing this much plutonium will lead to an elevated risk of worker exposure and increased environmental impacts, **49-3** and could result in plutonium being stranded at the fuel fabrication site at the Idaho National Laboratory (INL), the Savannah River Site (SRS), or the Los Alamos National Laboratory, if the project were consummated or halted. **49-4**

49-1 The candidate locations for the VTR and associated facilities are at the Idaho National Laboratory (INL) in Idaho and the Oak Ridge National Laboratory in Tennessee. The candidate locations for reactor fuel production activities are at INL and the Savannah River Site in South Carolina. DOE acknowledges the commenter's concern regarding an extension to the operating permit of Waste Isolation Pilot Plant (WIPP). Transuranic wastes meeting the WIPP waste acceptance criteria that are generated under the VTR Alternatives and Reactor Fuel Production Options would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for disposal at WIPP in New Mexico. Additionally, waste must meet the WIPP LWA, WIPP Hazardous Waste Facility Permit, and other applicable requirements. Compliance with these requirements may be demonstrated by acceptable knowledge, non-destructive assay, and other established methods.

TRU-contaminated waste that is not eligible for WIPP disposal would be categorized as greater-than-Class-C (GTCC)-like waste (DOE-owned) (refer to Chapter 2, Section 2.6, for an explanation of the potential for generating GTCC-like waste). At this time, DOE has completed a GTCC EIS (DOE 2016a), but has not made a decision regarding a disposal location. GTCC-like waste that could be generated by the VTR project is not included in the inventories evaluated in the GTCC EIS. If additional GTCC-like waste is generated through the VTR project, additional National Environmental Policy Act analysis may be conducted, as appropriate.

49-2 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

49-3 Please refer to the discussions in Section 2.3, "Nonproliferation," Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," and Section 2.8, "Intentional Destruction Acts," of this CRD for additional information. The environmental impacts and worker exposure related to the VTR alternatives and fuel production options are the subject of this EIS. Results of the impact analyses are presented in Chapter 4 (worker impacts are discussed in Sections 4.10.1, 4.10.2, and 4.10.3, and 4.10.4).

49-4 Please see Section 2.4, "Plutonium Use and Disposition," of this CRD for a discussion of this topic.

Commenter No. 49 (cont'd): John E. Wilks, III, Chair, Environmental Committee, Veterans For Peace, Chapter #63 (Albuquerque)

The transportation of fuel (uranium and plutonium) is a massive risk to public safety. If the fuel were sourced domestically, thousands of miles of overland transportation would be required to deliver it to either SRS or INL for fabrication, and (if produced at SRS) from there to the VTR site at INL, and post-use to Los Alamos for "down blending," prior to final transportation and storage in the WIPP. 49-5

If the VTR were to be constructed and operated at INL, the burden of all waste produced from operations would fall on the shoulders of current and future Idahoans and possibly New Mexicans. An estimated 34 metric tons of plutonium, and 120 metric tons of uranium would be needed to fuel the VTR over its lifespan. 49-6

Veterans For Peace, Chapter#63, will continue to diligently work with the New Mexico Environmental Department to preclude an extension to the operating permit for the WIPP. The WIPP is scheduled to neither accept waste after 2024, nor expand its storage capacity in the interim.

The amount of transuranic waste (TRU) produced as a result of fuel fabrication and operation of the VTR could be as much as 24,000 cubic meters. Disposal of this waste in the WIPP in New Mexico will unnecessarily challenge the legal volume cap of the WIPP and could negatively impact TRU disposal plans by DOE. 49-1 cont'd

We urge DOE to select the "zero option" and *not* construct a Versatile Test Reactor. 49-2 cont'd

Respectfully,

John E. Wilks, III
Chair, Environmental Committee
Veterans For Peace, Chapter #63 (Albuquerque)

49-5 The transportation of the reactor fuel (uranium and plutonium) would be carried out by the DOE Office of Secure Transportation (OST). OST is responsible for the safe and secure transport of government-owned nuclear materials in the contiguous United States. Even though the EIS identifies representative routes, specific information on the routes and dates of material movement are classified to ensure operational security. These materials are transported in highly modified secure tractor-trailers and escorted by armed Federal agents in accompanying vehicles for additional security, as needed. Appendix E, Section E.2.4, of this VTR EIS describes the key elements of the secure transportation asset, which emphasizes the various aspects of the transportation. It should be noted that secure transportation is an ongoing activity within the United States. As indicated in the EIS, the overall risks of transporting these materials are very small. It should be noted that the Los Alamos National Laboratory (LANL) is only considered as one of the sources for plutonium (Savanah River Site is the second source), and there would be no use of LANL for down-blending the wastes as indicated in the comment. Therefore, there would be no transportation back to LANL.

49-6 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed in Section 2.5 of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR SNF would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository.

Commenter No. 50: Tad Haight

From: Tad Haight
Sent: Wednesday, February 24, 2021 3:14:34 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Siting of The Versatile Test Reactor in Southeast Idaho

Mr. James Lovejoy
Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue
MS 1235
Idaho Falls, Idaho 83415

Dear Mr. Lovejoy,

I would like to submit this comment in reference to the *Draft Versatile Test Reactor Environmental Impact Statement (DOE/EIS-0542)*.

As a member of the Eastern Idaho community, I am entirely supportive of locating the VTR at the Idaho National Laboratory site, located West of Idaho Falls, Idaho. One of the founding missions of this National Laboratory has been the design, construction, and operation of research reactors. I strongly support the Department of Energy's efforts to continue this mission and the State of Idaho is uniquely qualified as a site for this project.

50-1 The benefits of siting this project at the INL are numerous and include:

- Localized economic development opportunities
- Improved understanding of reactor physics and reactor fuels
- An important source of fast-neutrons for radioisotope production

Again, I agree with the preferred option of siting the VTR Project and its associated fuel fabrication here in Idaho at the INL.

Sincerely,

Mayor Tad Haight
[redacted]

50-1 DOE acknowledges your preference for the Idaho National Laboratory (INL) VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

Commenter No. 51: Thomas Hally

From: Thomas Hally
Sent: Wednesday, February 24, 2021 6:40:15 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] VTR

I am very much in favor of this project. We need to move forward with nuclear power via research to remove carbon. The Texas power tragedy demonstrates the need for nuclear to be a significant part of the energy mix. *51-1*

51-1 DOE acknowledges your support of the proposed VTR. Refer to Section 2.1, "Support and Opposition," of this CRD for additional discussion of this topic. DOE believes there is a potential societal benefit from the development of advanced reactors and that nuclear energy should be part of the overall mix of energy sources in the United States.

Commenter No. 52: Alan J. Kuperman, PhD, LBJ School of Public Affairs, University of Texas, Austin

NPPP
NUCLEAR PROLIFERATION PREVENTION PROJECT

February 24, 2021

Mr. James Lovejoy
Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415
via email: VTR.EIS@nuclear.energy.gov

Re: Public Comment on Draft Versatile Test Reactor Environmental Impact Statement

Dear Mr. Lovejoy,

This submission responds to your announcement of February 12, 2021, extending the public comment period until March 2, 2021, for the Draft Versatile Test Reactor Environmental Impact Statement (Draft VTR EIS). I am submitting via email. **Please confirm receipt of this submission via return email to [redacted].**

52-1 I am Associate Professor at the LBJ School of Public Affairs, University of Texas at Austin, where I also am coordinator of the Nuclear Proliferation Prevention Project (www.NPPP.org). My comment focuses on the inadequacy of the Draft VTR EIS's analysis of environmental and related risks arising from the proposed fabrication and use of fuel incorporating tens of metric tons of plutonium. The Draft VTR EIS discusses these risks in only a cursory manner, as if large-scale fabrication of nuclear fuel that includes substantial amounts of plutonium were a routine activity having a successful historical track record, which is opposite of the truth.

The Draft VTR EIS states that, "during the reactor fuel production process, up to 34 metric tons of plutonium could be needed for startup and 60 years of VTR operation" (S-12). "Preparation of the source material may be required to convert the plutonium into a metal and to remove impurities" (B-59). To fabricate driver fuel, "Steps in the process include fuel alloying and homogenization, fuel slug casting and decasting, fuel pin assembly, and fuel assembly fabrication" (B-64). "The equipment layout that would be used has not been determined and would be finalized during the detailed design of the fuel production facility" (B-78).

Such proposed large-scale fabrication and use of fuel containing a mixture of plutonium and uranium (henceforth, "plutonium fuel") raises a number of major concerns. Despite the proposed activities encompassing multiple processing steps including possible conversion of plutonium between oxide and metal forms, and despite the absence at this time of even basic information such as the actual equipment layout, the Draft VTR EIS optimistically assumes that any radiological risk would be minimal (B-76). Other related risks that I detail below – including economic, security, and public acceptance – are barely mentioned let alone analyzed in the Draft VTR EIS. I contend that before DOE engages in further consideration of the VTR, the

The University of Texas at Austin LBJ School of Public Affairs | PO Box Y | Austin, TX 78713-8925 | www.NPPP.org | (512) 471-8245

52-1 Please refer to the discussion in Section 2.1, "Support and Opposition," of this CRD. The commenter is also referred to Chapter 4 of this EIS for the assessment of impacts from the VTR alternatives and options (Sections 4.10 and 4.11 for human health impacts). While engaging the public is a vital part of the National Environmental Policy Act (NEPA) process, note that public acceptance and project costs are not within the scope of an EIS. DOE will consider many factors in making a decision on the VTR project, the EIS is only one of those factors.

The commenter's assertion that DOE must include a comprehensive global study of the historical track record of such large-scale fabrication and use of plutonium fuel is not accurate. EIS requirements are identified in NEPA and the Council on Environmental Quality (CEQ) and DOE NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500 through 1508 and 10 CFR Part 1021, respectively).

Commenter No. 52 (cont'd): Alan J. Kuperman, PhD, LBJ School of Public Affairs, University of Texas, Austin

National Environmental Policy Act (NEPA) requires an analysis of the historical global track-record of such activities, which the Draft VTR EIS fails to provide.

More than a year ago, I published a refereed journal article: Alan J. Kuperman, "Challenges of Plutonium Fuel Fabrication: Explaining the Decline of Spent Fuel Recycling," *International Journal of Nuclear Governance, Economy and Ecology* 4, 4 (2019): 302-316. The article presents key findings of the first comprehensive global study of the commercial fabrication and use of plutonium fuel – analyzing environmental impact, health and safety, economics, security, performance, and public acceptance. Your draft EIS cites neither this article nor the book containing the underlying data: Alan J. Kuperman, ed., *Plutonium for Energy? Explaining the Global Decline of MOX* (Austin: NPPP, 2018), https://repositories.lib.utexas.edu/handle/2152/69255. The Draft VTR EIS thus neither conducts its own comprehensive global study of the historical track record of plutonium fuel fabrication and use, nor does it reference the only such study in existence. Clearly, the Draft VTR EIS does not rigorously evaluate the environmental and related risks arising from the proposed activity, as required by law. 52-1 cont'd

Below I summarize these risks, as analyzed in my article and book (Kuperman, 2018a, 2019), based in part on field research in all seven countries that have engaged in the commercial production or use of plutonium fuel: Belgium, France, Germany, Japan, the Netherlands, Switzerland, and the United Kingdom. Five of these seven countries already have decided to phase out commercial plutonium fuel activities. The price of plutonium fuel has proved to be three to nine times higher than traditional uranium fuel. Plutonium fuel also has sparked political controversy, due to safety and proliferation concerns, in four of the six countries where it has been used commercially.

These problems have been due mainly to the fact that plutonium has three big downsides compared to the uranium traditionally used to make nuclear fuel: it is much more likely to cause cancer if inhaled, may be used to make nuclear weapons, and (largely due to the first two characteristics) is very expensive to purify and fabricate into fuel. Despite these challenges, the aforementioned seven countries attempted to engage in the commercial fabrication and/or use of plutonium fuel. Three of these countries both fabricated and used plutonium fuel commercially: Belgium, France, and Germany. Three used but did not fabricate it commercially: Japan, the Netherlands, and Switzerland. One country fabricated but did not use it commercially: the United Kingdom.

As of 2018, five of the seven countries had already ended, or decided to phase out, their commercial plutonium fuel activities. Belgium halted both plutonium fuel fabrication and use in 2006. Switzerland ended its plutonium fuel use in 2007. The UK terminated commercial plutonium fuel fabrication in 2011. Germany halted plutonium fuel fabrication in 1991, and inserted its final plutonium fuel assembly in 2017. The Netherlands plans to load its last plutonium fuel assembly in 2026 and remove it four years later, when its sole nuclear power reactor will close. Except in the last case, commercial plutonium fuel activities were curtailed prior to a decision to phase out nuclear power. This track-record leaves only two countries planning to continue commercial plutonium fuel activities – France and Japan – and their programs too face financial and political challenges (Kuperman, 2018b).

Fabricating Plutonium Fuel

As detailed below, five of the six fabrication facilities for plutonium fuel that ever operated commercially have closed prematurely, and most of them underperformed while they were open.

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Section 102 of NEPA establishes procedural requirements, applying that national policy to proposals for major Federal actions significantly affecting the quality of the human environment by requiring Federal agencies to prepare a detailed statement on (1) The environmental impact of the proposed action; (2) any adverse environmental effects that cannot be avoided; (3) alternatives to the proposed action; (4) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and (5) any irreversible and irretrievable commitments of resources that would be involved in the proposed action. This VTR EIS has met those requirement.

The article and book the commenter cites address the challenges of a closed fuel cycle for commercial nuclear power. The previous experience mentioned by the commenter essentially applies to the separation of plutonium for use in fuel and to plutonium oxide fuel fabrication for commercial power plants and is not directly applicable to VTR fuel fabrication and use of metallic alloy fuel using exiting inventories of plutonium. Those challenges are not the same as those associated with the construction and operation of a single test reactor. For example, the author cites security as a concern. Security for the VTR project is greatly enhanced by the fact that all operations are being performed at DOE sites, all with existing security and radiological protection programs that are designed to protect facilities and nuclear material in compliance with DOE safety and security regulations and orders. Economic viability for a test reactor has a different meaning than for a commercial enterprise.

DOE is among the most experienced in processing plutonium and fabricating metallic reactor fuel. The VTR would use a metal fuel alloy composed of uranium, plutonium, and zirconium. Metallic driver fuels have previously been used as a standard-production driver fuel in EBR-II and demonstrated in FFTF, and uranium-plutonium-zirconium alloy fuel has been tested in EBR-II and FFTF. This fuel has a proven and well understood irradiation performance history. The fuel fabrication process, as described in Appendix B, Section B.5, is similar to that used for fabrication of EBR-II fuel. The experience with fabrication of metallic alloy fuel is the basis for the fabrication process selected for the VTR fuel, with known steps and equipment requirements. However, as part of the VTR project, DOE is continuing to assess fuel fabrication techniques for the VTR fuel. Results of this assessment could impact the fabrication process and the final fuel fabrication process would be validated before full-scale fabrication operations begin.

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A seventh facility in Germany was canceled after construction, an eighth in Japan is stalled at the early stages of construction, and a ninth in the United States was canceled in 2018 after partial construction costing billions of dollars (Gardner, 2018). The main underlying cause of this poor track-record is that plutonium is far more hazardous than uranium, leading to high costs and public opposition. Plutonium mostly comprises isotopes that are relatively long-lived but emit significant levels of alpha radiation. One isotope of plutonium, Pu-241, is not an alpha emitter but decays relatively quickly into americium-241, which is an especially strong alpha emitter. Such alpha radiation is not a major problem outside the body because it can be blocked by many materials including skin. However, if inhaled and lodged in the lungs, plutonium and americium isotopes persistently bombard the surrounding tissue with alpha particles that induce mutations, so that at a sufficient dose they are almost guaranteed to cause cancer, as demonstrated in laboratory studies (Oghiso, et al., 1998).

This danger arises especially during plutonium fuel fabrication, including when plutonium is in the form of an oxide that may be inhaled. To reduce the health risk to employees and surrounding communities, plutonium fuel plants employ costly hardware – including air purifiers, glove boxes, and automated equipment – and costly procedures such as lengthy shutdowns to clean up spills. As detailed below, these substantially raise the production costs for plutonium fuel compared to uranium fuel, even excluding the expense of obtaining plutonium in the first place. Attempting to reduce such fabrication costs has backfired by increasing accidents, outages, scandals, and public protest – thereby reducing the output and raising the per-unit cost.

The biggest failure was the UK's British Nuclear Fuel Ltd (BNFL) plant at Sellafield (SMP), which had a planned output of 120 metric tons of heavy metal per year (MTHM/yr, including both plutonium and uranium). In practice, during its operation from 2001 to 2011, the facility produced a total of only 14 MTHM, an average of barely one MTHM/year, or about one percent of its intended output. The two principal causes of this profound failure arose from the safety risk of plutonium: unproven automated techniques to reduce worker exposure, and an unreasonably small facility footprint to reduce the costs of worker-protection measures. The consequences were failed equipment, expensive repairs, and prolonged suspensions of production. Although SMP's troubles could be attributed to experimental technologies and poor design, both of those choices arose from concerns over plutonium's health threat and the costs of mitigating it (Mann, 2018).

BNFL's preceding and much smaller commercial demonstration facility also ended in failure, although to a lesser extent. The plant's capacity was eight MTHM/yr. During operation from 1993 to 1999, it produced a total of 20 MTHM, for an average of about three MTHM/yr, or 40 percent of capacity. However, the plant closed prematurely after revelations that workers had repeatedly falsified quality-control data, which led to an international scandal culminating in $100 million in penalties and the return of unirradiated plutonium fuel assemblies from Japan (Mann, 2018). It is uncertain why BNFL failed persistently to monitor quality control at this plant, which had paid high costs to address plutonium's health risks.

Germany's Alkem Hanau plant underperformed persistently and then closed prematurely in 1991 due to a radiation accident. The facility's potential output was 25 MTHM/yr, but from 1972 to 1991, its average annual production was eight MTHM, or about 30 percent of capacity. This shortfall stemmed partly from complications of plutonium's radiotoxicity, including "repair work under difficult glove-box conditions" and "plutonium contamination in the fabrication areas that required time-consuming cleanup," according to a senior facility official at the time.

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DOE has not selected the process for feedstock preparation. This selection would depend upon factors including the source of the plutonium as the best process for impurity removal depends upon the impurities in the feedstock material. Therefore, the analysis utilizes the best available information regarding the potential processes and no single feedstock preparation process was used in the assessment of impacts for this process. Fuel production impacts were developed based on the range of impurities found in both domestic and foreign inventories of plutonium. VTR fuel would use only existing inventories of plutonium and spent fuel would not be reprocessed. For further information, refer to the discussions in Section 2.3, "Nonproliferation," of this CRD.

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He reports that production also was hindered by intrusive EURATOM safeguards inspections and domestic controversy over transport security, both arising from plutonium's proliferation concerns. In 1991, a plant worker was contaminated by a glove-box accident, and public outrage led to permanent closure of the facility. Related controversy also blocked the opening of a nearly completed follow-on facility, Hanau 1, which was canceled in 1995 (Kennedy, 2018).

Belgium's P0 plant, operated by Belgonucléaire in Dessel, closed prematurely due to inefficiency, competition, and vanishing global demand for plutonium fuel. The plant had a capacity to fabricate 32 MTHM/yr of plutonium fuel rods, which were then combined into fuel assemblies at a neighboring facility owned by FBFC. From 1973 to 2006, the P0 plant produced approximately 600 metric tons of plutonium fuel rods, an average of nearly 18 MTHM/yr, or 55 percent of capacity. However, costs were extremely high, due mainly to efforts to address plutonium's health threat (Bonello, 2018). Eventually, P0 could not compete with France's more-efficient MELOX facility, especially as demand declined, so the Belgian plant closed for economic reasons rooted in the safety hazards of plutonium and the reduced global use of plutonium fuel. Meanwhile, a broken plutonium fuel rod at the adjacent FBFC facility in the mid-1990s compelled the shutdown of that facility's plutonium and uranium fuel operations, followed by a costly decontamination, and then the expensive construction of a new annex exclusively for plutonium fuel assemblies (Bonello, 2018).

France has been more successful at fabrication of plutonium fuel, at two successive facilities, but they too have faced economic and safety challenges. France's commercial fabrication of plutonium fuel started in 1989, in Cadarache, at the ATPu plant, whose capacity increased gradually from 20 to 40 MTHM/yr of plutonium fuel rods that later were combined into assemblies at plants in Belgium or France. In 1995, due to earthquake risk, French safety authorities ordered that the plant cease operations "shortly after 2000," and it did so in 2003 (Burns, 2018). Concerns included that an earthquake could trigger a plutonium fire, criticality accident, or other release of radioactivity.

The most successful plutonium fuel fabrication plant to date, and the only commercial facility still operating, is France's MELOX. The plant has a nominal capacity up to 250 MTHM/yr, but it has never been authorized above 195 MTHM/yr, and in practice it has produced much less. From 2014 to 2017, MELOX produced on average under 125 MTHM/yr, or less than half its nominal capacity. Such depressed output stems mainly from sharply decreased foreign demand (none from Germany since 2015, and only about 10 MTHM/yr combined from the Netherlands and Japan in recent years), while France's domestic utility has not significantly increased its use of plutonium fuel, possibly due to high cost. In 2017, MELOX also reported some "technical production difficulties" that may explain a further reduction in annual output to 110 MTHM (Burns, 2018).

Using Plutonium Fuel

All six countries that have commercially used plutonium fuel in reactors discovered that its price was many times that of traditional uranium fuel. The main cause was the increased cost of fuel manufacturing due especially to plutonium's health threat but also other factors, including small batch size, the challenge of uniformly blending uranium and plutonium, and enhanced security for transport (Kuperman, 2018b). Plutonium's greatest cost impact was on activities to fabricate fuel rods. According to an article by Belgian industry officials who led their country's efforts, "For plutonium fuel, the cost of this group of activities is typically 15 to 25 times higher" than for uranium fuel (Vielvoye and Bairiot, 1991).

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Everywhere it has been used, plutonium fuel has proved much more expensive than uranium fuel, both in terms of fabrication cost and purchase price. Japanese utilities in recent years have paid at least nine times as much for imported plutonium fuel as equivalent uranium fuel, according to press reports (Energy Monitor Worldwide, 2015). If Japan proceeds with its planned domestic plutonium fuel facilities, plutonium fuel would cost even more, 12 times as much as uranium fuel, according to the Japan Atomic Energy Commission (Atomic Energy Commission Bureau, 2011). In Belgium, a 1998 industry study found that plutonium fuel cost at least five times as much to produce as uranium fuel, even ignoring the expense of material inputs for plutonium fuel while including them for uranium (Belgonucléaire, 1998). In Germany, the cost to produce plutonium fuel was three to five times that of uranium fuel, according to experts from government, industry, and civil society (Kennedy, 2018). In the Netherlands, a 2010 utility licensing submission to initiate commercial use of plutonium fuel portrayed its fabrication cost as five times that of uranium fuel (EPZ, 2010). In the UK, the Department of Energy estimated in 1979 that fabrication costs were four times higher for plutonium fuel than for uranium fuel (Jones, 1984). In Switzerland, utilities historically paid about six times as much (inflation-adjusted) for plutonium fuel as the current price of uranium fuel (Kim and Kuperman, 2018).

In France, despite economies of scale, plutonium fuel costs four to five times as much to fabricate as uranium fuel, according to industry and other interviewees (Burns, 2018). A French government report, in 2000, indicated that the total cost of producing plutonium fuel, including obtaining plutonium via reprocessing, was 4.8 times that of uranium fuel (International Panel on Fissile Materials, 2015; Charpin, et al., 2000).

Public Acceptance

The decline of plutonium fuel is not merely an economic phenomenon, nor ancillary to a broader global retreat from nuclear power. Plutonium fuel has repeatedly proved less popular than traditional uranium fuel due mainly to plutonium's safety and security concerns. In Germany, anti-nuclear protests escalated in the 1990s, when they started focusing on the environmental and proliferation risks of international shipments associated with plutonium fuel. Popular outrage spurred a 2002 German law that prohibited the export of spent fuel for reprocessing after 2005; this occurred well before Japan's 2011 Fukushima accident prompted Germany to expedite a phase-out of nuclear energy (Winter, 2013). Ironically, the advent of plutonium fuel, originally conceived as necessary to sustain nuclear power, instead roused anti-nuclear sentiment in Germany.

In Japan, too, plutonium fuel has proved more controversial than uranium fuel for both domestic and international audiences due to health and security concerns. In 1999, Japanese anti-nuclear NGOs successfully persuaded the government, based on safety issues, to reject and return plutonium fuel that had been imported for the Takahama-4 reactor, yet they could not stop the plant from continuing to use uranium fuel. In 2001, again mainly on safety grounds, Japanese voters blocked the use of plutonium fuel in the Kashiwazaki-Kariwa-3 reactor, despite allowing the plant to continue operating with uranium fuel. Also in 2001, due to safety concerns, a governor withdrew consent for plutonium fuel use at the Fukushima power plant, which nevertheless continued using uranium fuel. These three popular revolts against plutonium fuel had the effect of delaying by a decade the commercial introduction of plutonium fuel in Japan, thereby exacerbating the Japanese-owned plutonium stockpile that recently totaled 47 metric tons (Acharya, 2018). Neighboring countries, including China, South Korea, and North Korea, have expressed strong security concerns about this plutonium accumulation, which is sufficient

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for more than 5,000 nuclear weapons (Tajima, 2018; Min-Hyung, 2018). Thus, Japan's plutonium fuel program has sparked both domestic and international protest.

In other countries as well, plutonium fuel has proved more controversial than nuclear power *per se*. In Switzerland, a 2003 referendum imposed a moratorium on exports of spent fuel for reprocessing to produce plutonium fuel, effective in 2006, yet Swiss voters continued to support operation of nuclear reactors until Japan's Fukushima disaster spurred a 2017 vote to phase out nuclear energy by around 2050 (Kim and Kuperman, 2018). In Belgium, in the 1990s, NGOs focused their anti-nuclear energy campaigns on plutonium fuel's proliferation, terrorism, and environmental risks. These efforts compelled the Belgian government in 1993 to initiate a moratorium on new reprocessing contracts and to start a reassessment of plutonium fuel, culminating in 1998 with termination of the last existing reprocessing contract. Belgium's Vice-Prime Minister explained, in 1998, that based on the "information we have concerning economic and ecological aspects, there is no justification to use another time the reprocessing technology," and he also cited proliferation concerns (WISE-Paris, 1999; Bonello, 2018). This was five years before the government, in 2003, decided to phase out nuclear power entirely with a target date of 2025. Only in two countries, France and the Netherlands, has commercial plutonium fuel proceeded without provoking decisive public opposition yet.

Conclusion

The Draft VTR EIS does not adequately assess the environmental and related risks arising from the proposed large-scale fabrication and use of fuel incorporating tens of metric tons of plutonium. Adequate assessment would include a comprehensive global study of the historical track record of such large-scale fabrication and use of plutonium fuel, which is absent from the Draft VTR EIS. Accordingly, NEPA requires that DOE revise the Draft VTR EIS to include such an assessment, which if conducted properly would reveal the environmental, health, economic, security, and public acceptance risks that have bedeviled past attempts at large-scale fabrication and use of plutonium fuel. These risks are so large that they would tilt the balance in favor of the "No Action Alternative." **52-1 cont'd**

I stand ready to provide further information upon request. Thank you for your consideration of these comments.

Sincerely,

Alan J. Kuperman, Ph.D.

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Commenter No. 53: Devon Boyer, Chairman, Fort Hall Business Council, Shoshone-Bannock Tribes

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February 23, 2021

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c/o Mr. James Lovejoy
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Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, ID 83415

Also submitted via email to: VTR.EIS@nuclear.energy.gov

Re: Versatile Test Reactor
Draft Environmental Impact Statement
DOE/EIS-0542
Document No. 2020-27951

Dear Mr. Boston,

The Shoshone-Bannock Tribes (SBT or Tribes) remain concerned that the Idaho National Laboratory (INL)—located only about 35 miles northwest of the Fort Hall Reservation and adjacent to lands where we have reserved Treaty Rights—is on track to become the hotbed for a new era of untested nuclear reactors. The Versatile Test Reactor (VTR) is just one example where the U.S. Department of Energy (DOE) supports the development of advanced nuclear reactors at INL. This VTR is not a commercial energy facility, but it is still a fairly large-scale facility for research and development that raises cause for concern. Our concerns, therefore, include not just those of the VTR Project itself but also the collection of impacts on the INL, our Treaty lands, and our Reservation and people. **53-1**

I. The VTR Project will be one of many new reactor projects at INL, which will increase nuclear waste at the site.

The VTR would generate a multitude of waste streams from the operation of the VTR. The estimated amounts of these wastes, added to existing waste at INL, were provided in Table 5-7 of the DEIS (see below). In addition, spent nuclear fuel (SNF) would be produced from operating the VTR, including 45 SNF rods annually and 110 metric tons of SNF heavy metal over the life of the VTR Project. While TRU waste would be shipped to WIPP for long-term storage, the DOE does not have a good solution for the SNF. The VTR SNF, after years of radioactive decay, would apparently be added to SNF storage pads at the INL—and there it is likely to stay for **53-2**

53-1 This VTR EIS evaluates a proposed action that is focused on the proposed VTR project. Potential future projects, such as other reactors, are not evaluated under this proposed action, but their impacts would be fully evaluated under separate National Environmental Policy Act (NEPA) analyses as and if they arise. Reasonably foreseeable future actions are considered in the Cumulative Impacts analysis in Chapter 5 of this VTR EIS.

The analysis of Environmental Justice in Chapter 4, Section 4.15, of this VTR EIS indicates that potential impacts on Native American populations would be comparable to non-Native Americans and would not result in disproportionately high and adverse human health or environmental effects.

Existing monitoring programs at the Idaho National Laboratory (INL) Site and offsite locations would continue throughout the project. The INL Site environmental surveillance programs collect and analyze samples or direct measurements of air, water, soil, biota, and agricultural products from the INL Site and offsite locations in accordance with DOE Order 458.1, "Radiation Protection of the Public and the Environment, Radiation Protection of the Public and the Environment"; DOE-HDBK-1216-2015, "Environmental Radiological Effluent Monitoring and Environmental Surveillance"; and DOE-STD-1196-2011, "Derived Concentration Technical Standard." The purpose of DOE Order 458.1 is to establish requirements to protect the public and the environment against undue risk from radiation associated with radiological activities conducted under the control of DOE pursuant to the Atomic Energy Act of 1954, as amended. Monitoring activities are performed to generate measurement-based estimates of the amounts or concentrations of contaminants in the environment. Measurements are performed by sampling and laboratory analysis or by "in place" measurement of contaminants in environmental media. The INL Site environmental surveillance programs meet or exceed requirements within these governing documents and have been determined through technical review to effectively characterize the levels and extent of radiological constituents in the environment and distinguish INL Site-related contributions from those typically found in the environment at background levels. The Annual Site Environmental Report (ASER) describes the quality assurance program to ensure validity of results from the environmental surveillance programs. Quality assurance is an integral part of every aspect of an environmental monitoring program, from the reliability of sample collection through sample transport, storage, processing, and measurement, to calculating results and formulating the report. Monitoring performed by the INL Management and Operations (M&O) contractor; the Idaho Cleanup Project Core contractor; the INL Environmental Surveillance, Education, and Research (ESER) Program contractor (independent from the M&O contractor); and the

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some undetermined amount of time. This DEIS provides no long-term solution or alternative for the storage of VTR SNF at INL. The DEIS also failed to identify how this increased nuclear waste at INL will affect DOE's ability to meet the target objectives of the Idaho Settlement Agreement.

Table 5–7. Cumulative Average Annual Waste Generation at the Idaho National Laboratory Site in Cubic Meters

Activity		LLW	MLLW	TRU Waste
Past, Present, and Reasonably Foreseeable Future Actions				
Existing Site Activities [a]		8,600	4,600	1,100
Other DOE actions		Small Quantities	Small Quantities	Small Quantities
Subtotal – Baseline Plus Other DOE Actions		8,600	4,600	1,100
VTR	INL VTR Alternative [a]	540	38	0.89
	INL Feedstock Preparation/Fuel Fabrication [b]	170[c]/170[d]	2[c, e]/2[d, e]	200[c]/200[d]
Subtotal for VTR		540 - 880	38 - 42	0.89 - 400
Total		9,100 - 9,500	4,600	1,500

LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; TRU = transuranic waste.

SNF storage at the INL is likely to increase beyond existing and VTR activities. That increase would also come from other advanced nuclear reactor projects that are being considered for development at the INL. The largest potential for SNF waste would likely come from the UAMPS/NuScale Project, a proposed commercial nuclear power plant. The Idaho Settlement Agreement of 1995 sought to prevent INL from becoming a SNF repository in part by limiting SNF shipments to INL that would come from commercial nuclear power plants. The Agreement did not specifically address SNF derived from commercial nuclear power plants (e.g. UAMPS facility) or from research and development reactors (e.g. the VTR) *located at INL*. But still, the Agreement ensured that DOE would treat SNF at the INL, prepare it for shipment, and ship it out of Idaho by 2035. The problem is that DOE has been non-compliant with the Idaho Settlement Agreement, requiring a conditional waiver under Sections D.2.e and K.1. This necessitated the Supplemental Agreement of 2019, which bought DOE more time to comply with certain terms in the 1995 Agreement. The question we have is: Has DOE considered how the increase in SNF from new reactor projects at INL will affect its ability to comply with the 1995 Agreement and any other related agreements? And has DOE considered the ramifications if Congress still does not establish a deep geological repository for this highly radioactive waste? This is not addressed in the VTR DEIS; DOE only provided a very general mention of the agreements in Chapter 7.

53-2 cont'd

II. DOE's advancement in nuclear energy fails to actually provide clean energy from start to finish, fails to properly address final-stage impacts, and leaves significant harm for countless generations to come.

The DOE is supporting advanced nuclear reactors without a solution to the final output of operating the reactors. New projects like the VTR still fail to solve the biggest problem with nuclear energy: highly radioactive waste, and lots of it. This waste can remain potentially lethal for tens of thousands of years. In other words, nuclear waste will threaten human societies virtually forever. Even in isolated and high-security areas, the threat remains. DOE has a pattern of not disclosing this impact in its NEPA documents, including this VTR Draft EIS.

53-3

Shoshone-Bannock Tribes' Comments on the Draft EIS
Versatile Test Reactor Project at INL
2/12/2021 2

Idaho Department of Environmental Quality (DEQ) INL Oversight Program demonstrate that impacts from the INL are low and consistent with the emissions reported in annual INL radionuclide National Emission Standards for Hazardous Air Pollutants (NESHAP) reports. DOE contractors' ambient air monitoring data are reported annually in the ASER which are available at http://idahoeser.com/Publications.html. DEQ's INL Oversight Program Annual Reports are available at DEQ's INL Oversight Monitoring Program website (https://www.deq.idaho.gov/idaho-national-laboratory-oversight/inl-oversight-program/).

53-2 DOE has considered the generation of spent nuclear fuel under the VTR alternatives and the uncertainty of the timing of an available offsite interim storage or permanent disposal path, with respect to existing agreements. As noted by the commenter, the proposed VTR project would generate spent nuclear fuel for which currently there is not a final disposition pathway. Although the previous project to establish a repository for spent nuclear fuel and high-level radioactive waste (HLW) at Yucca Mountain in Nevada was suspended by the Federal government, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of spent nuclear fuel. The need for a final repository for spent nuclear fuel is a national issue that is beyond the scope of this VTR EIS. Refer to Section 2.5 of this CRD for additional discussion regarding waste and spent nuclear fuel management and disposal.

As is appropriate, this VTR EIS addresses the spent nuclear fuel that would be generated from 60 years of operations. As described in this EIS, the operational life of the proposed VTR, and as a result, its production of SNF, will extend beyond January 1, 2035. As discussed in Appendix B, Section B.4, in this VTR EIS, spent nuclear fuel from VTR operations would be treated (to remove sodium), then placed in dry cask storage. Storage would be an active process that includes monitoring and inspections, and if necessary, maintenance actions to ensure that the spent nuclear fuel does not pose a threat to workers, the public, or environment. Over the time the spent nuclear fuel would be stored at the INL Site, the goal would be to maintain it in a manner that it is ready for offsite shipment whenever an offsite option becomes available. The storage casks are expected to be acceptable for storage at an offsite storage facility or a repository. The storage of spent nuclear fuel has been evaluated in this VTR EIS and is projected to have minimal impacts (i.e., once packaged, there would be no releases to the air, water, or soil and radiation doses would be low). Chapter 2, Section 2.8 of this VTR EIS was revised to indicate that prior to issuing a Record of Decision selecting an alternative, DOE would explore potential approaches with the State of Idaho to clarify and, as appropriate, address potential issues concerning the management of VTR SNF beyond January 1, 2035.

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We find this to be highly problematic because the single greatest environmental impact from nuclear energy is not even talked about. To be fair, the DOE discloses the amounts and types of nuclear waste that will be produced from the VTR and other projects at INL, and they disclose some immediate potential human health impacts. But DOE has failed to identify how the waste from the VTR and other reactors will continue to pose a threat to the human environment virtually forever. The disclosure of this long-term impact is missing from the VTR DEIS. We therefore recommend that the DOE analyze and disclose this long-term threat from nuclear waste. This matter seems increasingly germane given the DOE's momentum to support research, development, and commercialization of a new generation of advanced nuclear reactors in order to meet the nation's future energy needs. And if we are at the beginning of a new spike in the production of nuclear waste, then it is all the more critical for DOE to address in its NEPA documents the long-term impacts of the ever-increasing stockpile of nuclear waste.

The analysis and disclosure of this long-term impact/threat from nuclear waste is required pursuant to several NEPA regulations.

- 40 CFR 1500.1(b) requires that "environmental information is available to public officials and citizens before decisions are made and before actions are taken."
- 40 CFR 1502.16 requires a discussion of "any adverse environmental effects which cannot be avoided should the proposal be implemented."
- 40 CFR 1502.16 also requires that EISs discuss "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity."
- 40 CFR 1502.16(a) and (b) require the disclosure of direct and indirect effects and their significance.

A cornerstone of NEPA is for federal agencies to analyze environmental impacts in detail so as to allow the public, state and local agencies, and Indian tribes an opportunity to participate in the planning process.

The long-term nuclear waste issue is also at odds with Federal policies to move the nation toward clean energy. While we recognize that clean energy is often defined as energy produced free of greenhouse gases and carbon emissions, the increase in nuclear energy operations will produce substantial highly radioactive waste that cannot be recycled or turned into harmless substances. So, nuclear energy may be carbon-free, but it is not clean and is hazardous. We did not see this issue addressed in the VTR DEIS. We recommend that this potential conflict be discussed, as required under 40 CFR 1502.16(c), where an EIS must discuss "possible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian tribe) land use plans, polices and controls for the area concerned."

53-3 cont'd

III. Environmental justice impacts on the Shoshone-Bannock Tribes were not properly analyzed.

Executive Order 12898 directed federal agencies like DOE to make environmental justice part of their mission. What followed after the issuance for this EO was a pulse of guidance documents,

53-4

53-3 This comment implies a number of factors related to the management of the "highly radioactive waste" (that is spent nuclear fuel) that results from nuclear reactor operation. The research performed at INL could lead to the development of advanced nuclear reactors that could be deployed commercially. If this were to occur, those reactors would generate spent nuclear fuel. The potential for generation of additional SNF from the development and deployment of future reactors is beyond the scope of this VTR EIS. This EIS is properly focused on the potential environmental impacts that result from the construction and operation of the proposed VTR and associated facilities. The impacts of possible future reactors would need to be addressed if and when such reactors are proposed for deployment. The proposed VTR project would generate spent nuclear fuel for which there is not a final disposition pathway as indicated by the comment. Although the previous project to establish a repository for spent nuclear fuel and HWL at Yucca Mountain in Nevada was suspended by the Federal government, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of spent nuclear. The need for a final repository for spent nuclear fuel is a national issue that is beyond the scope of this VTR EIS. Refer to Section 2.5 of this CRD for additional discussion regarding waste and spent nuclear fuel management and disposal. As is appropriate, this VTR EIS addresses the spent nuclear fuel that would be generated from 60 years of operations. The fact that there is not a current resolution to the long-term management of spent nuclear fuel, including spent nuclear fuel that would be generated by the VTR, may not be a satisfying response to the commenter, but it is the reality. As discussed and evaluated in this VTR EIS, spent nuclear fuel from VTR operations would be treated (to remove sodium), then placed in dry cask storage. The storage casks expected to be acceptable for storage at an offsite storage facility or a repository. Storage would be an active process that includes monitoring and inspections, and if necessary, maintenance actions to ensure that the spent nuclear fuel does not pose a threat to workers, the public, or environment. Over the time it is stored at the INL Site, the goal would be to maintain it in a manner that it is ready for offsite shipment whenever an offsite option becomes available. The storage of spent nuclear fuel has been evaluated in this VTR EIS and is projected to have minimal impacts (i.e., once packaged, there would be no releases to the air, water, or soil and radiation doses would be low). In response to this comment, DOE revised this VTR EIS in a number of places to emphasize that the final disposition and long-term impacts of spent nuclear fuel from the VTR are not evaluated in this EIS, but would be addressed along with the much larger inventory of other spent nuclear fuel on a nationwide basis.

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memoranda, departmental strategy documents, and implementation plans. All of these documents provide critical guidance as to how environmental justice issues are supposed to be identified and addressed in NEPA documents, including the VTR Draft EIS.

In the DEIS, DOE focused on analyzing "the disproportionately high and adverse human health or environmental effects . . . on minority and low-income populations." DEIS at 3-59 and 4-150. While this language has its origins in Section 1-1 of EO 12898, the high disproportionality metric was not the only measure that the EO called for. In fact, the EO was accompanied by a memorandum instructing the heads of federal agencies to consider environmental justice under NEPA in four ways:

- Analyze the environmental effects, including human health, economic, and social effects of Federal actions, including effects on minority populations, low-income populations, and Indian tribes.
- Identify mitigation in the NEPA document in order to address significant and adverse effects of proposed federal actions on minority populations, low-income populations, and Indian tribes.
- Provide opportunities for effective community participation in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities…
- Ensure that the lead agency preparing the NEPA analyses and documentation has appropriately analyzed environmental effects on minority populations, low-income populations, or Indian tribes, including human health, social, and economic effects.

None of these directives constrain the analysis of environmental justice to the metric of high disproportionality. The first item above, for example, simply instructs the agency to analyze "environmental effects, including human health, economic, and social effects" on minority populations and on Indian tribes, like the Shoshone-Bannock Tribes.

DOE provided a small segment of such an analysis under Chapter 4.15 of the Draft EIS, but there was nothing specific about the Shoshone-Bannock Tribes. We were apparently lumped with other groups such as Pacific Islanders, Native Hawaiians, and Asians within the 20-50-mile radius—and this would have included the populations of Pocatello and Idaho Falls. Also, the DEIS provided nothing specific on how environmental effects from the VTR Project would impact the Tribes. There is nothing about potential economic impacts on the Tribes, and nothing about potential social impacts on the Tribes.

While the DEIS does state very generally that "high risk or exposure could occur through subsistence consumption of contaminated vegetation, fish, or wildlife," there is no specific information provided on how and where Tribal members could be at risk. This is problematic for three reasons. First, it fails to inform the Tribes as to the specifics on risks and exposure. Second, it fails to meet the guiding principles in EO 12898 associated memorandum and those provided in the CEQ's 1997 Environmental Justice Guidance. And third, it fails to provide specific information such that it undermines the requirements of NEPA. NEPA requires a federal agency

53-4 cont'd

DOE does not agree with the interpretation that the proposed VTR is at odds with Federal policies. Whereas there is a nationwide emphasis on the deployment of clean energy technologies, as indicated in Chapter 1, Section 1.2, of this VTR EIS, it is the mission of DOE to advance the energy, environmental, and nuclear security of the United States and promote scientific and technological innovation in support of that mission. In support of DOE's mission, the Office of Nuclear Energy has established research objectives intended to provide research, development, and demonstration activities that enable development of an advanced reactor pipeline. Thus, the VTR supports another aspect of ensuring the United States has a safe, secure, and reliable source of energy. Similarly, DOE does not believe that the proposed VTR is in conflict with land use plans, policies, and controls of the area concerned. Use of the land adjacent to the Materials and Fuels Complex as the proposed location for the VTR is consistent with use of that part of the INL Site. This VTR EIS clearly indicates that the VTR project would generate radioactive waste and would result in small air emissions of radioactive constituents. The potential environmental impacts have been presented in Chapter 4 and are summarized in Chapter 2, Section 2.9.

53-4 As described in Chapter 3, Section 3.1.14, and consistent with the 1997 *CEQ Guidance for Environmental Justice* (CEQ 1997), U.S. census data were utilized to characterize the racial and ethnic composition of the affected environment as they are the best available data for the subject matter analysis. The environmental justice analysis considers impacts on the following racial and ethnic groups, as designated in U.S. Census Bureau data: Black or African-American; Native Americans (based on the U.S. census data for American Indian and Alaska Native); Asian, Native Hawaiian, and Other Pacific Islander; some other race; as well as Hispanic or Latino of any race. Each group was presented individually in Chapter 3, Sections 3.1.14, 3.2.14, and 3.3.14 (see Table 3–20 for the INL Site data) and impacts were considered independently throughout Chapter 4, Section 4.15. In the Draft VTR EIS, the minority and low-income populations tables in Chapter 3 (including Table 3–20) and Chapter 4 (including Table 4-69) had an error. The American Indian and Alaska Native entries incorrectly included reference to a footnote that implied American Indians were combined with Asians, Native Hawaiians, Pacific Islanders, and others. The footnote reference was incorrect and was removed. Potential impacts on the American Indians were considered independently from other groups.

In Chapter 3, Section 3.1.14, census data for each racial/ethnic group were reported for the population within a 50-mile radius of the proposed VTR location at the

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to provide specific detailed information in the EIS so that we have a full and fair opportunity to provide meaningful comments. Environmental justice matters are no exception. 53-4 cont'd

In addition, the analysis of cumulative environmental justice impacts is flawed. The DEIS provides the following assessment:

> Impacts on minority and low-income populations would be comparable to those on the population as a whole and would be negligible. Because the doses from the Proposed Action at the INL Site would be small and there would be no disproportionate high and adverse impacts on minority and low-income populations, the Proposed Action would not substantially contribute to cumulative environmental justice impacts at the INL Site.

There are a few problems with this statement. First and foremost, cumulative effects are not and cannot be constrained to the INL Site. The air does not stay at INL, nor do the uncaptured air emissions that would be released from the VTR operations and spent nuclear fuel processing. But in the beginning of Chapter 5 of the DEIS, DOE lists the projects they considered for the cumulative impact analysis and these were all confined to INL for the INL Alternative. Because there would be off-site impacts—however major or minor—the DOE arbitrarily constrained its area of potential effect, which runs counter to NEPA requirements. This also resulted in the failure to properly analyze and disclose cumulative environmental justice effects as it relates to the Tribes. 53-5

Secondly, DOE failed to consider the heart of a cumulative environmental justice analysis. It is supposed to focus on communities like the Tribes, but it did not. A number of significant aspects of environmental justice were not considered in the VTR DEIS cumulative effects analysis. For one, the Fort Hall Reservation is surrounded by Superfund Sites, including INL in the north, Gay Mine to the east, and Eastern Michaud Flats (Simplot and FMC) in the south. Also, our people are substantially more at-risk because we rely on our Reservation and Treaty lands for food, medicines, and ceremonial items. In the cumulative effects analysis, the DOE is supposed to show the incremental addition of impacts on the Tribes from the VTR Project, other INL projects, and other projects that cumulatively impact our people. 53-6

IV. Potential air quality impacts are not fully disclosed.

The Tribes have a number of concerns about the analysis and disclosure of the VTR Project's impacts on air quality. First, the DEIS states that the Project is not expected to produce substantial quantities of ozone-depleting substances as regulated under 40 CFR 82. It also states that greenhouse gas emissions emitted from construction and operation of the VTR at INL would be a negligible percentage of the US and global GHG emissions and would not substantially contribute to future climate change. For both of these, we ask the DOE to show emissions calculations from point sources mentioned in this DEIS. 53-7

Second, we want to make sure that the high-efficiency particulate air (HEPA) filters used in the VTR Project smokestacks actually filter out radionuclide air emissions as DOE implies. The DEIS states that these HEPA filters are 99.9% efficient. But that efficiency rating is for certain particulate matter. Radionuclide emissions can be various sizes, and so we are concerned that the efficiency of these HEPA filters is not a flat 99.9% across all radionuclide air emissions 53-8

individual block group level, which is the smallest geographic area for which the U.S. Census Bureau provides consistent sample data. These data represent, as closely as possible, the potentially affected areas. Population data were organized into the various radial distances to maintain consistency with the analysis approach for the human health analysis, as human health impacts are the primary impacts of concern for the environmental justice analysis. Block groups near the INL Site with high concentrations of minority populations were specifically called out in Figure 3–11, including block groups located near Blackfoot and around the Fort Hall Indian Reservation with high concentrations of Native American populations. In Chapter 4, Section 4.15.1.2 (specifically in Table 4–69), the environmental justice impact analysis includes the average annual dose projected for each racial/ethnic group from the various proposed actions at the INL Site, including specifically for Native Americans, at all radial distances. The analysis indicates that the annual dose for any racial or ethnic minority individual, to include those within the Native American group, would not exceed that for the average nonminority individual by any more than 0.0001 millirem. To put this dose difference into context, the average annual dose from natural background radiation in the area is about 382 millirem and the regulatory limit for exposure through the air pathway is 10 millirem per year. Regardless, the difference is so small that it represents no appreciable change in the risk to the exposed individual of developing a latent fatal cancer. Further, as described in Chapter 4, Section 4.10.1.2, the annual dose from operations to the maximum exposed individual would be 0.0068 millirem, which is well below DOE and regulatory limits. Note the maximum exposed individual is assumed to be located at the INL Site boundary, which is approximately 20 miles from Blackfoot and the Fort Hall Indian Reservation. Text was added to Chapter 4, Section 4.15.1.2, to clarify this impact.

With respect to economic impacts, as described in Chapter 4, Section 4.14.1.1 and summarized in Chapter 4, Section 4.15.1.1, economic impacts at the INL Site from construction are anticipated to be negligible, to include both adverse and beneficial impacts. Overall economic impacts on the Shoshone-Bannock Tribes are similarly anticipated to be negligible. As described in Chapter 4, Section 4.14.1.2, no adverse economic impacts are anticipated during operations. Therefore, there would be no adverse economic impacts on the Shoshone-Bannock Tribes during operations at the INL Site. Impacts from operations would be expected to include small beneficial impacts on the local and regional economy (to include the Shoshone-Bannock Tribes) through an increase in population (through a small in-migrating

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produced from operating the VTR, from spent nuclear fuel storage and processing, and from treatment facilities. In fact, a study published by Min-Ho Lee et al. in the journal of Nuclear Engineering and Technology found that HEPA filtration efficiency is not a flat function.[1] It can vary, and it can drop off. The potential ramification is that radionuclide air emissions could be miscalculated. And this makes it all the more critical that DOE carefully monitors what emissions are actually passing through the HEPA filters and into the atmosphere. We recommend that DOE provides that information to the Tribes. **53-8 cont'd**

Third, given the momentum for constructing a suite of new reactors at INL and their potential impacts to the region, the Tribes must have additional monitoring equipment to help protect the health and wellbeing of our community. Currently, we only have one sampler on the Reservation, which measures only Tritium and Iodine. We have a TSP sampler that measures particulates, and an air quality station that displays some monitoring data obtained by NOAA. Compare our limited sampling and monitoring to the radionuclides releases just from the VTR Project at INL, and it is quite clear that we need additional monitoring and sampling equipment on the Reservation. At a minimum, we need a CMS on the northern part of the Reservation at Sage Hill, which is closer to INL. We would like to work with DOE to ensure that this additional monitoring/sampling station can be provided, so we can gauge a full range of potentially harmful emissions and properly protect the health and wellbeing of the Tribes. **53-9**

V. Several changes are needed in the Cultural Resources section of the VTR Draft EIS.

In Chapter 3, Affected Environment, we recommend that the DOE provide the following additional content:

- Not only do the Shoshone and Bannock peoples value tangible resources (e.g., archaeological sites, plants, animals, water, etc), but the intangible is also of great importance (e.g., the feeling and association of a place). There are several places on the INL that hold special and sacred feelings that remain significant to the Shoshone and Bannock. Please add this to the discussion on page 3-33 of the DEIS. **53-10**

- Since the creation of the INL Site, the Shoshone and Bannock peoples were able to travel freely to and from the Fort Hall Reservation to all of our hunting, gathering, and ceremonial areas. This was our inherent right and our Treaty Right. But it was cut during the WWII era when the Atomic Energy Commission restricted access and the U.S. military began testing munitions. A substantial amount of Shoshone-Bannock history was left behind on the Site—including burials, tools, sacred sites—even as some of that history was destroyed by munitions testing. Please add this to the discussion in the DEIS on page 3-33. **53-11**

- Although previous surface surveys have resulted in few archaeological resources in the proposed VTR Area of Potential Effect, there is still the potential for tribal **53-12**

[1] Min-Ho Lee, W. Yang, N. Chae, S. Choi. 2020. Performance assessment of HEPA filter against radioactive aerosols from metal cutting during nuclear decommissioning. Nuclear Engineering and Technology. 52: 1043-1050. **53-8 cont'd**

workforce and their families) and job opportunities. Text was added to Chapter 4, Section 4.15.1.2 to clarify these impacts.

With respect to other social impacts, to include exposure to radiation through subsistence consumption, as described in Chapter 4, Section 4.15.1, DOE conducts regular environmental sampling at various offsite locations, including at Blackfoot and the Fort Hall Indian Reservation, to monitor for possible impacts on the Shoshone-Bannock Tribes. Potential pathways for contaminants to reach humans are monitored and include air, water, precipitation, soil, agricultural products (i.e., milk, potatoes, wheat, and lettuce), and wildlife (i.e., pronghorn, mule deer, elk, waterfowl) as it relates to ingestion. Data from monitoring programs are reported and published annually. Monitoring locations for milk, potatoes, wheat products, and lettuce include traditional use areas of the Shoshone-Bannock Tribes and are located near Blackfoot and the Fort Hall Indian Reservation (DOE-ID 2020). Ongoing monitoring from the entirety of INL operations in both 2018 and 2019 (the most recently available data) does not indicate any risks from radiation exposure directly or through subsistence consumption (DOE-ID 2018, INL 2020b). Specifically, the total dose (via air and ingestion) estimated to be received by the maximally exposed individual during 2019 was 0.06 millirem (DOE-ID 2020). This dose is far below the annual public dose limit of 100 millirem established by DOE for a member of the public or the U.S. Environmental Protection Agency air pathway dose limit of 10 millirem. Even with the additional dose from the INL VTR Alternative, overall levels of exposure would remain very small and well below DOE and regulatory limits. Therefore, impacts on communities who rely on subsistence consumption (including Native American populations) would be negligible. Text has been added throughout Section 4.15 to clarify these impacts.

Please note, the statement the commenter references at the beginning of Section 4.15 regarding impacts on subsistence farming is meant to generally describe the types of impacts that are considered, not the impacts that DOE foresees would happen from any of the proposed actions in this EIS. The extent of analysis provided in Chapter 3, Section 3.1.14, and Chapter 4, Section 4.15, to include the referenced text additions, is commensurate with the anticipated level of negligible impact from the various proposed actions. This is consistent with the sliding-scale approach recommended in the *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements* (DOE 2004), as well as CEQ's instruction that agencies "focus on significant environmental issues and alternatives" (40 CFR 1502.1), and discuss impacts "in proportion to their

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archaeological resources below the surface in areas where the soils depth is not hindered by bedrock. Please add this to the discussion in the DEIS, page 3-34. **53-12 cont'd**

Furthermore, we request that a Tribal monitor be present on the VTR Project site during all phases of project disturbance/construction. **53-13** We also request notice from DOE should there be any changes to the VTR Project design, so we can be informed of those changes. **53-14**

VI. General concerns about the VTR Project.

In December 2020, as DOE offered a briefing on the VTR Project to the Fort Hall Business Council (FHBC), we voiced our concern about the potential risks and safety issues regarding the advanced reactor. It is a new design and has not been constructed or operated before. Like a prototype, it seems to pose some inherent risk. While we can appreciate the substantial amount of research and engineering that has gone into the VTR Project, we hope that DOE can appreciate our concern for the wellbeing of our traditional lands, the protection of our air and water, and the protection of all the plants and animals that our people use on the Reservation and our Treaty lands. **53-15**

The Tribes are also concerned about the potential for cyberattacks that could result in worst-case-scenario accidents. Under Section 4.11, the DOE analyzed the potential human health impacts that could result in a number of facility accidents, including accidents caused by earthquakes, fire involving spent fuel, and explosions. However, it appears that the DOE did not conduct an analysis of potential accidents that could result from cyberattacks. We understand that potential cyberattack-driven accidents leading to environmental impacts have not been a matter analyzed in other EISs from the DOE. But given the recent widespread cyberattacks in the US and abroad—including malicious attacks on nuclear power plants and water-treatment facilities—we recommend that this issue should be addressed in DOE's NEPA analysis. **53-16**

A final issue we raised at the briefing in December 2020 was that the Tribes receive no benefit from these new reactors at INL. The VTR could produce 300 MWth, but the Tribes would not receive any power from it. We have previously asked the DOE for assistance on energy-related issues, and we remain open to any energy-related assistance that the DOE can provide to the Tribes. **53-17**

In closing, we thank the DOE for this opportunity to provide comments on the VTR DEIS. We appreciate DOE taking our comments into consideration for the Final EIS to improve our understanding of potential risks from this VTR Project and other projects to come. **53-1 cont'd**

Sincerely,

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Fort Hall Business Council
Shoshone-Bannock Tribes

significance" (40 CFR 1502.2(b)). This VTR EIS analysis included (per EO 12898) the following considerations: (a) whether the health effects, which may be measured in risks and rates, are significant (as employed by NEPA), or above generally accepted norms; (b) whether the risk or rate of hazard exposure by a minority population, low-income population, or Indian tribe to an environmental hazard is significant (as employed by NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group; and (c) whether health effects occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards. Further, the analysis also considered a comparison of the proximity of impacts on the location of low-income and minority populations, as well as a comparison of doses to the non-minority and minority population. As described throughout this comment response, the offsite population doses from operation of the VTR and associated facilities are very low, and would not substantially contribute to human health impacts in the 50-mile region of interest (ROI) for human health impacts, including the Shoshone-Bannock Tribe (such as from any unique exposure pathways such as subsistence fish, vegetation or wildlife [including big game] consumption or well-water consumption). Therefore, more detailed impacts analyses are not warranted. Please also note that DOE engages in a range of ongoing data sharing and collaboration efforts with the Tribe per the 2017 "Agreement-in-Principle Between the Shoshone-Bannock Tribes and the United States Department of Energy" (DOE-ID 2017), and the Tribe has ongoing opportunities to access monitoring data or collect their own data for consideration outside of this EIS effort. This includes from a DOE-funded and supported Environmental Monitoring Station (EMS) located on the Fort Hall Reservation.

53-5 The environmental justice cumulative impacts analysis considers impacts throughout the various resource ROIs, including air quality and human health, which extend off the INL Site. Notably, Chapter 5, Sections 5.3.10 and 5.3.12, consider impacts within 50 miles of the INL Site (to include Blackfoot and the Fort Hall Indian Reservation), which is in turn considered in the environmental justice analysis. This section has been revised to clarify this statement. Please refer to the response to comment 53-6 for further clarification on the justification for the extent of environmental justice cumulative impacts analysis. Projects were selected for inclusion in the cumulative impacts analysis as described in Chapter 5, Section 5.2. Projects were included in the analysis if they were located within the ROI of resources considered for the VTR, and if they are currently under construction (i.e., ongoing) or are reasonably foreseeable future projects that could contribute

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to environmental impacts at the potentially affected sites. This is consistent with regulatory definitions of cumulative impacts (40 CFR 1508.7) and reasonably foreseeable future actions (43 CFR Part 46). Impacts from projects already completed or that are currently in operation are captured in the environmental monitoring as described in the INL Annual Site Environmental Reports (ASERs) (DOE-ID 2018, 2020) and other ongoing environmental monitoring. No projects were identified outside of the INL boundary within the various resource ROIs that fit the criteria for inclusion in the analysis. However, as previously stated, offsite impacts throughout the various resource ROIs were nonetheless considered and are discussed through Chapter 5, Section 5.3. Similar to as described in the response to comment 53-4, the environmental impacts described in the VTR EIS were evaluated on a sliding scale with the amount of detail commensurate with their importance per DOE guidance and in accordance with CEQ NEPA regulations. Because the offsite population doses from operation of the VTR and associated facilities are very low (see Chapter 5, Table 5–8), the additional population dose would not substantially contribute to human health impacts in the 50-mile ROI. Therefore, more detailed cumulative impacts analyses are not warranted.

53-6 As described in Chapter 5, Section 5.3.13, this EIS concludes that there would be negligible cumulative impacts on offsite environmental justice populations, which includes members of the Shoshone-Bannock Tribes, as a result of implementation of any of the VTR alternatives or options at the INL Site.

With respect to the two listed Superfund sites, the primary anticipated impacts from these sites would likely be existing soil contamination and potential resultant impacts on plant or animal species that come in contact with these soils, as well as groundwater contamination (EPA 2020, 2021). As described in Chapter 4, Section 4.3.2.1, the INL alternatives would not adversely affect groundwater quality, therefore; there would be no cumulative impacts when considered together with the existing Superfund sites. In regards to potential cumulative impacts on subsistence culture, Chapter 4, Section 4.10.1 concludes that the additional population radiation dose within 50 miles and dose to the maximally exposed individual from operations of the VTR and associated facilities would not substantially contribute to human health impacts, and would be far below the public dose limit of 100 millirem established by DOE for a member of the public; this includes impacts on the Shoshone-Bannock Tribes. Further, Chapter 5, Section 5.3.10, considers impacts from other cumulative projects, and reaches a similar conclusion. Ongoing monitoring efforts near Blackfoot and the Fort Hall

Indian Reservation in 2018 and 2019 do not indicate adverse impacts on agriculture products or game species (DOE-ID 2018, 2020). Therefore, implementation of any of the INL VTR alternatives or options are not anticipated to result in adverse effects to plant or animal species that subsistence cultures rely on, and therefore no cumulative impacts are anticipated when considered with any potential ongoing impacts from the Superfund sites. Agriculture and game species will continue to be monitored in accordance with ongoing monitoring programs near the INL, including near Blackfoot and the Fort Hall Indian Reservation, for presence of radionuclides. Please refer to the response to comment 53-5 for further clarification on the reasoning for inclusion of certain projects within the cumulative effects analysis. Similar to as described in the response to comment 53-4, the extent of analysis provided in Chapter 5, Section 5.3.13, is commensurate with the anticipated level of impact from the various proposed action alternatives, and is consistent with DOE guidance and CEQ NEPA regulations. Also, as noted in the response to comment 53-4, DOE engages in a range of ongoing data sharing and collaboration efforts with the Tribe per the 2017 Agreement-in-Principle Between the Shoshone-Bannock Tribes and the United States Department of Energy (DOE-ID 2017) to assist in the monitoring of ongoing impacts from radiation to the Tribe, which would encompass all regional activities or conditions, not just from INL operations.

53-7 The VTR EIS does not estimate emissions of ozone-depleting substances (ODSs) since the project would use very small amounts of materials that contain ODSs. Final EIS Table 4–6 identifies the point sources that would emit GHG emissions from the operation of the INL VTR Alternative. These point sources include diesel-powered electrical backup generators and propane-fired sodium heaters. The emissions calculations in the Final EIS analysis show that the project alternatives would emit minimal amounts of GHG emissions. As a result, it was not warranted to present air emission calculations in an appendix of the VTR EIS. However, these data are included as part of the project Administrative Record.

53-8 Please refer to the discussion in Section 2.11, "High-Efficiency Particulate Air (HEPA) Filter Performance," of this CRD. Many of the air emissions associated with VTR operations would be through existing MFC facility stacks that are currently monitored (Hot Fuel Examination Facility [HFEF], Fuel Manufacturing Facility [FMF], and Fuel Conditioning Facility [FCF]). Emissions from the VTR would be though a monitored release point. Data from the monitoring program would be included in the NESHAP reports and ASERs.

Commenter No. 53 (cont'd): Devon Boyer, Chairman, Fort Hall Business Council, Shoshone-Bannock Tribes

53-9 DOE takes its responsibility for the safety and health of the workers and the public seriously. Please refer to the response to comment 53-1 for additional details about the current INL environmental monitoring network. Federal and state laws, regulations, and orders require INL to establish a robust and comprehensive Environmental Management System. This system includes an extensive air monitoring system that includes 36 air samplers at 26 locations on the INL Site, off the INL Site near the boundary, and at locations distant from the INL Site. The results from the air monitoring system indicate that INL Site airborne effluents were not measurable in environmental air samples. These results are published in the INL Site Annual Site Environmental Report available at http://idahoeser.com/Publications.html.

Additionally, emissions from the VTR were evaluated to determine if additional monitoring locations are needed. The air quality analysis in the VTR EIS determined that construction and operation of the VTR project at INL would produce emissions that would remain below levels of concern and that the transport of these emissions to offsite locations at least 3 miles away would result in inconsequential concentrations. Construction and operation of the VTR project would implement best management practices that would minimize air emissions from proposed activities (see Final EIS Section 4.4.5). Additional monitoring and sampling equipment on the Reservation should be coordinated as outlined in the Agreement-in-Principle between the Shoshone-Bannock Tribes and DOE.

53-10 Revised text was added to the EIS as suggested by the comment.

53-11 Revised text was added and adapted to the EIS as suggested by the comment.

53-12 As described in Chapter 4, Section 4.6.1.1 of this VTR EIS, no traditional cultural properties or sacred sites were identified within the 138-acre area of potential effect for the proposed action. Therefore, impacts on these resources are not anticipated. Text was added to indicate that an inadvertent discovery of Native American resources would be handled in accordance with the Agreement-in-Principle between the Tribes and DOE-ID (DOE-ID 2017)

53-13 The Shoshone-Bannock Tribes' request to have a tribal monitor present on the VTR project site during all phases of land disturbance will be considered by DOE-ID in accordance with the Agreement-in-Principle between the Tribes and DOE-ID (DOE-ID 2017).

Commenter No. 53 (cont'd): Devon Boyer, Chairman, Fort Hall Business Council, Shoshone-Bannock Tribes

53-14 Consultation with Native American tribes is an important part of the NEPA process and DOE intends to continue to keep the Shoshone-Bannock Tribes informed of the progress of the VTR Project. Additional consultation with the Shoshone and Bannock Tribes would be conducted in accordance with the Agreement-in-Principle between the Tribes and DOE-ID.

53-15 DOE shares your concern for the well-being of your traditional lands and the protection of the air and water, all the plants and animals, and your people. The VTR reactor leverages design information from multiple liquid sodium-cooled fast reactors, including the GE Hitachi PRISM, the EBR reactors and the FFTF. The VTR design benefits from inherent reactor core safety and passive heat removal and builds on the safety experience demonstrated in EBR-II. As the commenter notes, DOE has committed a substantial amount of effort to research and engineering of the VTR project. That effort would continue and provide additional confidence in the safety of the VTR. Chapter 4 of this EIS identifies the impacts associated with the construction and operation of the VTR at the INL Site as well as other alternatives and options for the VTR and fuel production. If the VTR were to be sited at INL, DOE would continue to reach out to Shoshone-Bannock Tribes, providing information on the progress of the project.

53-16 Please see Section 2.8, "Intentional Destructive Acts," of this CRD for a discussion of cyberattacks. The consequences and risks of cyberattacks are bounded by the analysis in the VTR EIS. In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. The accident analysis for the EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators, such as earthquakes, tornados, wildfires, flooding, volcanoes, and human initiators. Accident scenarios considered include core disruptive accidents and sodium leaks or fires. This EIS also analyzes the impacts of potential accidents on workers and public health and safety. A description of emergency response and post-response cleanup in the event of an accident is included.

53-17 Although the VTR would be a 300 megawatt (thermal) reactor, its purpose is to provide a fast-neutron source testing capability. It would not produce electricity. Energy assistance to the Tribes is outside the scope of this EIS, but DOE will continue its discussions with the Tribes regarding energy-related issues.

Commenter No. 54: Tom Clements, Savannah River Site Watch

From: Tom Clements
Sent: Thursday, February 25, 2021 5:02:06 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Comment on Draft VTR EIS - re source of plutonium & TRU waste disposal

February 25, 2021

To: Mr. James Lovejoy
Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415
VTR.EIS@nuclear.energy.gov

From: Tom Clements
Savannah River Site Watch
Columbia, SC
[redacted]

I hereby submit this brief comment for the record of the draft EIS on the Versatile Test Reactor. Please confirm receipt.

In this document:.

https://inldigitallibrary.inl.gov/sites/sti/sti/Sort_27331.pdf

Versatile Test Reactor Fuel Cycle & Waste Management

Idaho National Laboratory
Doug Crawford
December 2020

...the following is stated on the amount of TRU waste generated per year by VTR operations - in a slide entitled "**VTR Reactor and Fuel Waste Streams (draft estimate from input to VTR EIS)**":

"TRU 0.89 m3/yr WIPP (if defense-related source; ~27 TRUPACT-II/yr)"

The EIS must clarify the source of plutonium for the VTR fuel. If the plutonium were to come from the European commercial plutonium stockpile, and thus would not be a "defense-related source," how would resulting TRU waste from fuel fabrication and other operations be disposed of if it could not be taken to the Waste Isolation Pilot Plant in New Mexico? Please discuss in details. *54-1*

For the EIS record, please provide any agreements and discuss commitments related to provision of the plutonium supply from US or European sources (including specific country names, companies and amounts of plutonium). *54-2*

The same document also states this concerning disposal of spent VTR fuel - with a plutonium "Composition at Discharge" of 89.33% Pu-239: "**Dilution of Pu in waste ingot to < 10 wt.% renders that material as Safeguards and Security Attractiveness Level D (per DOE-STD-1194-2011)**." Please discuss the downblending process to <10% weight plutonium and how the resultant waste form would meet Attractiveness Level D and how the Waste Acceptance Criteria for WIPP or another repository would be met. *54-3*

Thanks for your consideration of this comment, the second I have submitted on the draft EIS.

54-1 The VTR EIS evaluates a range of different sources of plutonium for the VTR driver fuel, including non-defense sources. If non-defense plutonium were used to produce VTR driver fuel, the transuranic waste generated as part of the reactor fuel production options would not meet the criterion of being defense related and would be designated and managed as greater-than-Class-C (GTCC)-like waste. All GTCC-like wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and agreements. GTCC-like wastes would be stored on site and be managed along with other GTCC/GTCC-like wastes at the site until they are transported to an interim storage facility or for permanent disposal. Currently there is not a path forward for the disposal of this waste. In February 2016, DOE issued the *Final Environmental Impact Statement for the Disposal of Greater-Than-Class-C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste* (DOE/EIS-0375) (Final GTCC EIS) that evaluated the potential environmental impacts associated with the proposed development, operation, and long-term management of a disposal facility or facilities for GTCC and GTCC-like waste (DOE 2016a). The Final GTCC EIS evaluated five alternatives including a No Action Alternative, geologic repository at the Waste Isolation Pilot Plant (WIPP) facility, intermediate-depth borehole, enhanced near-surface trench, and above-grade vault facilities. The Final GTCC EIS evaluates the Hanford Site, Idaho National Laboratory, Los Alamos National Laboratory, Nevada National Security Site, Savannah River Site, WIPP and the WIPP vicinity. The Final EIS also evaluates generic commercial disposal sites in four regions of the United States. The preferred alternative for the disposal of GTCC and GTCC-like waste in the Final GTCC EIS is the WIPP geologic repository and/or land disposal at generic commercial facilities. DOE has determined that the preferred alternative would satisfy the needs for the disposal of GTCC and GTCC-like waste. In accordance with the Energy Policy Act of 2005, in 2017 DOE issued a *Report to Congress on Alternatives for the Disposal of Greater-Than-Class C Low- Level Radioactive Waste and Greater-Than-Class C-Like Waste*, which provided an overview of GTCC LLW and GTCC-like waste disposal alternatives. In 2018, the DOE Office of Environmental Management (EM) issued an *Environmental Assessment for the Disposal of Greater-Than-Class C Low-Level Radioactive Waste and GTCC-Like Waste at Waste Control Specialists, Andrews County, Texas* (EA), which analyzed disposal of GTCC LLW and GTCC-like waste at Waste Control Specialists. The EA is not a decision document. In accordance with the Energy Policy Act of 2005, EM is continuing to work with Congress on the path forward for GTCC LLW disposal.

54-2 The requested documents are not available to be made part of the EIS record. Management decisions on specific sources of feedstock plutonium for the VTR fuel would not be made until the VTR is under construction. DOE's potential sources of plutonium for use as feedstock for VTR fuel production are discussed in Chapter 2, Section 2.6, of this EIS. The preferred feedstock material for the VTR would be excess NNSA material. As indicated in Section 2.6, most of the foreign material is reactor-grade plutonium and acceptable, though not preferable, for VTR fuel. If foreign material were used, agreements would be established that addressed transportation, safeguards, timing, transfer of ownership, and other items necessary to ensure safe and secure management of the material.

54-3 As discussed in the VTR EIS, Chapter 2, Section 2.2.3, "Other Support Facilities," spent driver fuel would be temporarily stored at the VTR within the reactor vessel for about 1 year. After the fuel radioactively decays and cools sufficiently, driver fuel assemblies would be removed from the vessel, the surface sodium coolant would be washed off the assembly, and the assembly would be transferred in a cask to a new onsite spent fuel pad. After several years (at least 3 years), during which time the radioactive constituents would further decay, the assemblies would be transported in a transfer cask to a spent fuel treatment facility. The sodium that was enclosed within the driver fuel pins to enhance heat transfer would be removed using a melt-distill-package process. The entire spent driver fuel assembly would be chopped. The chopped material would be consolidated, melted, and vacuum distilled to separate the sodium from the fuel. To meet safeguards requirements, the nonfuel elements of the driver fuel assembly would serve as a diluent for the remaining spent fuel to reduce the fissile material concentration. This waste is not a TRU waste to be sent to WIPP. The resulting material would be packaged in containers and temporarily stored in casks on a spent fuel pad, pending transfer to an offsite storage location. The location would be either an interim storage facility or a permanent repository when either becomes available for VTR spent driver fuel. The spent nuclear fuel is expected to be compatible with the acceptance criteria for any interim storage facility or permanent repository.

Commenter No. 55: John Chatburn, Administrator, Idaho Governor's Office of Energy & Mineral Resources

IDAHO GOVERNOR'S OFFICE OF ENERGY & MINERAL RESOURCES

BRAD LITTLE
Governor

JOHN CHATBURN
Administrator

304 N. 8th Street, Suite 250, P.O. Box 83720
Boise, Idaho 83720-0199

(208) 332-1660
FAX (208) 332-1661

February 26, 2021

U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue
MS 1235
Idaho Falls, Idaho 83415

Thank you for the opportunity to provide comments on the Draft Versatile Test Reactor (VTR) Environmental Impact Statement (EIS) (DOE/EIS-0542). The following comments were developed in coordination with the Idaho Department of Environmental Quality and the Idaho Governor's Office of Energy and Mineral Resources.

Consistent with the intent of the 1995 INL Settlement Agreement, all spent nuclear fuel (SNF) generated due to VTR operations (driver fuel) must be shipped out of the State for ultimate final disposition following temporary dry storage. **55-1**

In the Final VTR EIS please clarify if the concrete pad to be constructed on-site for the temporary dry storage of SNF (driver fuel) casks will be fully enclosed within a structure. **55-2** In addition, in the Final VTR EIS please clarify if the proposed location for the VTR is within Butte County or within Bingham County. **55-3**

The State supports the Federal Administration's promotion of advanced nuclear research and the use of advanced nuclear reactor technology at the Idaho National Laboratory (INL). **55-4** Construction and operation of the VTR at INL will increase jobs and income in the surrounding area and have a long-term beneficial impact on the Idaho economy. **55-5**

The State of Idaho appreciates the opportunity to submit these comments. Please feel free to contact me should you have any questions or need of clarification.

Sincerely,

John Chatburn
(208) 332-1671

55-1 Spent nuclear fuel (SNF) would be generated under the VTR alternatives and managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and agreements. The SNF assemblies would be stored within the VTR reactor vessel until decay heat generation is reduced to a level that would allow fuel transfer and storage of the fuel assemblies with passive cooling. After allowing time for additional radioactive decay, the SNF would be transferred to a fuel treatment facility. As discussed in the VTR EIS, Chapter 2, Section 2.2.3, following treatment and removal of sodium within the spent fuel, the SNF would be melted, diluted, placed in canisters ready for future disposal, which would then be placed in dry storage casks, and stored on a storage pad on site in compliance with all regulatory requirements and agreements. This VTR SNF would be managed along with other SNF at the site until it is transported off site to an interim storage facility or a permanent repository. As described in this EIS, the operational life of the proposed VTR, and as a result, its production of SNF, will extend beyond January 1, 2035. Chapter 2, Section 2.8, Preferred Alternative, of this VTR EIS was revised to indicate that prior to issuing a Record of Decision selecting an alternative, DOE would explore potential approaches with the State of Idaho to clarify and, as appropriate, address potential issues concerning the management of VTR SNF beyond January 1, 2035.

The SNF is expected to be compatible with the acceptance criteria for any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

55-2 There are no plans to enclose the concrete pads to be constructed for onsite temporary dry storage of treated spent nuclear fuel. DOE is investigating the use of commercial storage casks for the storage of VTR spent nuclear fuel. These casks are currently in use at multiple commercial sites throughout the United States where an enclosure is not used.

Commenter No. 55 (cont'd): John Chatburn, Administrator, Idaho Governor's Office of Energy & Mineral Resources

55-3 As shown in Chapter 2, Section 2.4, Figure 2–5 of this VTR EIS, if located at the Idaho National Laboratory (INL) Site, the VTR would be constructed adjacent to MFC in Bingham County.

55-4 DOE acknowledges your preference for the INL VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

55-5 Thank you for your support of the proposed project and acknowledgement of the beneficial economic impacts it is expected to have on the region and State of Idaho.

Commenter No. 56: Michael F. Keller, President Hybrid Power Technologies LLC

From: [redacted]
Sent: Friday, February 26, 2021 8:55:23 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Comment on VTR - Hybrid Power Technologies LLC

Hybrid Power Technologies LLC strongly objects to the entire Versatile Test Reactor (VTR) effort as fundamentally an ill-advised adventure that is counterproductive to the strategic interests of the United States. **56-1**

The VTR's sole objective is support the development of fast breeder reactors. Such reactors are designed to close the nuclear fuel cycle. However, the closed fuel cycle is grossly non-competitive relative to the open-fuel cycles used by today's thermal reactors, particularly when considering the need for extremely expensive (tens of billions of dollars) reprocessing facilities needed by fast reactors. Further, the closed fuel cycles create about the same level of high level nuclear waste as open fuel cycles. These conclusions were reached in 2003 - see "The Economics of Reprocessing vs. Direct Disposal of Spent Nuclear Fuel", Bunn, M., et. al., John F. Kennedy School of Government, DE-FG26-99FT4028, December 2003. The report accurately forecast dismal reprocessing economics decades into the future. Considering the technology improvements of advanced thermal reactors since 2003, breeder reactor economics have become even more dismal. **56-2**

Advanced thermal reactors do not require the services of the VTR as existing development facilities are quite adequate. **56-3**

In addition fast reactor safety and licensing remain very much an open question. Simply bypassing the Nuclear Regulatory Commission (apparently the intent of the VTR) does not inspire public confidence in nuclear power and is of questionable legality. **56-4**

By diverting billions of dollars into the VTR, development of viable US advanced reactor technologies is severely and likely fatally stunted. Those dollars are much better directed towards advanced reactors that may be competitive, thereby helping re-establish the US as a leader in useful nuclear technologies. **56-5**

To be blunt, the VTR is simply a means to enrich DOE laboratory sites at the expense of the nation's strategic interests. The VTR needs to be abandoned. **56-1 cont'd**

Michael F. Keller
President
Hybrid Power Technologies LLC
A small business of the State of Kansas www.hybridpwr.com

[redacted]

56-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition," and Section 2.2, "Purpose and Need," of this CRD for additional information.

56-2 The sole purpose of the VTR is not to support the development of fast breeder reactors. As stated in Chapter 1, Section 1.3, the purpose of the VTR is to provide "testing capability for next-generation nuclear reactors—many of which require a fast-neutron spectrum for operation—thus enabling the United States to regain technology leadership for the next-generation nuclear fuels, materials, and reactors." Even without using a fast reactor for breeding fuel, there are potential advantages to the use of fast reactors. Fast reactors have several inherent safety characteristics, allowing for the use of passive systems to remove heat in many off-normal and accident conditions; hold the promise of more effective use of fuel; and can help address at least some issues associated with the long-term storage of spent nuclear fuel. As evidence, the PRISM reactor whose design was leveraged to help in the development of the VTR, is a sodium-cooled fast reactor, and is not a breeder reactor.

56-3 As presented in Chapter 1 of this VTR EIS, DOE assessed the mission need for a versatile reactor-based fast-neutron source to serve as a national user facility. DOE determined that there is a need for a fast-neutron spectrum VTR to enable testing and evaluating nuclear fuels, materials, sensors, and instrumentation for use in advanced reactors and other purposes. There is an expectation that although much of the research would be for advanced fast reactors, VTR research would also contribute to advances in thermal reactors (existing and advanced).

56-4 Siting the VTR at a DOE facility was not done to bypass NRC licensing. As stated in Section 2.7.2 of the EIS, "Chief among the factors is the realistic and pragmatic assessment of whether the site had an adequate location and the technical infrastructure necessary to support the key VTR activities. Most importantly, the site needed to have established technical infrastructure to support construction and operation of a test reactor; to operate hot cells for post-irradiation examination of test items; to use hot cells for the disassembly of spent fuel and processing it to a form suitable for long-term disposal; and to manufacture VTR driver fuel, including feedstock preparation and fuel fabrication." These factors alone make siting the VTR at a DOE facility preferable over a non-DOE site. While the VTR would not be an NRC-licensed facility, the DOE would construct and operate the VTR in close collaborations with the NRC. In September of 2019, DOE and the NRC entered into a memorandum of understanding (MOU) on the VTR. This MOU sets the framework for the sharing of information and expertise between the two organizations for construction and operation of the VTR. Among other items, the NRC's engagement, consistent with its role as an independent safety and security regulator, would provide DOE with information on NRC's regulations, guidance, and licensing processes and provide a senior staff member to provide technical and regulatory expertise to the DOE Safety Basis Approval Authority regarding the applicability, interpretation, and use of NRC Regulatory Guides and other NRC guidance or documentation. It is anticipated that DOE would use NRC staff to augment DOE's safety review team on a cost-reimbursable basis. DOE has the legal authority to develop and operate reactors as authorized by the Atomic Energy Act of 1954 and the Energy Reorganization Act of 1974. Since the VTR would be located at a DOE site and would not be connected to the electrical grid, it would fall under DOE's authority to approve operations.

56-5 The VTR would provide a valuable test capability that would also support advanced thermal reactor research and development. Please refer to Section 2.2 of this CRD for additional discussion of the purpose and need for the VTR.

Commenter No. 57: Trevor Casper

From: Trevor Casper
Sent: Saturday, February 27, 2021 3:28:19 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Public Statement

Mr. James Lovejoy,

Attached is the statement that I would like to submit regarding the siting of the Versatile Test Reactor at the INL.

Thank you!

Trevor Casper

Response side of this page intentionally left blank.

Commenter No. 57 (cont'd): Trevor Casper

Comments Regarding the Siting of the Versatile Test Reactor at the Idaho National Laboratory

Submitted February 26, 2021 by Trevor Casper, [redacted]

I am a graduate student living in Idaho Falls and pursuing a Master's degree in nuclear engineering through the University of Idaho, and I would like to voice my support for the Versatile Test Reactor project here in eastern Idaho.

We must act to build the VTR so its facilities may be utilized as soon as possible to develop the materials and nuclear fuels that will be needed for these advanced nuclear technologies. The Idaho Falls area is an ideal place to site this facility. The region has a long history of expertise with nuclear technologies and the handling of nuclear materials, and the impressive track record of the Idaho National Laboratory has shown that nuclear technologies can be safely developed and utilized in this region.

Tremendous political and economic momentum is building worldwide to pursue the development of clean energy sources to mitigate the effects of climate change and meet CO2 emission goals. Nuclear power is recognized more and more as an important contributor to clean power, and in the last few years the development of advanced nuclear power technologies has seen notably improved bipartisan support in Congress, a body where nuclear power has historically faced significant partisan opposition. The environmental benefits provided by nuclear power are increasingly understood to outweigh the environmental risks.

57-1 The US must maintain leadership in nuclear research or we risk effectively ceding that strategic influence to other nations, most notably Russia and China, to be the world leaders in the development and export of nuclear technologies. We cannot afford to miss this opportunity to ensure we have the research infrastructure in place that will be needed to develop and test the next generation of nuclear technologies in the coming years. These technologies promise to offer nuclear power that is safer to operate, uses less fuel, and produces safer and more stable waste than the nuclear power plants of the 20th century. The need for these clean and environmentally-friendly energy solutions is urgent.

It's additionally important to acknowledge that the waste disposal issue is not unique to nuclear power, and that even wind turbines and solar photovoltaic panels face their own significant recycling and waste disposal environment challenges which are only beginning to be acknowledged and understood today. No energy source is without waste disposal issues.

Historical evidence has shown that nuclear facilities can be, and have been, operated very safely when compared with all other energy production facilities. The location of a national long-term disposal site for used nuclear fuel remains an ongoing political issue, but once one is selected, the science necessary to safely store and shield nuclear materials is well understood. In the meantime, the nation's used nuclear fuel is currently being stored effectively in temporary locations across the country, underscoring the viability of safe handling and medium-term storage of nuclear materials.

Please approve and expedite the development of the Versatile Test Reactor at the Idaho National Laboratory.

57-1 DOE acknowledges your preference for the Idaho National Laboratory (INL) VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition," and Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD for additional information.

Commenter No. 58: Michael McClay

From: Mike Mcclay
Sent: Saturday, February 27, 2021 5:52:35 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Versatile Test Nuclear Reactor

DOE,
I live in Idaho and have toured the INL.
I am opposed to the VTR project for 2 reasons.

One reason is safety concerns at INL. The second is the advances in clean renewable energies make them the focus for our future. 58-1

Thank you for your time,
Michael McClay

58-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition," and Section 2.7, "VTR Facility Accidents," of this CRD for additional information.

Commenter No. 59: Ralph Stanton

From: Jodi Stanton
Sent: Sunday, February 28, 2021 5:04:46 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] VTR EIS DOE/ EIS-0542 for public comment

I AM AGAINST THE NEW VERSATILE TEST REACTOR AND ITS FUEL PREPARATION FACILITIES BEING BUILT OR OPERATED AT THE IDAHO NATIONAL LABORATORY'S MATERIALS AND FUELS COMPLEX. **59-1**

The reasons are many but I will start with a facility at MFC, the Fuel Conditioning Facility (FCF), which I understand would be used to perform pyrochemical treatment of the VTR spent nuclear fuel, 2 metric tons per year. I also understand that the spent fuel would be stored at various facilities at MFC. I think it would be safe to assume that the Zero Power Physics Reactor Facility (ZPPR) would be used as one of the storage sites. **59-2**

I worked as a nuclear facility operator in both of these dilapidated facilities. The Department of Energy would not provide the funding to update the mostly inoperable mechanical slaves in FCF used to operate in the hot cells. DOE's lack of funding also included proceeding at risk by not replacing the compromised MTG computer system used for criticality safety. Nuclear Operations Management also removed all of the criticality alarms in this facility to lower maintenance cost even though there were sufficient levels of fissionable material stored there to cause a criticality. **59-3**

The same negligent behavior by DOE's contractor, Battelle Energy Alliance and DOE-Idaho led to the November 8, 2011 ZPPR facility accident which resulted in my radiological dose far exceeding regulatory limits. Biodosimetry along with liver and bone biopsy results don't lie like an unethical dose reconstruction can.

The environmental impact statement for this reactor stated that an individual would need to receive a radiological dose of a 1000 rem before any adverse effects could be expected. This is further evidence that both BEA and DOE either do not understand the effects of radiation exposure or are just being dishonest - a 1000 rem dose is a quick and painful death sentence for the exposed individual. **59-4**

The negligent decisions leading to the 2011 plutonium inhalation accident at the ZPPR and my radiological and medical consequences were based solely on lowering maintenance cost with a total disregard for safety. **59-3 cont'd**

59-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

59-2 Spent nuclear fuel (SNF) would be generated under the VTR alternatives and managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and agreements. The SNF assemblies would be stored within the VTR reactor vessel until decay heat generation is reduced to a level that would allow fuel transfer and storage of the fuel assemblies with passive cooling. After removal from the reactor vessel, the spent fuel assemblies would be washed and transferred in a cask to an onsite spent fuel pad. After allowing time for additional radioactive decay, the SNF would be transferred to a fuel treatment facility. As discussed in the VTR EIS, Chapter 2, Section 2.2.3, following treatment and removal of sodium within the spent fuel, the SNF would be melted, diluted, placed in canisters ready for future disposal, which would then be placed in dry storage casks, and stored on a storage pad on site in compliance with all regulatory requirements and agreements. This VTR SNF would be managed along with other SNF at the site until it is transported off site to an interim storage facility or a permanent repository. The SNF is expected to be compatible with the acceptance criteria for any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. As indicated in Section 2.5 of this CRD, all radioactive waste would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. All waste would meet the receiving facilities waste acceptance criteria. No wastes would be stored at the Zero Power Physics Reactor (ZPPR) facility at the Idaho National Laboratory (INL) Site.

59-3 After the November 8, 2011 plutonium contamination accident involving 30-year-old legacy materials at the ZPRR, the DOE Office of Health, Safety and Security conducted a detailed accident investigation and prepared an Accident Investigation Report (DOE 2012). The Accident Investigation Report included 18 Judgement of Need conclusions for actions where BEA and/or DOE-ID needed to improve. In

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My point is that when the Department of Energy allows their nuclear facilities to operate in such an unsafe and illegal manner, it will more than likely only affect personnel within the facility or complex. That is bad enough, but when the same pattern of negligent behavior affects the operation of a nuclear reactor, the consequences to the surrounding area can be catastrophic. **59-3 cont'd**

Every county that borders the INL has twice the incidence of thyroid cancer as the rest of the state and the country. Most of the employees who work at the INL live in Health District 7 where Bonneville County is located, has one of the nation's highest thyroid cancer rates. Arco, in Butte county and Health District 6, is the closest city to the INL and can boast a thyroid cancer incidence three times than the cancer rate as the rest of the state. The incidence of myeloma in Butte county is five times the rest of the state. The rate of childhood cancer incidence in Butte County is three times the rest of the state. The common denominator is the Idaho National Laboratory. **59-4 cont'd**

Neither the State of Idaho nor other agencies such as the Nuclear Regulatory Commission or OSHA can monitor or assure safety compliance and the pattern of negligent behavior by the Department of Energy and its contractors, such as BEA, will no doubt continue. This is why southeast Idaho cannot afford to take a chance with another reactor.

I also don't wish for my children and their children to be burdened with risks and the costs of the radioactive waste and the spent fuel storage from these operations, which will remain in Idaho, for many decades. **59-2 cont'd**

Former Nuclear Facility Operator,

Ralph Stanton

response to the incident and the Accident Investigation Report, BEA and DOE-ID developed a Corrective Action Plan and have tracked and completed the corrective actions. DOE-ID and BEA have made substantial safety improvements at MFC and INL since the unfortunate 2011 plutonium inhalation incident at ZPPR.

In 2011, fuel inspections were completed in a hood. Since then, and as a part of the corrective action, two new hoods and two inert gloveboxes were added to the ZPPR work room. This type of work is now being performed in a much more controlled and confinement environment.

During fuel production and operation of the VTR and support facilities, DOE would require safety analysis of configurations, tests, and experiments to show that the VTR would continue to operate safely with the new configuration and in compliance with the documented safety analysis. Safe operation of the VTR and the support facilities is paramount. DOE is committed to maintaining the safety basis for the VTR and all fuel production and support operations in compliance with 10 CFR Part 830.

59-4 Appendix D was revised to remove the sentence that includes the reference to the 1,000 rem dose. The statement was being interpreted differently than was intended. The intended information regarding risk of a latent cancer fatality from exposure to radioactive material is adequately and appropriately presented in the sentence that preceded the deleted sentence.

This EIS provides information on the cancer rates in the area of interest around the INL Site (Chapter 3, Section 3.1.10). It is not the purpose of this EIS to establish a cause for the cancer rates. Cancer is caused by both external factors (e.g., tobacco, infectious organisms, chemicals, and radiation) and internal factors (e.g., inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). Risk factors for cancer include age, cancer-causing substances, chronic inflammation, diet, hormones, immunosuppression, infectious agents, obesity, radiation, sunlight, and alcohol and tobacco use. Therefore, to determine the cause of any incidence of cancer can be very difficult as there are many confounding factors. Also, please refer to the response to comment 59-3.

Commenter No. 60: Deborah Reade

Date: March 1, 2021

By email to: VTR.EIS@nuclear.energy.gov.
Mr. James Lovejoy, Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS1235
Idaho Falls, Idaho 83415

Re: **Draft Versatile Test Reactor (VTR) Environmental Impact Statement (EIS-0542)**

Dear Mr. Lovejoy:

There are a variety of problems with the Versatile Test Reactor proposal and EIS, not the least of which is DOE's assertion that there is a need to construct and run such a reactor. DOE claims there is a need to have a fast-neutron reactor for experimentation but where is the proof in the Record to support this claim? And there is no clear need for such experimentation to take place in a new reactor, rather than using facilities that already exist. Finally, the only "need" for this project seems to be a very expensive **60-1**
way to use up 34 metric tons (MT) of surplus plutonium. The project should have been one of the alternatives for the previous DEIS for *The Surplus Plutonium Disposition Program for Dilution of 34 Metric Tons of Surplus Plutonium and Disposal in the Waste Isolation Pilot Plant (WIPP)*, instead of having its own, isolated, EIS. **60-2**

Public Participation and Civil Rights

Efforts to provide for public participation have been inadequate and appear to be discriminatory. Low English Proficiency (LEP) Spanish and other language speakers do not seem to have anywhere near the amount of vital information about this project easily available to them as is available for English speakers. Notification and engagement of the general public as well as of the LEP public to participate has also been minimal. Notification and education of the population along the transportation routes so they are aware of the potential dangers to themselves, their property and their environment is a particular problem and also has not been adequate. **60-3**

The project could produce as much as 24,000 cubic meters of transuranic (TRU) waste which is planned to be disposed of in the Waste Isolation Pilot Plant (WIPP) in my state, New Mexico. **60-4** Yet New Mexicans have not been adequately informed about this and those living along the routes or around the site, with some exceptions, have no understanding at all that yet more waste could be coming their way. As mentioned above, there is less vital information about this project available for LEP Spanish speakers than is easily available to English speakers. **60-3 cont'd** Yet, within a 50 mile radius of the WIPP site there is a majority of minority people – mostly of Hispanic or Mexican descent, but Native Americans as well. Many people are low income and the history, needs and concerns of this population involve little access to medical care, poor health and a multiplicity of polluting facilities both licensed and not. All of this needs to be covered in detail in any EIS. Whether sending these materials to WIPP would be a discriminatory act with the surrounding population being already so vulnerable, overwhelmed and minority, also needs to be studied in the EIS. **60-5**

60-1 Information about lack of a domestic fast-neutron testing capability and the purpose and need for a VTR is discussed in Chapter 1 of this VTR EIS. DOE is pursuing the VTR to provide a test capability that supports the fulfillment of its mission of advancing the energy, environmental, and nuclear security of the United States and promoting scientific and technological innovation in support of that mission. Refer to Section 2.2 of this CRD for additional discussion of the purpose and need for the VTR. Although the VTR as proposed would use a uranium-plutonium-zirconium alloy fuel, the reason for using this fuel is to maximize neutron production over a desired test volume while minimizing the size of the reactor. The purpose and need for the VTR are not to provide a means to disposition surplus plutonium.

60-2 DOE believes the VTR project should have its own, separate EIS. Chapter 1 of this VTR EIS discusses the background regarding the lack of an adequate fast-neutron testing capability in the United States, with Section 1.1 specifically addressing the purpose and need for the VTR. The purpose and need is for a testing capability.

60-3 This comment suggests that DOE provided inadequate notice and opportunity for public participation and thus may be discriminatory. DOE followed applicable National Environmental Policy Act (NEPA) procedures and guidance for public involvement. No requests were received regarding translation of the document into another language, nor were there any other comments regarding inadequate notification or review process discrimination.

The project being evaluated is the construction and operation of a new test reactor, associated facilities, and the necessary reactor fuel production capability at sites in Idaho, Tennessee, or South Carolina. None of the proposed facilities would be located in New Mexico.

In addition to the official U.S. Environmental Protection Agency (EPA) Notice of Availability published in the Federal Register, DOE published a Federal Register notice, notified individuals and organizations on email lists for each site, as well as on a national email list, and placed advertisements in newspapers near the candidate sites. All notifications identified the online location of the Draft VTR EIS and provided an email and U.S. mail address for communications about the project.

DOE acknowledges that the project would generate transuranic (TRU) waste and low-level radioactive waste (LLW) that would be shipped from the proposed project sites to established disposal facilities that currently receive similar wastes, including the Waste Isolation Pilot Plant (WIPP). The proposed action would not result in

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To avoid the kind of discrimination that DOE has been guilty of in the past, DOE must follow EPA guidance, including guidance on LEP and Public Participation to involve and notify the many different communities around the WIPP site, the VTR site, any fabrication site and the transportation routes that both the original radioactive materials and the radioactive waste will travel. The history, needs, concerns and demographics of *all* potentially affected communities around the sites and along the routes must be understood and addressed. **60-3 cont'd** **60-6**

Transportation

Transportation has also not been adequately considered even though this is perhaps the part of the project that will most affect the public – at least during normal operations. Using the WIPP project as an example, since it also includes many thousands of miles of plutonium transportation, **most of the negative health effects to the public of the entire project during normal operations occur during the transportation phase and along the transportation routes**. Most of these exposures and negative health effects have been projected to occur at rest stops where employees can be irradiated over and over again for years. But the general public can also be exposed while driving on the routes, by living very near a route or rest stop, or by going to rest stops themselves. **60-7**

Whether transporting surplus plutonium and uranium from other, closer, domestic or international sites; or shipping them or fuel across virtually the entire country from the Savannah River Site (SRS) to the VTR site at Idaho National Laboratory (INL), and then shipping TRU waste back across the country to WIPP in New Mexico; thousands of miles of potential health risks will have to be travelled. The exposure of the public will continue to increase with the addition of so many shipments of these radioactive materials. And of course, the risk of an accident increases with every additional unnecessary mile travelled.

Effects

The effects on and risks to the public of building and running the VTR, of fabricating the fuel, of transporting that fuel or its components, of transporting and disposing the resulting TRU waste in WIPP and eventually decommissioning the VTR itself and disposing of it as waste, must all be studied both for normal operations and for accidents – both at the sites and along the transportation routes. **60-8** Indeed, effects studies are a requirement of the RCRA permit that regulates the WIPP site; possibly other parts of the project fall under RCRA as well. If so, this should be clearly described in the EIS along with what that means for the project. **60-9**

Such effects studies must include how the effects will interact with the various health and socioeconomic factors in the affected communities along the routes and at the various sites involved, so that a true picture of the effects can be drawn. **60-8 cont'd** Whether these effects will be disparate on communities of color and low income also needs to be determined. **60-10** Costs of each part of the project, including final disposition and any changes needed to avoid discriminatory effects, should also be included in any EIS. **60-11** It certainly seems, just from the short analysis possible with the information available to me now, that if all the actual risks and the enormous total costs of the project are described correctly, the risk/benefit analysis of this vague project will most likely come out heavily on the risk and cost side with few actual benefits shown. **60-12**

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any new transportation routes for shipping TRU waste or LLW to their respective disposal sites. As shown in the transportation data (see Chapter 4, Section 4.12), the number of additional transports to either the WIPP facility or a LLW disposal facility would not be a substantial amount, less than 1 per day.

60-4 TRU wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for disposal at the WIPP in New Mexico. If the DOE defense plutonium were used to produce VTR driver fuel, the TRU waste generated as part of the reactor fuel production options would meet the criterion of being defense related. The WIPP Land Withdrawal Act (LWA) (P.L. 102-579 as amended by P.L., 104-201) requires waste disposed at WIPP to (1) meet the definition of "transuranic waste" (WIPP LWA Section 2(18)) and (2) be generated by atomic energy defense activities (WIPP LWA Section 2(19)). Additionally, waste must meet the WIPP LWA, WIPP Hazardous Waste Facility Permit, WIPP waste acceptance criteria, and other applicable requirements. Compliance with these requirements may be demonstrated by acceptable knowledge, non-destructive assay, and other established methods. The waste stream must comply with the WIPP Waste Acceptance Criteria and the WIPP Permit Waste Analysis Plan by passing a TRU waste certification audit, an inspection by EPA, and New Mexico Environment Department (NMED) approval of the final audit report.

The WIPP LWA stipulates that the TRU waste capacity of the WIPP facility is a total TRU waste volume capacity limit of 175,600 cubic meters (6.2 million cubic feet). As of April 3, 2021, the WIPP facility has disposed of 70,115 cubic meters of TRU waste. This TRU waste disposal volume is about 40 percent of the total TRU waste volume allowed by Public Law 102-579 as amended by Public Law 104-201. TRU waste volume estimates such as those provided in NEPA documents, are not intended to demonstrate compliance with the WIPP Land Withdrawal Act TRU waste volume capacity limit. TRU waste volumes projected in NEPA documents will be incorporated, as appropriate, into future ATWIR [Annual Transuranic Waste Inventory Report] TRU waste inventory estimates.

DOE is conducting preliminary planning to evaluate options to be able to continue uninterrupted TRU waste disposal operations up to the total TRU waste volume capacity limit. Additional TRU waste disposal panels that would provide capacity to dispose of TRU waste up to the WIPP LWA total TRU waste volume capacity limit may be authorized under a future permit modification. The WIPP Permit, consistent with Resource Conservation and Recovery Act regulations at 40 CFR 270.42, can

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Piecemeal Approach

Like the EIS for *The Surplus Plutonium Disposition Program for Dilution of 34 Metric Tons of Surplus Plutonium and Disposal in the Waste Isolation Pilot Plant (WIPP)* mentioned above, this EIS involves multiple facilities in multiple states as part of the project. The transportation phase involves even more states. This is clearly a national project but where is the Programmatic Environmental Impact Statement (PEIS) to bring it all together? Such a PEIS is required and necessary to look at *all* the radioactive materials and waste, and *all* the environmental consequences for *all* the facilities, *all* the transportation and *all* the processes involved. ***60-13***

In addition, DOE is segmenting this particular part of the process by running two separate sets of "alternatives" for 34 MT of surplus plutonium in parallel EISs. The VTR project should be one of the alternatives in an EIS for a *Surplus Plutonium Disposition Program* and not a separate EIS. The Dilution and Disposal option (that also has its own, isolated, EIS) should be another alternative in the same EIS. The VTR EIS is clearly another alternative way to make the 34 metric tons of surplus plutonium waste safe from proliferation, and the two EISs must be combined together. Only with a PEIS and combining all alternatives appropriately together into a single EIS, can the public understand what the alternatives for this "surplus" plutonium really are. ***60-14***

Breaking everything up is contrary to EPA policy, as I'm sure you are well aware. That policy is there for a reason and shouldn't be violated. The confused and piecemeal approach for the VTR and Dilute & Dispose EISs gives the impression that DOE is trying to hide what they are doing (and I believe this is actually the case) because they believe if the public truly were to understand what's going on and how they would be affected, they wouldn't like *any* of DOE's alternatives.

Problems at WIPP

The project, as described, assumes that as much as 24,000 cubic meters of TRU waste would be disposed at WIPP, here in New Mexico. However, this will break the volume limits imposed by the Land Withdrawal Act and the promises that DOE made to the state of New Mexico that convinced the state to allow WIPP to be built here. But besides these violations, there is a very real possibility that WIPP will not be available to receive this waste when the project needs to start disposal shipments. ***60-15***

Completely as a result of their own bungling, which included disposing waste too quickly and ignoring basic safety protocols, LANL and WIPP have disposed hundreds of explosive drums in WIPP. One or more of these exploded on February 14, 2014 two weeks after a vehicle fire in the underground. Massive safety failures both at LANL and at WIPP were revealed in the following, scathing accident reports. The result of this explosion is that much of the underground at WIPP is contaminated and the radioactive exhaust air must be filtered to keep contamination from being released. But the explosion also damaged the filtration building so underground workers have only had about 25% of the air they need to work efficiently and keep to their preferred disposal schedule.

WIPP was building a New Filtration Building that would have soon provided all needed air, but again, the contract was bungled so badly that all work on that is now shut down. Instead of working to improve their contracting and oversight capabilities, WIPP has decided that it is still "cleanup" if the radioactive air is dumped into the public airspace. This supposed "jewel in the crown" of DOE's cleanup model is a failed project that cannot demonstrate the safe underground disposal of radioactive waste

be modified by submittal of a Permit Modification Request (PMR) and decision by the NMED to approve the PMR. Both Class 2 and Class 3 PMRs include a public comment period as a step in the regulatory process. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

60-5 Please refer to Chapter 3, Sections 3.1.14, 3.2.14, and 3.3.14 (which identify minority and low- income populations within 50 miles of each site), and Chapter 4, Section 4.15, for analysis as it pertains to environmental justice and impacts on low-income and minority populations at the Idaho National Laboratory (INL) Site, the Oak Ridge National Laboratory, and the Savannah River Site.

Human health impacts from transportation of radiological and nonradiological waste associated with the VTR alternatives, including transportation accidents, are included in Chapter 4, Section 4.12, and Appendix E of the EIS. Transportation of radioactive materials and wastes occurs along public highways, as roads are authorized for transport of these materials and wastes by the U.S. Department of Transportation (DOT). The use of roads that allow transportation of radioactive materials requires a selection and approval process, in accordance with requirements specified at 49 CFR Parts 390–397, that results in minimal impacts on surrounding populations, including low-income and minority populations. Specifically, designations of routes that allow transport of radioactive materials and wastes "must be preceded by substantive consultation with affected local jurisdictions and with any other affected States to ensure consideration of all impacts and continuity of designated routes" (49 CFR 397.103). Transportation of radioactive materials and waste is regulated by Federal and State regulations, as well as DOE orders, as described in Chapter 7, Table 7–1. Please refer to the response to comment 60-7 for additional clarification regarding transportation routes and the VTR alternatives.

As noted in the beginning of Chapter 5 of this VTR EIS, the cumulative impacts of offsite waste management and disposal are not included in the EIS analysis. As described in Chapter 4, Section 4.9, the management of wastes at offsite facilities would not exceed the facilities' capacities. The impacts of these activities were already evaluated in the licensing or permitting processes for these facilities and would not result in an additional cumulative impact. Specifically, operations of the WIPP, to include ongoing waste disposal, were considered in the *Waste Isolation*

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for more than 15 years, let alone 10,000. Now they are purposely venting waste so they can hurry up again and keep to their schedule, when the prudent approach would be to protect the public and get the New Filter Building project re-started. The radioactive venting is an admission that WIPP has failed and that they cannot run the project without polluting the people and environment around the site. This is not "cleanup."

Even the GAO has said that it is not at all clear that WIPP operators and contractors can manage a significant contract like the New Filter Building construction contract. Reading about how that contract was managed, it was clearly yet another debacle on WIPP's part. WIPP and LANL both seem completely unclear about the definition of "cleanup" and "safety," claiming that "safety is a journey." It is not at all clear that WIPP will be available for the VTR TRU waste when that waste is ready to be disposed. **60-15 cont'd**

In addition, much of the New Mexico public is opposed to bringing new waste and more waste to WIPP and opposed to expanding WIPP indefinitely. WIPP's RCRA permit is up for renewal soon and expanding WIPP so that there would be room for this and other new waste will be challenged hard at that time. Again, WIPP may not be available for disposal. The EIS, whether just the VTR EIS independently or an EIS with the VTR as one alternative for dealing with the 34 MT of surplus plutonium, must address this uncertainty and return to the original promise of finding alternative repositories for waste that exceeds WIPP's current volume limitations. **60-16**

Conclusion

All possible alternatives, including the VTR alternative must be combined into one EIS and a PEIS needs to be done for the VTR and all national projects with multiple sites in multiple states. **60-17** Better justification of the need for a newly-constructed VTR must be provided unless the no-action alternative is to be the preferred alternative. **60-18** Problems with public participation and discrimination must be corrected **60-19** and comprehensive effects studies must be done for all sites and all transportation routes. **60-20** These effects studies must then be turned into disparate impact studies to see if the project will create disparate effects on minority or low income communities. **60-21** Costs must include long-term final disposition costs of all parts of the project including the VTR itself. **60-22** Multiple realistic waste disposal scenarios must be included; it is not realistic to assume that **all** waste resulting from the project will be able to be disposed in WIPP. **60-23**

Sincerely,
Deborah Reade
[redacted]
Santa Fe NM 87501
[redacted]

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Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement (DOE 1997), and more recently considered in the *Supplement Analysis for Waste Isolation Pilot Plant Site-Wide Operations* (DOE 2021b). This analysis included consideration of environmental justice impacts and impacts on minority and low-income populations.

The extent of the environmental justice analysis provided throughout this VTR EIS is commensurate with the anticipated level of negligible impact from the various proposed action alternatives under consideration. This is consistent with the sliding- scale approach in the *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements* (DOE 2004), as well as CEQ's instruction that agencies "focus on significant environmental issues and alternatives" (40 CFR 1502.1) and discuss impacts "in proportion to their significance" (40 CFR 1502.2(b)).

60-6 Please refer to the response for comment 60-5.

60-7 DOE disagrees with the commenter's assertion that the transportation impacts in this EIS are not adequately addressed. Chapter 4, Section 4.12, of this VTR EIS summarizes the transportation impacts of various nuclear and waste materials shipped between the various sites (e.g., production and disposal sites). As indicated in Section 4.12, the detailed description of the transportation impacts analysis is in Appendix E of this EIS. The analysis provides the expected exposure risks in terms of dose and expected latent cancer fatalities from low-level radiation emanating from the radioactive materials during incident-free transports. The dose from the normal transports includes those occurring on the road, at the rest stops, and the interval stops that are required for the inspection of the cargo, while in transit. These exposures are transitory, (i.e., only active when a person is near the cargo), and once the cargo is passed there would be no effects on those individuals. Given the various transport routes and the exposed population groups along these routes, the cumulative dose to the general population over the 63 years likely would not result in any LCFs from transport of radioactive materials, waste, and unirradiated VTR fuel. DOE believes that the transportation of nuclear materials to the reactor fuel fabrication and operational facilities, and the LLW and TRU wastes to the disposal facilities would result in low overall human health risks, as these activities are conducted in a safe manner based on compliance with comprehensive Federal and State regulatory requirements. The transportation of the reactor fuel (uranium and plutonium) in the United States, whether domestic or international plutonium, would be carried out by the DOE Office of Secure Transportation

(OST). OST is responsible for the safe and secure transport of government-owned nuclear materials in the contiguous United States. Even though the EIS identifies representative routes, specific information on the routes and dates of material movement are classified to ensure operational security. These materials are transported in highly modified secure tractor-trailers and escorted by armed Federal agents in accompanying vehicles for additional security, as needed. Appendix E, Section E.2.4, describes the key elements of the secure transportation asset, which emphasizes the various aspects of transportation. It should be noted that secure transportation is an ongoing activity within the United States. Appendix F of the EIS details the transportation impacts of the internationally procured plutonium to a U.S. port of entry. As indicated in this EIS, the overall risks of transporting these materials are very small.

60-8 Please refer to discussions in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," and Section 2.9, "Transportation," of this CRD and to Chapter 4 of this VTR EIS for more information. Chapter 4 includes discussions of human health impacts from normal operation (Section 4.10 with additional information in Appendix C) and accidents (Section 4.11 with additional information in Appendix D), transportation impacts (Section 4.12 with additional information in Appendix E), and socioeconomics (Section 4.14). Socioeconomic impacts are not presented for the transportation routes as normal transportation of the materials, fuels, and waste would not have a socioeconomic impact on the people along the transportation route.

60-9 All candidate locations for the VTR and associated facilities (INL, ORNL, and SRS), and offsite hazardous waste management facilities (including WIPP), currently operate under RCRA hazardous waste permits. All proposed waste management activities would comply with the existing permits and any modified permit conditions needed to ensure compliance with RCRA requirements.

60-10 Please refer to the response for comment 60-5.

60-11 An Environmental Impact Statement (EIS) is a document prepared in accordance with NEPA regulations to disclose and compare the environmental impacts of alternatives for accomplishing a proposed action. If available, cost information may be included in an EIS, but an EIS is not a document to determine the costs of an activity. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost.

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60-12 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). As described in Chapter 4 and summarized in Section 2.9 of this VTR EIS, a review of the impacts shows that construction and operation of the proposed VTR and associated facilities do not pose a substantial threat to health, property, or livelihood.

60-13 As the commenter notes, the alternatives and options presented in this VTR EIS could involve activities in multiple States: Idaho, Tennessee, and South Carolina. Chapter 4 of this VTR EIS fully evaluates the potential environmental consequences that would occur from the construction (where needed) and operation of the facilities that are being considered in each of the three locations. The consequence analysis also evaluates the potential effects of nuclear materials transport, as well as the transport and disposal of radioactive waste (details of the transportation analysis are include in Appendix E). Nationwide transportation of radioactive materials, including those associated with the VTR project, are evaluated in Chapter 5 of this VTR EIS. There is no need for a programmatic EIS to bring it all together as asserted by the comment.

60-14 DOE and NNSA are engaged in two separate NEPA actions for the VTR and the Surplus Plutonium Disposition Program because the purpose and need for each program is quite different–DOE does not agree that this is segmenting. The VTR project responds to the need for a test facility to provide a reactor-based fast-neutron source and associated facilities that meet identified user needs for a testing capability to support development of next-generation nuclear reactors—many of which require a fast-neutron spectrum for operation. The purpose of the action proposed by the Surplus Plutonium Disposition Program is to reduce the threat of nuclear weapons proliferation worldwide by dispositioning surplus plutonium in the United States in a safe and secure manner, ensuring that it can never again be readily used in nuclear weapons. Each NEPA effort will fully evaluate the potential environmental impacts of its respective proposed actions so they are available for public review. As discussed in Chapter 2, Section 2.6, one possible source of plutonium for VTR driver fuel is DOE/NNSA excess plutonium managed by the Surplus Plutonium Disposition Program. If this material were used for fuel, there would be coordination between the two programs. As discussed in Section 2.6,

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DOE/NNSA could propose in the future to make a portion of the excess plutonium available as feedstock for VTR driver fuel. Such a decision to allow use of excess plutonium as feedstock for VTR fuel production would be subject to future NEPA analysis. That analysis would evaluate the different activities that would be required to make excess plutonium available as feedstock as opposed to preparing it for disposition in accordance with current planning.

60-15 Please refer to the response to comment 60-4.

60-16 VTR operation is independent of and has an entirely different purpose and need from the Surplus Plutonium Disposition Program. Please refer to the response to comment 60-14, as well.

DOE remains committed to meeting its obligations to manage and, ultimately, dispose of transuranic waste. However, how DOE will meet this commitment as well as future WIPP facility operations are beyond the scope of the VTR EIS. Please refer to the response to comment 60-4, as well.

60-17 DOE addressed the elements of this comment in the responses to comments 60-2, 60-13, and 60-14. This VTR EIS properly evaluates alternatives related to the need for a fast-neutron, reactor-based test capability, evaluating the potential environmental impacts at the sites in the States in which possible VTR-related facilities would be located. It is not necessary or appropriate to prepare an EIS that combines the separate actions and purposes of different DOE programs.

60-18 Information about lack of a domestic fast-neutron testing capability and the purpose and need for a VTR is discussed in Chapter 1 of this VTR EIS. DOE is pursuing the VTR to provide a test capability that supports the fulfillment of its mission of advancing the energy, environmental, and nuclear security of the United States and promoting scientific and technological innovation in support of that mission. Refer to Section 2.2 of this CRD for additional discussion of the purpose and need for the VTR.

60-19 DOE believes there were no problems with discrimination or opportunities for public participation for the VTR EIS. DOE followed applicable NEPA procedures and guidance for public involvement. Please refer to the response to comment 60-3.

60-20 Please refer to the response to comment 60-7.

Commenter No. 60 (cont'd): Deborah Reade

60-21 Please refer to the response to comment 60-5.

60-22 An EIS is a document prepared in accordance with NEPA regulations to disclose and compare the environmental impacts of alternatives for accomplishing a proposed action. If available, cost information may be included in an EIS, but an EIS is not a document to determine the costs of an activity. Please refer to the response to comment 60-11, as well.

60-23 Please refer to the response to comment 60-15.

Commenter No. 61: Ian Cotten, Energy Program Manager, Snake River Alliance

Mr. James Lovejoy
Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415

March 1, 2021

Re: Draft Versatile Test Reactor Environmental Impact Statement (EIS-0542)

Dear Mr. Lovejoy,

The Snake River Alliance has served as Idaho's grassroots nuclear watchdog since 1979. We are familiar with the impacts of the past and current activities at the Idaho National Laboratory. I am providing these comments on behalf of the Alliance and the additional public interest groups listed below.

There are several areas of concern surrounding this proposal, some of which are outlined below.

The need for a VTR is ill-defined and seems to rest primarily on agency assertions. The DOE claims to need a fast-neutron reactor for experimentation, but this need is merely asserted, not demonstrated. **61-1** Furthermore, the DOE suggests the only way to satisfy the unproven need is to construct and operate this particular reactor. If the DOE ever establishes a need, it should consider modifying existing facilities to meet it. **61-2**

While fuel for all nuclear reactors is dangerous, the fuel for the proposed VTR is especially concerning. In addition to uranium, plutonium would also be required to fuel the reactor. **61-3**

The proposed use of plutonium presents typical risks of contamination and hazardous waste, but also the additional danger of nuclear proliferation and the threat of terrorism. Plutonium is a key component of nuclear bombs, and its proposed use as fuel for the VTR will set a dangerous precedent for the nuclear energy industry in the future. **61-4**

The massive amount of fuel that would be used over the lifetime of the VTR is also of concern. Based on the EIS, an estimated 34 metric tons of plutonium would be fabricated into fuel over the 60 year lifespan of the reactor. Processing this much plutonium will lead to an elevated risk of worker exposure and increased environmental impacts, **61-3 cont'd** and could result in plutonium being stranded at the fuel fabrication site (INL or SRS) if the project were halted. **61-5**

The transportation of fuel (uranium and plutonium) for the proposed VTR is a massive risk to public safety. If the fuel were sourced domestically, thousands of miles of overland transportation would be **61-6**

61-1 DOE acknowledges that there are differences of opinion as expressed in this comment, but has identified the background and purpose and need for a fast-neutron source to support research activities as described in Chapter 1 of this VTR EIS. Refer to Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic.

61-2 DOE considered other means of providing the fast-neutron test capability that would be provided by the VTR. Chapter 2, Section 2.7, of this VTR EIS presents the reasons that existing reactors and other technologies would not meet the need and schedule for establishing the fast-neutron test capability.

61-3 Please see Section 2.3, "Nonproliferation"; Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal"; and Section 2.8, "Intentional Destruction Acts," of this CRD for additional information. The environmental impacts and worker exposure related to the VTR alternatives and fuel production options are the subject of this EIS. Results of the impact analyses are presented in Chapter 4 (worker impacts are discussed in Sections 4.10.1, 4.10.2, 4.10.3, and 4.10.4).

61-4 DOE acknowledges your concern regarding nuclear proliferation. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic. The proposed VTR is a one-of-a-kind reactor where the neutron production over a desired test volume is maximized while minimizing the size of the reactor. To achieve the desired performance, VTR proposes to use plutonium in a metal alloy fuel. The use of plutonium in VTR fuel does not mean that future advanced reactors would use the same fuel; the advanced reactors currently under development would use non-plutonium fuels such as high-assay, low-enriched uranium (HALEU) or thorium fuels.

61-5 Please see Section 2.4, "Plutonium Use and Disposition," of this CRD for a discussion of this topic.

61-6 The transportation of the reactor fuel (uranium and plutonium) would be carried out by the DOE Office of Secure Transportation (OST). OST is responsible for the safe and secure transport of government-owned nuclear materials in the contiguous United States. Even though the EIS identifies representative routes, specific information on the routes and dates of material movement are classified to ensure operational security. These materials are transported in highly modified secure tractor-trailers and escorted by armed Federal agents in accompanying vehicles for additional security, as needed. Appendix E, Section E.2.4, describes

Commenter No. 61 (cont'd): Ian Cotten, Energy Program Manager, Snake River Alliance

required to deliver it to either proposed fuel fabrication site (Savannah River Site (SRS) or INL, and (if produced at SRS) from there to the VTR site at INL). If sourced internationally there would be the added risk of trans-oceanic transport. There can be no guarantee of safe transportation of these fuels. It is a risk that should not be taken. 61-6 cont'd

The use of liquid sodium as coolant adds yet another unique and substantial risk with the proposed VTR: sodium is incredibly volatile when exposed to air and water. The Monju Power Plant in Japan is a shining example of the flaws with using liquid sodium as a coolant, as it was plagued with accidents and issues around the sodium coolant system which eventually led to its decommissioning. 61-7

If the VTR were to be constructed and operated at INL, the burden of all waste produced from operations would fall on the shoulders of current and future Idahoans. An estimated 34 metric tons of plutonium, and 120 metric tons of uranium would be needed to fuel the VTR over its lifespan. As outlined in the draft EIS, the spent nuclear fuel (SNF) would not only include uranium, but also plutonium. It is short-sighted and dangerous to continue to produce SNF at any site. At INL it would sit above the Snake River Aquifer. The Snake River Aquifer is the sole source of drinking water for 300,000+ Idahoans and provides irrigation water for Idaho's richest agricultural regions. 61-8

The amount of transuranic waste (TRU) produced as a result of fuel fabrication and operation of the VTR could be as much as 24,000 cubic meters. Disposal of this waste in the Waste Isolation Pilot Plant (WIPP) in New Mexico will unnecessarily challenge the legal volume cap of WIPP and could negatively impact TRU disposal plans by DOE. 61-9

The exorbitant estimated cost of this project is also an important consideration. Spending $3 billion to $6 billion to support a nuclear energy industry that has stagnated for decades is an irresponsible use of taxpayer money. With the typical cost overruns of nuclear energy projects, the final price tag is likely to land well above even the high cost projection of this proposal. 61-10

The Snake River Alliance and the additional undersigned organizations support Alternative 2.3 ("No Action Alternative") outlined in the Draft EIS. The VTR proposal should not be pursued. 61-11

Thank you for your consideration of these comments.

Sincerely,

Ian Cotten
Energy Program Manager
Snake River Alliance
[redacted]
Boise, Idaho 83702
[redacted]

the key elements of the secure transportation asset, which emphasizes the various aspects of transportation. It should be noted that secure transportation is an ongoing activity within the United States. As indicated in this EIS, the overall risks of transporting these materials are very small.

If the plutonium is obtained from a foreign nation (e.g., France or United Kingdom), these materials would be transported in specially built vessels that have been used for transport of similar materials internationally with sufficient security and safeguards in place during their transport. The shipments would be carried out in a carefully managed and well-conceived manner. There are a series of independent barriers between the radioactive material and the outside environment. This system of "safety in depth" encompasses the material being transported, special packages in which the materials are transported, and the protection provided by the ships with their reinforced double hulls. The vessel safety system provides much greater protection than typically exists for other hazardous cargoes (such as chemicals, petroleum products), which are shipped much more frequently. It also removes reliance on the availability of emergency assistance from countries adjacent to the shipping routes. Appendix F of this EIS describes the environmental consequences from ship transport of plutonium from foreign countries to a U.S. port of entry, including impacts under incident-free and accident conditions. Transport of these materials within the U.S. would be carried out by the OST, as discussed above.

61-7 DOE takes its responsibility for the safety and health of the workers and the public seriously. The Experimental Breeder Reactor (EBR)-II and the Fast Flux Test Facility (FFTF) demonstrated safe operation with sodium as the coolant. Using past reactor operating experience and knowledge gained from extensive inherent safety testing at EBR-II and FFTF, along with advanced analysis tools, the VTR is being designed to safely operate with sodium as the coolant. Appendix D, Section D.3.3.1, reviews the history of sodium-cooled reactor operations and accidents. The discussion in Appendix D considers events and tests at EBR-I, Fermi-I, Phenix, SuperPhenix, MONJU, FFTF, and EBR-II. It should be noted that while Japan's MONJU reactor experienced a sodium leak that did not affect the reactor core, it was not restarted due to a number of other economic and political factors.

The discussion provided in Appendix D acknowledges the concerns mentioned in the comments as well as other information related to tests in FFTF and EBR-II. Evaluating past performance and tests provides valuable information that is considered in the design of the VTR. Appendix D, Section D.3.3.2, discusses safety analyses that have been performed for the VTR. Appendix D discusses how the

Commenter No. 61 (cont'd): Ian Cotten, Energy Program Manager, Snake River Alliance

And on behalf of all below:

Tom Clements
Director
Savannah River Site Watch
[redacted]

Helen Jaccard
Project Manager
Veterans for Peace Golden Rule Project
[redacted]

Jane Swanson
President
SLO Mothers for Peace
[redacted]

Joni Arends
Executive Director
Concerned Citizens for Nuclear Safety
[redacted]

Mavis Belisle
Nuclear Free World Committee Co-Chair
Dallas Peace and Justice Center
[redacted]

Jenn Galler
Community Organizer
Blue Ridge Environmental Defense League
[redacted]

Jay Coghlan
Executive Director
Nuclear Watch New Mexico
[redacted]

Marylia Kelley
Executive Director
Tri-Valley CAREs
[redacted]

Ralph Hutchison
Coordinator
Oak Ridge Environmental Peace Alliance
[redacted]

Kevin Kamps
Radioactive Waste Specialist
Beyond Nuclear
[redacted]

Alice Slater
New York Director
Nuclear Age Peace Foundation
[redacted]

Sheila Parks, EdD
Founder
On Behalf of Planet Earth
[redacted]

Glenn Carroll
Coordinator
Nuclear Watch South
[redacted]

Mark Haim
Director
Mid-Missouri Peaceworks
[redacted]

Susan Gordo
MASE Coordinator
Multicultural Alliance for a Safe Environment
[redacted]

Scott Kovac
Operations and Research Director
Nuclear Watch New Mexico
[redacted]

VTR is being designed to ensure safety throughout proposed operating conditions. The VTR design is also resilient under potential accident or upset conditions. DOE guidance for design of the VTR focuses on reducing or eliminating hazards, with a bias towards preventive, as opposed to mitigative, design features and a preference for passive over active safety systems. This general approach creates a design, which is reliable, resilient to upset, and has low potential consequences of accidents. Safe operation of the VTR is ensured by reliable systems design to ensure preservation of the key reactor safety functions. These key safety functions are (1) reactivity control, (2) fission- and decay-heat removal, (3) protection of engineered fission product boundaries, and (4) shielding.

61-8 The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as spent nuclear fuel (SNF) annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

61-9 Transuranic wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico. If the DOE defense plutonium were used to produce VTR driver fuel, the transuranic waste generated as part of the reactor fuel production options would meet the criterion of being defense related. The WIPP Land Withdrawal Act (LWA) (P.L. 102-579 as amended by P.L., 104-201) requires waste disposed at WIPP to (1) meet the definition of "transuranic waste" (WIPP LWA Section 2(18)) and (2) be generated by atomic energy defense activities (WIPP LWA Section 2(19)). Additionally, waste must meet the WIPP LWA, WIPP Hazardous Waste Facility Permit, WIPP waste acceptance criteria, and other applicable requirements. Compliance with these requirements

Commenter No. 61 (cont'd): Ian Cotten, Energy Program Manager, Snake River Alliance

Peggy Maze Johnson
President
Heart of America NW
[redacted]

Diane Turco
Executive Director
Cape Downwinders
[redacted]

Robert M. Gould, MD
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San Francisco Bay Physicians for Social Responsibility
[redacted]

Nancy Vann
President
Safe Energy Rights Group (SEnRG)
[redacted]

Sally Jane Gellert
Occupy Bergen County (New Jersey)
[redacted]

Susan Dancer-Lopez
South Texas Association for Responsible Energy
[redacted]

Stephen Brittle
President
Don't Waste Arizona
[redacted]

John LaForge and Kelly Lundeen
Nukewatch
[redacted]

Terry J. Lodge, Esq.
Toledo Coalition for Safe Energy
[redacted]

Debra Stoleroff
Vermont Yankee Decommissioning Alliance
[redacted]

Deb Katz
Executive Director
Citizens Awareness Network
[redacted]

Marilyn Elie
Indian Point Safe Energy Coalition
[redacted]

Judy Treichel
Nevada Nuclear Waste Task Force
[redacted]

Mark Stansberry
Community Organizing Center
[redacted]

Charley Bowman
Environmental Justice Task Force
WNY Peace Center
[redacted]

Manna Jo Greene
Environmental Action Director
Hudson River Sloop Clearwater
[redacted]

Michael Welch
Redwood Alliance
[redacted]

Lon Burnam
Convener
The Peace Farm
[redacted]

may be demonstrated by acceptable knowledge, non-destructive assay, and other established methods.

If foreign sources of plutonium were used to fabricate VTR fuel, the resulting transuranic-contaminated waste would not meet the criterion of being generated by atomic energy defense activities and therefore would not be eligible for WIPP disposal. Such waste would be categorized as greater-than-Class-C (GTCC)-like waste (DOE-owned) (refer to Chapter 2, Section 2.6 for an explanation of the potential for generating GTCC-like waste). At this time, DOE has completed a GTCC EIS (DOE 2016a), but has not made a decision regarding a disposal location. GTCC-like waste that could be generated by the VTR project is not included in the inventories evaluated in the GTCC EIS. If additional GTCC-like waste is generated through the VTR project, additional National Environmental Policy Act analysis may be conducted, as appropriate.

61-10 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031.

DOE always strives to learn from its past projects as well as those from the private sector. Specifically, VTR would begin construction after the appropriate level of final design has been completed as well as development of the supply chain, prototype testing of critical components, and completion of labor analysis studies. The U.S. Government would provide funding for the VTR and associated facilities through congressional appropriation. The 2021 Energy and Water Development and Related Agencies appropriations bill (R46384), directed DOE to give the Appropriations Committees "a plan for executing the Versatile Test Reactor project via a public-private partnership with an option for a payment-for-milestones approach." The bill also included the Energy Act of 2020, which, in Section 2003, further directed DOE to proceed with the design and construction of VTR and authorized its funding. DOE plans to continue to work with private sector and foreign governments to establish needed collaborations and partnerships to successfully complete the project. Congressional appropriations and funding priorities are outside the scope of this VTR EIS. In making a decision regarding construction and operation of the VTR, DOE

Commenter No. 61 (cont'd): Ian Cotten, Energy Program Manager, Snake River Alliance

Carley Towne
National Co-Director
Codepink
[redacted]

Tim Judson
Executive Director
Nuclear Information and Resource Service
[redacted]

Lizzie Turner
Organizing and Advocacy Director
Chicago Area Peace Action
[redacted]

Scott Williams
Executive Director
Healthy Environment Alliance of Utah
[redacted]

Richard Denton, MD
Friends for Peacebuilding and
Conflict Prevention
[redacted]

Dave Kraft
Founder & Director
Nuclear Energy Information Service
[redacted]

Don Safer
Board Member
Tennessee Environmental Council
[redacted]

Iris Potter
Volunteer Organizer
Michigan Safe Energy Future
[redacted]

Connie Kline
Ohio Citizens Against a
Radioactive Environment
[redacted]

Michel Lee, Esq.
Chairman
Council on Intelligent Energy &
Conservation Policy
[redacted]

Vic Macks
Steering Committee
Michigan Stop the Nuclear Bombs Campaign
[redacted]

will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost.

61-11 DOE acknowledges your support for the No Action Alternative and opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

Commenter No. 62: Tami Thatcher

From: Tami Thatcher
Sent: Tuesday, March 2, 2021 12:04:06 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Second Public Comment Submittal on the VTR EIS (DOE/EIS-0542)

Please find attached my second public comment submittal on the Versatile Test Reactor draft Environmental Impact Statement (DOE/EIS-0524).

I would appreciate being notified that you have received these comments.

Thank you.

Tami Thatcher

Response side of this page intentionally left blank.

Commenter No. 62 (cont'd): Tami Thatcher

Public Comment Submittal on the U.S. Department of Energy's Versatile Test Reactor Draft Environmental Impact Statement (VTR EIS) (DOE/EIS-0542)

Comment submittal (Second Set) by Tami Thatcher, March 1, 2021

Comments Due: March 2, 2021. Sent by email to VTR.EIS@Nuclear.Energy.gov

BACKGROUND

The draft Environmental Impact Statement for the Versatile Test Reactor (VTR) considers the potential environmental impacts for the construction and operation a new Department of Energy regulated test reactor, and associated facilities for post-irradiation evaluation of fuels and other materials, VTR driver fuel production (fuel feedstock and fuel fabrication), and the managing of its spent nuclear fuel. [1] [2] The VTR would be a 300 megawatt (thermal) fast neutron reactor that does not generate electricity and is only used for high neutron bombardment of fuels and other materials. The VTR is a pool-type, sodium-cooled reactor with a fast-neutron spectrum and will use a uranium-plutonium-zirconium metal fuel.

GE Hitachi Nuclear Energy is working with the Idaho National Laboratory on the VTR conceptual design based on its PRISM reactor, which was based on the Experimental Breeder II reactor. [3] The EBR II which was operated by Argonne National Laboratory – West at the Idaho site which is now the Materials and Fuels Complex (MFC) at the INL, although the EBR II has been dismantled. The 60-year-old pyrochemical (or pyroprocessing or electrometallurgical processing) facility at MFC, the Fuel Conditioning Facility (FCF) remains at the former EBR II complex.

OVERALL SUMMARY

The Department of Energy proposes to construct and operate the Versatile Test Reactor at either the Idaho National Laboratory or the Oak Ridge National Laboratory DOE site. DOE's stated preferred site is the INL. DOE would also produce VTR fuel at the INL or the Savannah River Site. I oppose construction of the Versatile Test Reactor at the preferred site (INL) and at ORNL. The cost of the project is going to skyrocket far beyond the several billion dollars currently discussed and the accident risks are unacceptable. Sodium-cooled fast reactors are not

62-1
62-2
62-3/4

[1] U.S. Department of Energy's Versatile Test Reactor Draft Environmental Impact Statement (VTR EIS) (DOE/EIS-0542) at https://www.energy.gov/ne/downloads/public-draft-versatile-test-reactor-environmental-impact-statement-doeeis-0542 (Announced December 21, 2020). A copy of the Draft VTR EIS can be downloaded at https://www.energy.gov/nepa or https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor. Extended deadline, VTR EIS comments now due: March 2, 2021. Send by email to VTR.EIS@Nuclear.Energy.gov

[2] See Versatile Test Reactor (VTR) draft Environmental Impact Statement comments on our home page at http://www.environmental-defense-institute.org and at http://www.environmental-defense-institute.org/publications/CommentVTRdEIS.pdf

[3] Press Release, GE Hitachi, "GE Hitachi and PRISM Selected for U.S. Department of Energy's Versatile Test Reactor Program," November 13, 2018. https://www.ge.com/news/press-releases/ge-hitachi-and-prism-selected-us-department-energys-versatile-test-reactor-program

1

62-1 DOE acknowledges your opposition to the Idaho National Laboratory (INL) VTR Alternative and the VTR project. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information. In Chapter 4, Sections 4.10 and 4.11, with additional information provided in Appendices C and D, this EIS presents estimates the evaluation of human health risks. As stated in these sections, the VTR easily meets all public health and safety requirements (for normal operational releases) and goals (for facility accidents).

62-2 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. DOE always strives to learn from its past projects as well as those from the private sector. Specifically, VTR would begin construction after the appropriate level of final design has been completed as well as development of the supply chain, prototype testing of critical components, and completion of labor analysis studies. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost.

62-3 In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. The accident analysis for the EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators, such as earthquakes, tornados, wildfires, flooding, volcanoes, and human initiators. Accident scenarios considered include core disruptive accidents and sodium leaks or fires. The EIS also analyzes the impacts of potential accidents on workers and public health and safety. A description of emergency response and post-response cleanup in the event of an accident was included.

62-4 The VTR is being designed as a one-of-a-kind test reactor and not a prototype for a commercial power reactor. Therefore it is not appropriate to compare the costs of the VTR with a commercial power reactor. DOE believes it is premature to draw conclusions about what may result from the research and development of advanced reactors that would be supported by the VTR. Regarding the VTR, as shown by the

Commenter No. 62 (cont'd): Tami Thatcher

economically competitive, are not likely to be as safe as already unsafe light-water reactors and also significantly increase proliferation concerns. [4] **62-4 cont'd**

The INL site is said to be preferred due to the lower population near the facility, which yields lower latent cancer fatalities following an accident. But precisely because Idaho has a lower population near the facility, the Department of Energy will take more shortcuts, undercutting safety at the facility. **62-5**

The accident consequences from a reactor accident such as a "core disruptive accident" at the VTR is enormous. So enormous that the VTR EIS hides the total curie amount. But do the math on 110 fuel assemblies and the reactor holds 1.57 billion curies. A reactor accident at the VTR is on the order of one or more Chernobyl nuclear disasters depending on which estimate of the Chernobyl radiological release is used in the comparison. **62-6**

Even without a core disruption accident, the fuel handling, and fuel preparation and fabrication impose risks and consequences to the population within 50 miles of the facilities similar to the estimated risk and consequences of a meltdown of a commercial light-water reactor regulated by the U.S. Nuclear Regulatory Commission. **62-7** The Department of Energy, however, is notorious for cutting safety features without having a technical justification, as happened at the DOE's WIPP facility and at the DOE's Materials and Fuels Complex regarding the plutonium inhalation event in 2011. **62-8**

The DOE is proposing conducting fuel pyrochemical (or pyroprocessing) in 60-year-old facilities at the INL to remove sodium-bonded material from the VTR fuel and years of outdoor storage of spent nuclear fuel and transuranic waste. The facilities will be too old to treat the material for the proposed added 60 years of VTR operations. **62-9**

Importation of plutonium from France or the UK is likely to be preferred over U.S. surplus plutonium because of the variety of impurities. The purification processes for the U.S. surplus plutonium have been costly and slow. The VTR EIS will probably not be reducing the U.S. surplus plutonium stock pile. **62-10** The VTR only exacerbates plutonium disposal issues, all while creating many opportunities for plutonium theft and plutonium release accidents as the material is transported and during storage. The transportation of plutonium from Europe to the US and around the U.S. has not been addressed adequately in the VTR EIS due to the number of shipments, the flexible and lax packaging requirements, and the inadequate emergency response readiness. The VTR EIS must address the plutonium shipment accident consequences and explain whether any compensation program (such as Price-Anderson Act) would apply to radiological releases from transportation of radiological material. **62-11**

The VTR EIS relies on numerous EISs that are inadequate for many facets of the VTR program including being inadequate to address the unavoidable waste streams including the spent nuclear fuel from the VTR. A Programmatic Environmental Impact Statement (PEIS) is required to address the VTR because it would be adversely impacting waste disposal at the **62-12**

[4] Thomas B. Cochran, et al., *Fast Breeder Reactor Programs: History and Status*, A research report of the International Panel on Fissile Materials, February 2010. http://large.stanford.edu/courses/2011/ph241/dunn1/docs/rr08.pdf **62-4 cont'd**

2

analysis in this VTR EIS, Appendix D, the reactor would be designed to operate with very low risks associated with accidents. Refer to Section 2.3, "Nonproliferation," of this CRD, for additional discussion of this topic.

62-5 DOE would apply the same safety standards to the construction and operation of the VTR at either INL or ORNL. INL is DOE's preferred site for the VTR for many reasons, including the availability of hot cells and a highly qualified, specialized work force with the requisite skills to support VTR operation. Worker and public safety are DOE's highest priority, and INL workers are highly trained in performing their jobs. Education and training requirements, including those for safety and radiation protection, are commensurate with job functions. The purpose of this EIS is to assess the environmental impacts of the proposed action. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and the Nuclear Regulatory Commission (NRC). DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons.

62-6 DOE evaluated a hypothetical beyond-design-basis VTR accident to enable comparisons between the siting options and to provide a bounding analysis at this stage of design. DOE expects the probabilistic risk analyses and other safety analyses that would be performed as the design progresses to demonstrate that the accident is not credible.

DOE notes that comparisons of the Chernobyl accident with the VTR hypothetical accident are not directly applicable. There is no similarity to the Chernobyl power plant, in terms of reactor type, structures, and especially power level and radioactive inventory (both are much smaller in the case of VTR). Chernobyl data on radionuclide release is not directly relevant to other reactor designs because of the unique features and release mechanisms associated with the RBMK reactor design. The size of the VTR and RBMK reactors, and their radiological inventories, are not directly comparable either. Additionally, the values provided by the commenter are for the radiological inventory of the VTR, not the amount released in the hypothetical reactor accident and should not be compared to the Chernobyl radiological release data.

Commenter No. 62 (cont'd): Tami Thatcher

Waste Isolation Pilot Plant (WIPP), DOE's Greater-Than-Class-C waste disposal, spent fuel continued storage and disposal at the non-existent DOE spent fuel and high-level waste disposal program, and impacting treatment of existing sodium-bonded spent fuel at the INL. The hoped-for off-shoots of the VTR will then greatly add to the spent nuclear fuel problem because we already need two Yucca Mountain repositories and we don't have one Yucca Mountain repository and there has been no program to develop one since 2010. **62-12 cont'd**

The high cost of VTR siphons scare money away from real climate change solutions. **62-13** And any meaningful increase in the use of nuclear energy would mean needing a new Yucca Mountain repository every year. [5] **62-12 cont'd**

I am opposed to the Department of Energy's proposed Versatile Test Reactor project and to locating it at the Idaho National Laboratory. And anyone who cares about human health in general and southeast Idaho in particular who understands the costs and risks imposed by the VTR project would be opposed to this project. **62-1 cont'd**

Please add these comments to the comments I sent earlier in February [6] just prior to the announced deadline extension. In this second comment submittal, I address more of the errors and misleading portrayals of the accident likelihood and consequences in the VTR EIS.

The VTR EIS addresses the radiation dose to a noninvolved worker at 330 feet from the accident, to a hypothetical member of the public at 3.1 miles from the accident, and the latent cancer fatalities for the population within 50 miles. The harm to human health harm, particularly from cancer incidence rather than cancer fatality, increased illnesses, increased birth defects is not included in the VTR EIS and it must, in order to fulfill the intent of NEPA reguations. **62-14**

The radioactive waste storage and disposal problems the Idaho National Laboratory already faces are greatly worsened by the VTR project. The extent to which radioactive wastes from the VTR project will be buried over the Snake River aquifer or will languish with no disposal facility are not realistically or transparently addressed in the VTR EIS. The VTR EIS violates NEPA by pretending that previous EISs, many of which have flailing or non-existent programs, cover the issue of waste management. From the DOE's greater-than-class-C low-level radioactive waste that DOE has not ruled out sending to INL, to the over-committed Waste Isolation Pilot Plant (WIPP) in New Mexico, to the non-existent spent nuclear fuel disposal program, the VTR EIS is waiving at fictions to pretend that DOE has the comprehensive planning, research and program implementation to address existing waste or future VTR wastes. **62-15**

The DOE wants us to believe its many assumptions and assertions about the accident risks posed by the project. Buried in the EIS document it does admit that if the VTR has a bad day, **62-16**

62-12 cont'd

[5] Edited by Allison M. Macfarlane and Rodney C. Ewing, *Uncertainty Underground Yucca Mountain and the Nation's High-Level Nuclear Waste*, The MIT Press, 2006. Page 4.

[6] See Tami Thatcher's first public comment submittal on the U.S. Department of Energy's Versatile Test Reactor Draft Environmental Impact Statement (DOE/EIS-0542) at http://www.environmental-defense-institute.org/publications/CommentVTRdEIS.pdf

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DOE takes its responsibility for the safety and health of the workers and the public seriously. The Experimental Breeder Reactor (EBR)-II and the Fast Flux Test Facility (FFTF) demonstrated safe operation with sodium as the coolant. Using past reactor operating experience and knowledge gained from extensive inherent safety testing at EBR-II and FFTF, along with advanced analysis tools, the VTR is being designed to safely operate with sodium as the coolant. Appendix D, Section D.3.3.1 reviews the history of sodium-cooled reactor operations and accidents. Sodium-cooled reactors have been operated for a number of years. The discussion in Appendix D considers events and tests at EBR-I, Fermi-I, Phenix, SuperPhenix, MONJU, FFTF, and EBR-II. The discussion provided in Appendix D acknowledges the concerns mentioned in the comments as well as other information related to tests in FFTF and EBR-II. Evaluating past performance and tests provides valuable information that is considered in the design of the VTR. Appendix D Section D.3.3.2 discusses safety analyses that have been performed for the VTR. Appendix D discusses how the VTR is being designed to ensure safety throughout proposed operating conditions. The VTR design is also resilient under potential accident or upset conditions. DOE guidance for design of the VTR focuses on reducing or eliminating hazards, with a bias towards preventive, as opposed to mitigative, design features and a preference for passive over active safety systems. This general approach creates a design, which is reliable, resilient to upset, and has low potential consequences of accidents. Safe operation of the VTR is ensured by reliable systems design to ensure preservation of the key reactor safety functions. These key safety functions are (1) reactivity control, (2) fission- and decay-heat removal, (3) protection of engineered fission product boundaries, and (4) shielding.

62-7 Please refer to the response to comment 62-6. As indicated in Appendix D, Section D.4.9.6 the risks of the hypothetical, beyond-design-basis VTR accident are much lower than the estimated risks of a commercial light-water reactor regulated by the U.S. Nuclear Regulatory Commission.

62-8 DOE is dedicated to learning from past accidents. DOE now has stronger rules for maintaining records of facility configuration and maintaining transparency in operations. These actions should minimize the likelihood of past accidents identified in the comment. Facilities are operated in accordance with their approved safety basis authorization and maintained to reduce the likelihood and consequences of an accident. During operation of the VTR, DOE would require safety analysis of configurations, tests, and experiments associated with the VTR to show that the VTR would continue to operate safely under the new condition and in compliance

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"the consequences can be in the hundreds or thousands of rem to the public…" [7] But trust us, they say in technojargon, that is "beyond extremely unlikely." **62-16 cont'd**

The DOE wants to bet the farm - your farm (or business or home or life or your child's life) that a severe reactor accident won't happen.

And even without a reactor accident, an accident involving making VTR's plutonium fuel or performing the required processing to store the fuel involves significant risk to communities within 50 miles of the facilities. **62-17**

The project DOE is promoting aims for privatized profits at tax payer expense. It claims to help solve energy poverty by helping to generate electricity in the most expensive and accident-prone way known and by adding to the spent nuclear fuel storage and disposal problems we already have. [8] [9] [10] **62-18** The Department of Energy has not estimated what the nation's spent nuclear fuel storage, repackaging and disposal costs will ultimately be.

The fees collected from operating commercial nuclear reactors probably won't even pay for the cost of repackaging the waste for disposal, let alone obtaining the two disposal repositories now needed. [11] [12] [13] **62-19**

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[7] Excerpt from VTR EIS, Appendix D, page D-74, Section D.4.9 Versatile Test Reactor Beyond-Design-Basis Reactor Accidents, "By design, the VTR is able to withstand a wide range of accidents. Most events that could affect safe operation of the VTR are mitigated by the VTR design. This section addresses potential beyond-design-basis accidents that have the potential for high consequences even though the probability is very low (1×10^{-6} to 1×10^{-8} per year). These accidents represent events in which the consequences can be in the hundreds or thousands of rem to the public while probabilities are less than one in a million per year. Consideration of these very low-probability but potentially high-consequence accidents provides valuable insight for the public and decision-makers in understanding the overall risks of operation, siting decisions, and the need for emergency preparedness." **62-16 cont'd**

[8] Blue Ribbon Commission of America's Nuclear Future. 2012. (It uses 2010 estimates for spent fuel quantities) www.brc.gov **62-18 cont'd**

[9] U.S. Nuclear Waste Technical Review Board (NWTRB), Management and Disposal of U.S. Department of Energy Spent Nuclear Fuel. Arlington, December 2017. See p. 15.

[10] Nuclear Regulatory Commission, 10 CFR 51, Waste Confidence-Continued Storage of Spent Nuclear Fuel, Federal Register, Vol. 78, No. 178, September 13, 2013.

[11] Government Accountability Office, Spent Nuclear Fuel: Accumulating Quantities at Commercial Reactors Present Storage and Other Challenges, GAO-12-797. September 14, 2012. https://www.gao.gov/products/GAO-12-797 The amount of spent nuclear fuel is increasing by about 2,000 metric tons per year and likely more than doubling to about 140,000 metric tons before it can be moved off-site. "At the end of 2012, over 69,000 metric tons is expected to accumulate at 75 sites in 33 states, enough to fill a football field about 17 meters deep." Apparently they converted to metric units by changing feet to meters (?) **62-19 cont'd**

[12] Sandia National Laboratories, Spent Fuel and Waste Science and Technology, *Direct Disposal of Spent Nuclear Fuel in Dual Purpose Canisters: R&D Path Forward*, PowerPoint presentation, SAND2018-5437 PE, May 2018. https://www.osti.gov/servlets/purl/1515737 Their study estimated the cost of repackaging spent nuclear fuel canisters at $32.7 billion, see page 9. The criticality concerns for not repackaging were said to need to argue low risk rather than low probability of criticalities in the repository, meaning their argument would have to show criticalities were low consequence.

[13] U.S. Government Accountability Office, *Commercial Nuclear Waste: Effects of a Termination of the Yucca Mountain Repository Program and Lessons Learned*," GAO-11-229, May 10, 2011. https://www.gao.gov/assets/320/317634.html "Spent nuclear fuel is considered one of the most hazardous substances on earth. Without protective shielding, its intense radioactivity can kill a person exposed directly to it within minutes or cause cancer in those who receive smaller doses. Although some elements of spent nuclear fuel

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with the documented safety analysis (DSA). DOE is committed to operating the VTR in accordance with DOE orders to protect the safety and health of the workers and the public and to maintaining the safety basis for the VTR in compliance with 10 CFR Part 830.

62-9 The FCF is indeed nearly 60 years old. However, part of INL's investment strategy addresses the maintenance of base operations, plant health, and research, development, and demonstration capability. A portion of this includes reviving and improving MFC capabilities and improving facility reliability through refurbishment and replacement of aging instruments and plant systems that can impact facility reliability and availability. Needed upgrades to ensure continued safe operation of the FCF would be addressed as part of this effort. Should the FCF be designated for decommissioning at some point in the future while still supporting the VTR project, the construction of a replacement facility or the relocation of VTR spent fuel treatment activities would be evaluated to determine the need for future National Environmental Policy Act (NEPA) action.

62-10 DOE's potential sources of plutonium for use as feedstock to VTR fuel production are presented in Chapter 2, Section 2.6, of this EIS. DOE expects to use DOE plutonium in the VTR. As indicated in Section 2.6, most of the foreign material is reactor-grade plutonium and acceptable, though not preferable, for VTR fuel.

62-11 The transportation of plutonium is routinely carried out by the DOE Office of Secure Transportation (OST). OST is responsible for the safe and secure transport of government-owned nuclear materials in the contiguous United States. These materials are transported in DOE Department of Transportation (DOT)-certified Type B packages. Even though the EIS identifies representative routes, specific information on the routes and dates of material movement are classified to ensure operational security. These materials are transported in highly modified secure tractor-trailers and escorted by armed Federal agents in accompanying vehicles for additional security, as needed. Appendix E, Section E.2.4, describes the key elements of the secure transportation asset, which emphasizes the various aspects of the transportation. It should be noted that secure transportation is an ongoing activity within the United States. Finally, as indicated in this EIS, the overall risks of transporting these materials are very small. With respect to activities conducted for DOE, the Price-Anderson Act achieves its objectives by requiring DOE to include an indemnification in each contract that involves the risk of a nuclear incident. This DOE indemnification (https://www.energy.gov/sites/prod/files/gcprod/documents/paa-rep.pdf) (1) provides omnibus coverage of a DOE contractor and all other

Other radioactive wastes from the VTR project will either be buried over the Snake River Plain aquifer as it the DOE's current practice or shipped elsewhere. The presumption that the Waste Isolation Pilot Plant (WIPP) in New Mexico can accept any and all waste that the DOE can't dispose of anywhere else continues a long pattern of DOE expecting to undermine the laws that were made to protect New Mexico from an ever-expanding mission. 62-19 cont'd

The VTR project could use surplus plutonium stocks but these proved costly and complicated to purify at the DOE's canceled MOX plant. The VTR EIS says DOE may choose to import the plutonium from France or the UK. Importing the plutonium, however, would simply add to the nation's current plutonium disposal problems. 62-20

The DOE has actually stated it hopes the VTR project will "lead to reduced nonproliferation concerns." [14] [15]Translated this means DOE's stated goal is to *increase the proliferation concerns* – which is indeed, what the proposed program will actually do. It will make it easier for nuclear weapons material like plutonium to get into the wrong hands. 62-21

The DOE had to cease collecting fees from commercial nuclear power plants in 2014 because a court found that the DOE had no spent nuclear fuel disposal program and hasn't since 2010. [16] [17] [18] 62-18 cont'd The VTR EIS relies on numerous inadequate waste management EISs, hoping we won't 62-22

cool and decay quickly, becoming less radiologically dangerous, others remain dangerous to human health and the environment for tens of thousands of years. The nation's inventory of over 65,000 metric tons of commercial spent nuclear fuel--enough to fill a football field nearly 15 feet deep--consists mostly of spent nuclear fuel removed from commercial power reactors. The volume of commercial spent nuclear fuel is expected to more than double by 2055—assuming currently operating reactors receive license extensions and no new reactors are built--and is currently accumulating at 75 sites in 33 states…" 62-18 cont'd

[14] The Department of Energy's Federal Register notice that is in Appendix A of the VTR EIS actually quotes DOE as having an objective of the VTR to lead to ***reduced nonproliferation concerns***. Most of us would like to reduce the weapons proliferation concerns, however.

[15] Also see Federal Register stating DOE's intent. Specifically, "DOE will continue to explore advanced concepts in nuclear energy that may lead to new types of reactors with further safety improvements and reduced environmental and nonproliferation concerns." https://www.federalregister.gov/documents/2019/08/05/2019-16578/notice-of-intent-to-prepare-an-environmental-impact-statement-for-a-versatile-test-reactor 62-21 cont'd

[16] Steven Dolley, Elaine Hiruo, and Annie Siebert, *S&P Global Platts*, "Federal court orders suspension of US DOE nuclear waste fund fee," November 19, 2013. https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/111913-federal-court-orders-suspension-of-us-doe-nuclear-waste-fund-fee

[17] World Nuclear News, Zero day for US nuclear waste fee, May 16, 2014. https://www.world-nuclear-news.org/Articles/Zero-day-for-US-nuclear-waste-fee Collection of the fee ended on what is being called "zero day," May 16, 2014.

[18] Brandi Buchman, *Courthouse News Service*, "Entergy Says Feds Are 50 Years Behind on Nuclear Waste," July 2, 2017. https://www.courthousenews.com/entergy-says-feds-50-years-behind-nuclear-waste/ 62-18 cont'd

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persons who might be legally liable for injury or damage resulting from a nuclear incident; (2) indemnifies fully all legal liability up to the statutory limit on such liability (approximately $9.43 billion for a nuclear incident in the United States); (3) covers any DOE contractual activity that might result in a nuclear incident in the United States; (4) is not subject to the availability of appropriated funds; and (5) is mandatory and exclusive. The Department of Energy Acquisition Regulation (DEAR) sets forth standard nuclear indemnification clauses that are incorporated into all DOE contracts and subcontracts involving source, special nuclear, or by-product material (nuclear material). The Price-Anderson Act would compensate members of the public following a transportation accident involving DOE radioactive materials.

If the plutonium is sourced from a foreign nation (e.g., France or United Kingdom), these materials would be transported in specially built vessels that have been used for transport of similar materials internationally with sufficient security and safeguards in place during their transport. The shipments in vessels would be carried out in a carefully managed and well-conceived manner. There are a series of independent barriers between the radioactive material and the outside environment. This system of "safety in depth" encompasses the material being transported, special packages in which the materials are transported, and the protection provided by the ships with their reinforced double hulls. The vessel safety system provides much greater protection than typically exists for other hazardous cargoes (such as chemicals, petroleum products), which are shipped much more frequently. It also removes reliance on the availability of emergency assistance from countries adjacent to the shipping routes. Appendix F of this EIS discusses the environmental consequences from ship transport of plutonium from foreign countries to a U.S. port of entry, including impacts under incident-free and accident conditions. Transport of these materials within the U.S. would be carried out by the OST, as discussed above

62-12 This VTR EIS addresses an appropriate scope for the proposed project. It evaluates the potential impacts of reactor fuel production, VTR construction and operations, post-irradiation evaluation, waste management, and spent nuclear fuel management. With respect to waste management, the EIS identifies the quantities and disposition of low-level radioactive waste (LLW), mixed low-level radioactive waste (MLLW), and transuranic waste (TRU). With respect to the WIPP facility, the VTR project proposes to use it as it is intended–for the disposal of qualifying transuranic waste that meets waste acceptance criteria. It is beyond the scope of this VTR EIS to attempt to resolve the national issue of spent nuclear fuel disposal.

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notice the multiple disconnects with reality. There is no spent nuclear fuel disposal facility on the horizon. [19] [20] [21] **62-22 cont'd**

The routine emissions from the VTR will be negligible, the VTR EIS assures us. **62-23** And the routine radiological releases from the INL have been increasing over the last two decades, including releases of americium-241. **62-24**

In Idaho and elsewhere, thyroid cancer incidence has been rapidly climbing. But curiously, all of the counties surrounding the INL have experienced more than a decade of roughly double the thyroid cancer incidence than the rest of Idaho and the rest of the country. [22] [23] [24] [25] **62-25**

Americium-241 has been determined to pose a significant risk for thyroid cancer incidence which the VTR EIS ignores because of its focus on cancer fatalities, not incidence. [26]

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[19] See everycrsreport.com from September 16, 2019 on Civilian Nuclear Waste Disposal. By law, the Yucca Mountain repository was capped at 70,000 metric tons. DOE estimated that there was 81,600 metric tons in 2018. And it discusses the projected need to dispose of 130,000 metric tons, citing a 2007 projection. https://www.everycrsreport.com/files/20190916_RL33461_9c53abb93c522f94939ff34d94bba8f2b8c190ef.html#Content

[20] FCRD-UFD-2014-000069, August 2014, reports the Department of Energy already assuming to projected need to dispose of approximately 139,000 metric tons, projected to be produced through shutdown of the last reactor in 2055. (Two repositories were to hold 140,000 metric tons of spent nuclear fuel.) https://www.energy.gov/sites/prod/files/2014/10/f19/7FCRDUFD2014000069R1%20DPC%20DirectDispFeasibility.pdf

[21] Sierra Club, *Guidance on Implementing Sierra Club Policy on the Management of High-Level Nuclear Waste*, Adopted by the Board of Directors September 12, 2020. https://www.sierraclub.org/sites/www.sierraclub.org/files/uploads-wysiwig/sierraclub_guidance_high-level_nuclear_waste_management_2020_08_05.pdf?v=20200805 "Even more problematic, after cancelling the Yucca project, our federal government has not launched a scientific and technical effort to identify the necessary elements for a permanent repository and all the key safeguards. Instead the federal government is now jointly participating in research being conducted by other countries, using Underground Research Laboratories for the studies."

[22] National Cancer Institute, Surveillance, Epidemiology, and End Results Program, Cancer Query System. https://seer.cancer.gov/canques/incidence.html

[23] Hyeyeun Lim et al., JAMA, "Trends in Thyroid Cancer Incidence and Mortality in the United States, 1974-2013," April 4, 2017. https://pubmed.ncbi.nlm.nih.gov/28362912/ or https://jamanetwork.com/journals/jama/fullarticle/2613728

[24] C. J. Johnson, B. M. Morawski, R. K., Rycroft, Cancer Data Registry of Idaho (CDRI), Boise Idaho, Annual Report of the Cancer Data Registry of Idaho, *Cancer in Idaho – 2017*, December 2019. https://www.idcancer.org/ContentFiles/AnnualReports/Cancer%20in%20Idaho%202017.pdf.

[25] Environmental Defense Institute February/March 2020 and July 2020 newsletter articles. "Rate of cancer in Idaho continues to increase, according to Cancer Data Registry of Idaho." As the SEER 9 region thyroid incidence peaked at 15.7 per 100,000, and the State of Idaho thyroid incidence average was 14.2 per 100,000, Bonneville County reached thyroid cancer rates of 30.9 per 100,000. [25] But other counties near the Idaho National Laboratory also have elevated thyroid cancer incidence rates: Madison (29.3 per 100,000), Fremont (27.9 per 100,000), Jefferson (28.9 per 100,000), and Bingham (28.6 per 100,000). But let's not forget Butte county. Butte county's thyroid cancer rate of 45.9 per 100,000 puts it in a class by itself. Much of Butte county is within 20 miles of the INL and nothing says radiation exposure like Butte's leukemia rate at 3 times the state rate and myeloma at 5 times the state average rate. **62-25 cont'd**

[26] T.R. Hay and J.P. Rishel, Pacific Northwest National Laboratory, Department of Energy, *Revision of the APGEMS Dose Conversion Factor File Using Revised Factor from Federal Guidance Report 12 and 13*, PNNL-22827, September 2013. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-22827.pdf

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This VTR EIS specifies the quantity of spent nuclear fuel to be generated, and as is appropriate, addresses processing the spent fuel to a stable form and safely storing it until an offsite storage facility or repository is available. Similarly, it is not within the scope of this VTR EIS to evaluate the possible future generation of spent nuclear fuel from advanced reactors that may or may not be developed and deployed. Plans for treating VTR spent nuclear fuel were made with recognition of the ongoing project to use the Fuel Conditioning Facility to process existing sodium-bonded spent nuclear fuel. By the time the VTR is constructed and the first load of spent fuel is removed from the core, allowed to cool in the reactor vessel for about a year, and transferred to a storage pad to cool for another 3 years, DOE will have completed treatment of the existing sodium-bonded spent fuel inventory at the INL Site. If foreign sources of plutonium were used to fabricate VTR fuel, DOE-owned greater-than-Class-C (GTCC)-like waste would be generated (refer to Chapter 2, Section 2.6 for an explanation of the potential for generating GTCC-like waste). At this time, DOE has completed a GTCC EIS (DOE 2016a), but has not made a decision regarding a disposal location. GTCC-like waste that could be generated by the VTR project is not included in the inventories evaluated in the GTCC EIS. If GTCC-like waste were generated by the VTR project, additional National Environmental Policy Act analysis would be conducted, if appropriate.

62-13 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). The prioritization of funding for climate change solutions is outside the scope of this VTR EIS.

62-14 Appendix C, Section C.1.3, of this VTR EIS presents a detailed discussion of human health effects due to exposure to radiation. Radiation can cause a variety of damaging health effects in humans, both somatic and genetic. Somatic effects (those that affect the exposed individual) are more probable. The most significant effect is induced cancer fatalities. These are called latent cancer fatalities (LCFs) because the onset of cancer may take many years to develop after the radiation dose is received. In this VTR EIS, LCFs are used as the measure of estimated risk due to radiation exposure.

This EIS (as is common practice in DOE EISs that include alternatives with potential radiological impacts) uses population and maximally exposed individual dose

When I started studying radiological releases from the INL, I never imagined what Idaho citizens would be facing now and in the future. With my years as a nuclear safety analyst at the INL and my years studying accidents, environmental surveillance, worker illness compensation and CERCLA cleanup, and the way the Department of Energy manages its nuclear facilities, I am terrified of the VTR program proposed for the INL. Citizens of southeast Idaho should be, too. 62-1 cont'd

I have compiled a table of the VTR accidents, including the "beyond extremely unlikely" ones not discussed in the main body of the VTR EIS documents, see Table 1. The accidents are ordered by dose to the hypothetical maximally exposed individual located 3.1 miles from the facility during the accident. Many of these accidents would affect the public within 50 miles of the accident, but those figures are more difficult to conceptualize as they depend on population dose. 62-26

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and latent cancer fatality as the measure of health impacts on the public. DOE recognizes that these are not the only potential impacts from radiation exposure. As the commenter notes, cancer incidence is also an impact, and the morbidity rate is higher than the mortality rate. The mortality rate used by DOE when making estimates of risk uses a conversion factor of 6×10^{-4} LCFs per rem or person-rem (the conversion factor used in this EIS), while the morbidity conversion factor suggested for use is 8×10^{-4}. Consistent use of the cancer mortality rates across all alternatives and fuel production options allows for an assessment of the differences in impacts between the alternatives. Adding the morbidity rate to the assessment would not add to the ability to differentiate between alternative impacts.

DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons.

62-15 As discussed in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, all low-level radioactive waste (LLW), mixed LLW (MLLW), and transuranic (TRU) waste would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR wastes would be managed in accordance with applicable laws, regulations, and DOE orders.

Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF, including the SNF from VTR. The VTR EIS includes an evaluation of the construction and operation of a SNF storage facility that could safely store the entire 60-year inventory of SNF generated under the VTR alternatives. Storage would be an active process that includes monitoring and inspections, and if necessary, maintenance actions to ensure that the spent nuclear fuel does not pose a threat to workers, the public, or environment. Over the time it is stored at the INL Site, the goal would be to maintain it in a manner that it is ready for offsite shipment whenever an offsite option becomes available. The storage of spent nuclear fuel is projected to have minimal impacts (i.e., once packaged,

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Table 1. Versatile Test Reactor project accident highlights (includes those deemed "beyond extremely unlikely").

Accident scenario	Material-at-risk of being released	Radiological material released	Dose at 330 ft (rem)	Dose at 3.1 miles (rem) [50-mile population LCF]
VTR core disruption reactor accident – the only reactor accident and the only "beyond-design-basis accident noted in the VTR EIS.	66 fuel assemblies in-core and 44 fuel assemblies decayed 220 days, total of 1.57E9 curies, See Table D-42 for individual fuel assemblies	Use release fractions of Table D-32 for 1,100 C, which range from 1.0 to 0.001 For 1,300 C, the release is stated in the VTR EIS to be several times higher	520,000 rem This uses the release factors for 1100 C. The release fractions for the 1300 C accident would have been several times higher.	790 rem [220]
D.3.1.8 Aircraft Crash into VTR Fuel Fabrication Facility	5000 grams Pu, See Table D-2	1020 grams, Pu-239 equivalent	830 rem	1.1 rem [0.1]
D.3.1.9 Beyond-Design-Basis Earthquake Involving All VTR Fuel Fabrication and Preparation MAR	5000 grams Pu See Table D-2	1020 grams, Pu-239 equivalent	830 rem	1.1 rem [0.1]
D.3.3.5.2.2 Eutectic Fire Involving VTR 6 Fuel Assemblies in the VTR Experiment Hall	3 Fuel Assembles (half of the assemblies)	220-day cooled assemblies. See Table D-42 and see the uniquely chosen release fractions in Table D-10	160 rem	0.24 rem [0.02]
D.3.3.5.2.4 VTR Seismic Event Resulting in Collapse of the Experiment Hall	18 Spent fuel assemblies in experiment hall	220-day cooled assemblies. See Table D-42 and see the uniquely chosen release fractions in Table D-10	58 rem	0.071 rem [8E-9]
D.3.1.4 Spill and Oxidation of Molten Pu-U with Seismically Induced	5,090 grams KIS-grade PuO_2	11.1 grams Pu-239 equivalent	9 rem	0.012 rem [1E-3]

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62-26 cont'd

there would be no releases to the air, water, or soil and radiation doses would be low). Therefore, there would be no expected impacts on the Snake River Plain Aquifer. Refer to Section 2.6, "Snake River Plain Aquifer," of this CRD for additional discussion regarding this subject.

Regarding the comment about GTCC waste disposal, DOE has not issued a Record of Decision following preparation of the *Final Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste* (DOE 2016a) and the *Environmental Assessment for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste at Waste Control Specialists, Andrews County, Texas* (DOE 2018); however, the preferred alternative for disposal of LLW and GTCC-like waste in the Final EIS is generic commercial facilities and/or the Waste Isolation Pilot Plant (WIPP) in New Mexico.

62-16 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions of event frequency represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. A beyond-design-basis accident is recognized as a potential hazard; however, such an event is extremely unlikely because a large number of independent failures would have to happen before an accident could occur. DOE would have multiple engineered and administrative controls in place to prevent these failures. In the unlikely event an accident were to occur, the potential dose to the public is bounded by the accident analysis in the EIS. No events would be as severe as the beyond-extremely-unlikely event analyzed in this VTR EIS. The beyond-extremely-unlikely event evaluated in this VTR EIS is appropriately assigned an event frequency of 1×10^{-7} per year. In any case, the event frequency is applied consistently between VTR alternatives and thereby allows a fair comparison between the VTR alternatives. In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. The accident analysis for the EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators, such as earthquakes, tornados, wildfires, flooding, volcanoes, and human initiators. Accident scenarios considered

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Accident scenario	Material-at-risk of being released	Radiological material released	Dose at 330 ft (rem)	Dose at 3.1 miles (rem) [50-mile population LCF]
Confinement Failure (During Fuel Production)				
D.3.6.1 Seismic event Causes Failure of Spent Fuel Storage Cask	6 spent fuel assemblies	3 spent fuel assemblies, 4-year cooled, See Table D-43 and see Table D-13 for unique and very low release fractions of 4.0E-5 for all but the noble gases	3.1 rem	3.9E-3 rem [4E-10]
D.3.1.6 Beyond-Design-Basis Fire Involving TRU Waste Drum (From Fuel Production)	398 grams KIS-grade Pu	1.96 grams Pu-239 equivalent	1.6 rem	2.2E-3 rem [2E-9]
D.3.4.1 Criticality Involving Melted Spent Fuel (Failed Confinement) (During Spent Fuel Handling and Treatment)	1.0E19 fissions	Noble gases and Iodine, see Table D-44	1.0 rem	3.9E-3 rem [8E-5]
D.3.1.5 Plutonium Oxide-to-Metal Conversion Explosion of 3013 Container of PuO_2 (Fuel Production)	5,090 grams KIS grade PuO_2	97.3 grams Pu-239 equivalent	0.27 rem	0.11 rem [1E-2]

Table sources: See various tables throughout Appendix D of the VTR EIS. The 50-mile population LCF [latent cancer fatality] is the number of expected latent cancer fatalities for the entire population within 50-miles, in order to compare the accident severity presented in the table. But the actual value should not be construed as realistic. The Department of Energy's rate of cancer fatalities per rem low-balls the actual figure, omits cancer incidence, and increased birth defects as well as other health impacts. The VTR EIS does include a long-term figure but appears to do so incorrectly by neglecting the wide spread impact of contaminated food and future generations of people living in the long-lived radioactive contamination. Note that for some accidents, the release is modeled to stay closer to the INL. The explosion of a 3013 can of plutonium oxide, D.3.1.5, however, has a substantial offsite dose, higher than several other accidents that had higher doses at 3.1 miles.

62-26 cont'd

include core disruptive accidents and sodium leaks or fires. The EIS also analyzes the impacts of potential accidents on workers and public health and safety. A description of emergency response and post-response cleanup in the event of an accident was included.

62-17 In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. Section D.3 identifies and addresses a range of accidents associated with fuel handling and treatment, spent fuel storage, post-irradiation examination, and fuel production in addition to the VTR accidents analyzed. The accident analysis for the EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators, such as earthquakes, tornados, wildfires, flooding, volcanoes, and human initiators. Accident scenarios considered include core disruptive accidents and sodium leaks or fires. The EIS also analyzes the impacts of potential accidents on workers and public health and safety. A description of emergency response and post-response cleanup in the event of an accident was included.

62-18 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF. The VTR EIS would not generate electricity. For information on spent fuel storage and disposal, please see the Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

62-19 Please refer to the response to comment 62-15.

62-20 Refer to the response to comment 62-10. If foreign sources of plutonium were used, transfer of feedstock materials would not be expected until the VTR construction is proceeding. See also the discussion in Section 2.5, "Radioactive Waste and Spent Fuel Management and Disposal," of this CRD for additional information.

62-21 The text referred to in the comment is was not specific to the VTR, but to a part of DOE's larger mission and was incorrectly stated. DOE's intent is to work to reduce proliferation concerns. This language has been corrected in Chapter 1 and the Summary of the Final VTR EIS. Because Appendix A is a copy of a previously issued *Federal Register* notice, that text was not changed.

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SUMMARY OF VTR EIS INADEQUACY WITH EMPHASIS ON THE ACCIDENT ANALYSIS

The harm from a VTR accident regarding economic impacts from the loss of agriculture, contaminated property, land, homes and vehicles, loss of livelihoods and the many years, more than decades of unacceptable levels of radiological contamination is not adequately conveyed in the VTR EIS. 62-27

The VTR EIS has buried in the document, the radionuclides and curie-amounts released by various accidents, in ways that require ferreting the information out from various tables in appendixes. The VTR EIS goes to extreme lengths to avoid saying the total curies released and from which radionuclides for the beyond-design-basis reactor accident. Even the release fraction table, Table D-32 is not specific enough to ascertain precisely which radionuclides the release fraction corresponds to. 62-28

Why does the VTR EIS go to these lengths? I think they don't want the public to know that the VTR reactor accident can release 1.57 billion curies. I think they don't want the public to know that the VTR reactor accident can release nearly the amount of cesium-137 that the 1986 nuclear disaster at Chernobyl (based on accepted but probably underestimated release estimates). I think they don't want the public to understand how a VTR accident can release an unusually high amount of long-lived transuranic radionuclides, specifically the americium and curium, which have a high release fraction. These radionuclides decay through a long series of radioactive elements and so the half-life of an individual radionuclide can be misleading. 62-29

The story that the VTR EIS emphasizes is that the Department of Energy's estimated accident likelihoods are so low that there's no need to worry. The public won't understand the degree to which the Department of Energy's accident likelihood estimates and the various release factors used to whittle down the radiological releases are **biased, speculative and unreliable.** 62-30

The story that the VTR EIS emphasizes is that there are laws and regulations and that the Department of Energy follows these laws and will ensure that its operations are safe. But I have studied the serious accidents over the last decade at Department of Energy facilities: the 2011 plutonium inhalation event at the Idaho National Laboratory's Materials and Fuels Complex, the 2014 underground fire and then drum explosion at WIPP, and the 2018 accident when four waste drums popped their lids and ejected powdery radioactive waste in a fabric enclosure that would usually have unprotected workers present. In each accident, the Department of Energy was found to have serious deficiencies in multiple safety programs. In each case, the Department of Energy was taking shortcuts with maintenance of equipment, shortcuts in emergency response training and planning, and making indefensible safety changes. 62-31

The accident analyses in the VTR EIS rely on many assumptions that are unreliable even if sanctioned by the Department of Energy methodologies. 62-32 The amount of radioactive material that could be released, the "material-at-risk" may be significantly larger than the VTR EIS has estimated. 62-33 The fraction of the admitted "material-at-risk" to the fire or explosion is then reduced by various factors such as the "airborne-release-fraction," the "respirable faction," the "damage ratio," and the "leak-path-factor" These chosen factors may reduce the radiological release by 62-34

62-22 This VTR EIS appropriately evaluates management of waste and spent nuclear fuel that would be generated by the VTR project in Chapters 2 and 4. Please refer to the response to comment 62-12 and the discussion in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

62-23 Thank you for your comment. Routine emissions were developed using current INL Site emissions information for similar activities as required to support the VTR project. These estimates were scaled to account for differences between the VTR project and current operations (quantity of material being handled and in the case of spent fuel treatment age of the fuel). Also see the response to comment 23-34 in this commenter's other comment submittal.

62-24 An evaluation of the historical radiological emissions from the INL Site is not within the scope of the EIS. However, some historical data was reviewed to address this comment. Information about routine radiological releases from the INL Site can be found in the Annual Site Environmental Reports (ASER). Based on data in the 2000 ASER and the 2016 to 2019 ASERs, the total air emissions from the INL Site have been reduced by a factor of more than 3 over that time period. The 2000 ASER did not specifically identify americium as an effluent, but the 2016 to 2019 average INL Site americium emissions as documented in the ASERs also show a reduction by an order of magnitude compared to the americium releases reported in the 2005 ASER.

62-25 As stated above, this EIS (as is common practice in DOE EISs that include alternatives with potential radiological impacts) uses population and maximally exposed individual dose and latent cancer fatality as the measure of health impacts on the public. DOE recognizes that these are not the only potential impacts from radiation exposure. As the commenter notes, cancer incidence is also an impact, and the morbidity rate is higher than the mortality rate. The mortality rate used by DOE when making estimates of risk uses a conversion factor of 6×10^{-4} (the conversion factor used in this EIS), while the morbidity conversion factor suggested for use is 8×10^{-4}. Consistent use of the cancer mortality rates across all alternatives and fuel production options allows for an assessment of the differences in impacts between the alternatives. Adding the morbidity rate to the assessment would not add to the ability to differentiate between alternative impacts. The commenter is correct in noting that the relationship between the morbidity rate and mortality rate for thyroid cancers is higher than that associated with cancers in general, FGR 13 shows a mortality to morbidity ratio of 0.1. (The statement that americium has been shown to pose a significant thyroid risk cannot be substantiated. The cancer risk several orders of magnitude. This means, for example, that an estimated dose of 3 rem to a noninvolved worker at 330 ft from the accident may actually yield a dose 100 or more times higher — 300 rem rather than the 3 rem. Such differences can be the difference between life and death for the person exposed. 62-34 cont'd

And obscured beyond the focus on hypothetical radiation doses to people is the extensive radiological contamination that will yield years, decades or more, of long-term impact to citizens living in the region. The sometimes modest-appearing radiological doses mean that a significant radiological release, particularly of the long-lived radionuclides released to southeast Idaho, will blow in the wind, contaminate air, soil, water, agricultural land, real estate, homes, businesses, vehicles — and is simply not explained adequately in the VTR EIS. 62-35

Even a modest, non-reactor VTR accident would have severe adverse impact to communities near the Idaho National Laboratory. And following a severe reactor accident at the VTR, communities would be devastated, economically and from short-term and long-term radiation health effects. While some radioactive gases would blow away in the winds, other radionuclides like the plutonium and americium would stay in our communities for, basically, millennia.

Radionuclides of various radioactive decay half-lives would be released. The radionuclides would remain pervasive in the environment as fine, invisible and deadly dust that we breathe, that through airborne contamination contaminates our water wells and water tanks, and that contaminates agriculture products, both plant and animal. It would not simply be the misfortune of some workers at the INL — this proposed project creates numerous ways for serious radiological releases to occur that would devastate the lives and livelihoods of many people living in southeast Idaho. 62-36

The VTR EIS Must Explain the Curie Amounts and Radionuclides Released

By never stating the curie size of the release, and by asserting, without sound technical basis, that the accidents are "beyond extremely unlikely", if the reader misses one page of an appendix, they would not see the out-of-this-world radiation doses to someone 330 ft from the accident or the deadly dose even 3.1 miles away.

The VTR EIS obscures that fact that a reactor accident involving the Versatile Test Reactor could involve a radiological release larger than released by the 1986 Chernobyl accident. Neither the human health nor the economic devastation from a VTR accident are realistically conveyed in the VTR EIS. 62-37

The VTR EIS repeatedly asserts that a reactor accident won't happen and is "beyond-design-basis," at 1.0E-7 accidents per year. But the VTR EIS Tables show that if such an accident does occur, it would involve releasing a significant portion of 1.57 billion curies. 62-38 But you have to do the math yourself. Even the release fractions are given in a fuzzy way (Table D-32) and the VTR results did not use the higher temperature accident, so they could lower the presented radiological consequences. The VTR EIS must be clear about the total curies released for every radionuclide released by an accident and the release fractions must be given in a less fuzzy way. The VTR EIS must state the total curies released from a VTR accident for both the moderate and the high temperature accidents, not just the moderate temperature accident. The VTR EIS 62-39

associated with americium is primarily to bone tissue, the lung, and liver.) However at the low doses predicted from the radiological releases from VTR including VTR fuel production (see Chapter 4, Section 4.1.10), no additional instances of thyroid cancer would be expected. As noted by the commenter, there are elevated levels of thyroid cancer in the counties surrounding the INL Site. However, the overall cancer rate for the surrounding counties is lower than that for Idaho and for the U.S. in general. This EIS provided information on the cancer rates in the area of interest around the INL Site (Chapter 3, Section 3.1.10). It is not the purpose of this EIS to establish a cause for any of these cancer rates. Cancer is caused by both external factors (e.g., tobacco, infectious organisms, chemicals, and radiation) and internal factors (inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). Risk factors for cancer include age, alcohol, cancer-causing substances, chronic inflammation, diet, hormones, immunosuppression, infectious agents, obesity, radiation, sunlight, and tobacco use. Therefore, to determine the cause of any incidence of cancer can be very difficult as there are many confounding factors.

62-26 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. The consequences of beyond-extremely-unlikely accidents were not included in the main body of the EIS because their inclusion would not change the conclusions of the EIS. The consequences of beyond-design-basis accidents are addressed in Appendix D of the EIS. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons.

62-27 The MACCS2 projected economic impacts are based on best-estimate engineering models as the current state of knowledge is ever changing. The MACCS2 computer program projected economic costs, including population-dependent costs, farm dependent costs, decontamination costs, interdiction costs, emergency phase costs, and milk and crop disposal costs based on local land use and economic conditions. The models projected economic costs within 50 miles for the severe accidents at INL and ORNL. The models' projected economic costs for the ORNL regions are much higher than those for INL primarily due to the higher population density and the more varied land use. In any case, the long-term impacts are applied consistently

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assumed that the accident would not attain temperatures above 1100 C but noted that if the temperatures do exceed 1100 C, the **releases would be several times higher.** 62-39 cont'd

A VTR accident would involve the 66 fuel assemblies in the core and the 44 fuel assemblies stored out-of-core but in the reactor vessel. The accident would occur rapidly and involve the entire 110 fuel assemblies, but DOE assumes that the accident does not reach temperatures above 1100 C would cause an **estimated radiation dose of 520,000 rem** to the noninvolved worker at 330 ft from the accident and **790 rem to a hypothetical citizen** located 3.1 miles from the accident. 62-40 Much about the radiological exposures to people within 50 miles is left to the imagination. The VTR EIS only wants to communicate that the higher population near Oak Ridge means that the VTR should be located in the more sparely populated southeast Idaho — because people in a lower population zone are expendable. 62-41

The radiological doses would depend on how the wind blows, when it rains, and whether or not contaminated food is consumed. A bad day at the Versatile Test Reactor could be an accident fifteen times larger in terms of total curies than many of the experts had estimated the Chernobyl accident to have released. The experts don't have a consensus on how many curies and of each radionuclide were actually released from Chernobyl. The contamination from the VTR could stay closer to home but much depends on the weather at the time of the accident. 62-42

The VTR EIS doesn't state the amount of curies that its limited temperature VTR accident would release, nor the curies released in the event that the accident reaches higher temperatures. The radionuclide inventory of the fuel assemblies in Table D-42 show that for the 110 fuel assemblies, 1.57 billion curies are releasable from the 66 in-core fuel assemblies and additional 44 fuel assemblies stored in the reactor vessel, but it is left for the reader to do the math because the table is in terms of a single fuel assembly. 62-43

The VTR EIS includes a large number of potential radiological accidents. I highlighted just a few of them in Table 1 (above). Table 1 includes the material-at-risk and then the material assumed to actually be released, after having been reduced by a number of assumptions pertaining to the airborne-release-factor, respirable fraction, damage ratio and leak-path-factor. The estimated radiological doses to the noninvolved worker at 330 ft from the accident, to the maximally-exposed-individual of the public located 3.1 miles from the accident give an indication of the severity of the accident. Although the releases can also affect the population within 50 miles of the accident, the VTR EIS's lowballed accident frequencies and the dependence on low population, the latent cancer fatality statistics or risk estimates are less easily understood. 62-44

The VTR EIS uses language to promote the false impression of more confidence in the overly optimistically low releases and low radiation doses than warranted by the what is really known. If it is science, it must be understood as the "tobacco science" that it is, because of the heavy bias toward reducing radiological release estimates, the associated radiation doses and the human health and economic harm. 62-45

The Summary and Chapter 4 of the VTR EIS exclude any mention of what its authors have deemed "beyond extremely unlikely" or "beyond design basis." For that reason, none of the higher radiological dose impacts from VTR's Appendix D are mentioned. 62-46 But while the DOE 62-47

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between VTR alternatives and the feedstock preparation options and are sufficiently accurate to allow a fair comparison among the siting alternatives, as well as with the No Action Alternative.

62-28 Radiological impacts are not proportional to the total number of curies released to the environment in an accident. The radiological impact of exposure to a curie of some isotopes can be factors of hundreds to thousands higher than the exposure to other isotopes. DOE prepared the EIS and included all information necessary to determine the potential for environmental impact. Detailed technical data and discussions that support the information provided in the main body of this EIS are included in appendices; facility accident information (e.g., the isotopic composition of the material at risk [MAR] considered for the different accidents, the curie inventory, and the release fractions) is included in Appendix D. The number of curies is specified for each radionuclide in Table D–42 and Table D–43 for 6 percent burnup, 220-day-decay, and 4-year-decay fuel types. The fuel type and release fractions are specified for all accident scenarios. The release fractions in Table D–32 are specified for the isotope groups. The release fraction for an isotope group applies to all of the radionuclides listed in the group. Calculation of the curies released is an interim step in determining the potential impact to humans, that is, the dose and risk of LCFs. The release fractions for each scenario are applied to the appropriate radionuclide inventories by the MACCS computer code in calculating the impact. Whereas the number of curies released is important, it is only one element of determining the potential impact. As discussed in the Appendix C, Radiation Basics text box, there are different types of radioactive emissions and differences in the health impacts of those emissions. There are many other factors that affect the dose received by a receptor including the physical state of an isotope; atmospheric transport and deposition; biological uptake of plants and animals; and consumption and inhalation rates.

62-29 Specifying the number of curies released does not consider the importance of each radionuclide in terms of health effects. Please refer to the response to comment 62-28.

DOE notes that comparisons of the Chernobyl accident with the VTR hypothetical accident are not directly applicable. Chernobyl data on radionuclide release is not directly relevant to other reactor designs because of the unique features and release mechanisms associated with the RBMK reactor design. The size of the VTR and RBMK reactors, and their radiological inventories, are not directly comparable either. The commenter is incorrect in the estimation of the potential release from

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asserts that a VTR accident is so unlikely as to be less than 1.0E-6/yr, it is only a biased assertion and not a estimate based on data. Likewise, the VTR EIS hints at the problem of existing facilities that will not be updated to current seismic standards, yet it pretends those accidents won't happen either (Accident D-3.1.9). 62-47 cont'd 62-48

Inadequate seismic analyses for existing INL Materials and Fuels Complex facilities, including the Fuel Conditioning Facility, were long-standing and still not corrected in 2010. [27] It is doubtful that compliance has been achieved other than to accept seismically inadequate structures. The VTR EIS must be forthright about the seismic deficiencies at MFC.

The VTR EIS must admit which facilities at the Materials and Fuels Complex will simply comply with existing seismic standards by the reasoning of the allowed "grandfathering" of existing facilities. The VTR EIS must show (make publicly available) the seismic design analysis of the fragility of these facilities in its VTR EIS. 62-49

The VTR EIS states in Appendix D, page D-74, Section D.4.9 Versatile Test Reactor Beyond-Design-Basis Reactor Accidents: **"**By design, the VTR is able to withstand a wide range of accidents. Most events that could affect safe operation of the VTR are mitigated by the VTR design. This section addresses potential beyond-design-basis accidents that have the potential for high consequences even though the probability is very low (1×10-6 to 1×10-8 per year). These accidents represent events in which the consequences can be in the hundreds or thousands of rem to the public while probabilities are less than one in a million per year. Consideration of these very low-probability but potentially high-consequence accidents provides valuable insight for the public and decision-makers in understanding the overall risks of operation, siting decisions, and the need for emergency preparedness."

In the VTR EIS, a VTR reactor accident is presumed to be "beyond-design-basis" and the frequency of a severe accident below 1.0E-7 per year. Given the high number of sodium-cooled reactor core melt accidents (the EBR I and Fermi-1) and very little time in operation, the core accident risk early in the operating life of a sodium-cooled reactor could more appropriately be approximated as 0.1/yr (or 1 accident in 10 years) rather than 1.0E-7/yr (or one accident in 10,000,000 years.) 62-50

The radiological consequences of the beyond-design-basis VTR accident are discussed in Appendix D, pages D-78 and D-79. The low number for the probability of latent cancer fatalities was obtained by multiplying by the presumed 1.0E-7/yr accident probability.

A severe VTR accident was estimated to give an early radiation dose to a hypothetical member of the public, the maximally exposure individual (MEI) located 3.1 miles from MFC, of astonishing size, 790 rem (see Table D-33, page D-79 and see page D-8 for distance to MEI). 62-51

The VTR EIS doubles down on general Department of Energy ignorance of radiation health by saying, for an individual, that "Unless the exposure is quite high (~ 1000 rem), the 62-52

[27] Department of Energy, Office of Health, Safety and Security, *Independent Oversight Review of the Idaho National Laboratory Fuel Conditioning Facility Safety Basis*, April 2010. https://www.energy.gov/sites/prod/files/hss/Enforcement%20and%20Oversight/Oversight/docs/reports/eshevals/2010/2010_INL_FCF_Report%20_final_April_2010.pdf 62-49 cont'd

the hypothetical, beyond-design-basis VTR accident and is making an incorrect comparison of potential radiological impacts. The commenter is citing the VTR inventory, expressed in total curies, rather than the amount that might be released in the hypothetical accident and this number should not be compared to the Chernobyl release data.

62-30 DOE disagrees with the statement that the event frequency estimate is a biased assertion and not an estimate based on data. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. A beyond-design-basis accident is recognized as a potential hazard; however, such an event is extremely unlikely because a large number of independent failures would have to happen before an accident could occur. DOE would have multiple engineered and administrative controls in place to prevent these failures. In the unlikely event an accident were to occur, the potential dose to the public is bounded by the accident analysis in the EIS. No events would be as severe as the beyond-extremely-unlikely event analyzed in this VTR EIS. The beyond-extremely-unlikely event evaluated in this VTR EIS is appropriately assigned an event frequency of 1×10^{-7} per year. In any case, the event frequency is applied consistently between VTR alternatives and thereby allows a fair comparison between the VTR alternatives.

62-31 Operation of the VTR and associated facilities would comply with all applicable laws, regulations, permits and agreements including safety requirements. Chapter 7, Table 7-1, of this VTR EIS lists these requirements.

62-32 Worker and public safety are DOE's highest priority, and INL workers are highly trained in performing their jobs. Education and training requirements, including those for safety and radiation protection, are commensurate with job functions. The purpose of this EIS is to assess the environmental impacts of the proposed action. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. The accident analysis for

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expected LCF [latent cancer fatalities] would be 0." (See Appendix D, pages D-66 and D-67) 62-52 cont'd

But the VTR EIS statement is ridiculous as well as false because a radiation dose received in an acute dose is known to have an LD50 of 300 to 400 rad, meaning 50 percent of adults receiving this dose would die within weeks. The VTR EIS has made quite a remarkable error and exaggeration as to the nature of a 1000 rem whole body dose. See many sources, including *Radiobiology for the Radiologist*, by Eric J. Hall, 5th ed., 2000, p. 134. 62-53

With the predicted 790 rem dose to a hypothetical member of the public 3.1 miles from the reactor, to the MEI, from a VTR accident being so high, the Department of Energy tried to try to give the impression that doses up to 1000 rem have negligible latent cancer fatality risk. This person standing at 3.1 miles (or closer) to the VTR for plume passage from the destroyed reactor is dead within weeks of the accident. 62-54

Note in Table D-33, that in addition to the rem dose of 520,000 rem to a person at 330 ft from the reactor and the rem dose of 790 rem to the maximally exposed member of the public, the MEI, at 3.1 miles from the reactor if located at the Idaho National Laboratory's Materials and Fuels Complex, there is also given in Table D-33 the population dose in "person-rem" which cannot be compared to the individual rem doses. The "person-rem" dose is the average dose to the population within 50 miles, multiplied by the total number of people within 50 miles. 62-55

The VTR EIS does not say much about how, in addition to the 790-rem dose 3.1 miles from the VTR, every person working at MFC may have faced a deadly radiation exposure. If they were somehow sheltered, the car they drove to work is now too contaminated for anyone to drive. The number of "hot" cars in southeast Idaho would be astonishing and so will the owners be, when they are reminded that their vehicles are not insured for radiation exposure. 62-56

The VTR EIS does not point out how a hospital admitting anyone contaminated by the MFC VTR accident is going to severely contaminate the medical facility or be refused admission. 62-57 The doses to the rest of the population will depend on how the contamination is dispersed and whether or not it rains. And the resuspension of fallout will be contaminating air, soil and water for years. The exclusion zone created by such an accident would be larger than that of Chernobyl. And the areas requiring cessation of agriculture and livestock could extend beyond a 50-mile radius of the VTR. 62-58

The 66 fuel assemblies in the core and 44 additional used fuel assemblies in the vessel, a VTR severe accident would release roughly 1570 million curies (or 1.57 billion curies) for VTR's 110 fuel assemblies. (See the 2.35E7 curies per assembly for 66 in-core assemblies and 4.30E5 curies per assembly for 44 fuel assemblies out-of-core but stored in-vessel (aged 220 days) from Table D-42.) 62-59 The vague way that the release fractions are given in Table D-32 makes identifying which the release fraction corresponds to, very difficult. 62-60

VTR EIS Beyond Design Basis Reactor Accident Comparison to Chernobyl

Estimates of the 1986 Chernobyl accident range from 80 million curies to over 3 billion curies. Using the U.S. Nuclear Regulatory Commission estimate from NUREG-1250 of the 62-61

the EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators, such as earthquakes, tornados, wildfires, flooding, volcanoes, and human initiators. Accident scenarios considered include core disruptive accidents and sodium leaks or fires. The EIS also analyzes the impacts of potential accidents on workers and public health and safety. A description of emergency response and post-response cleanup in the event of an accident was included.

62-33 The purpose of this EIS is to assess the environmental impacts of the proposed action. The calculated impacts also allow a fair comparison between alternatives and options. One aspect of evaluating the impacts is to have a common MAR when evaluating the impacts from the VTR alternatives and the feedstock preparation options. The MAR for a test assembly is either included in the event description or in the case of the event involving the fuel in the reactor core and in-core fuel storage, the MAR of the test assembly is a third order effect. In all cases, the MAR is consistent when evaluating the alternatives and options. Furthermore, the MAR only includes radionuclides that are significant in determining the consequences of events. The accident analysis provides a means for comparing the consequences between alternatives and options. A standard methodology is used when determining health effects from an event to facilitate comparing effects from alternatives and options. The analyses provide a conservatively high measure of consequences for any of the receptors. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. The comment does not provide any information that would indicate any of the impact data presented in the EIS should be reconsidered based on technical or scientific reasons.

62-34 Release fractions are applied to the MAR to determine the source term for each event evaluated in the EIS. Since the purpose of the accident analysis is to provide a means for comparing the consequences between alternatives and options, the release fractions are applied consistently in the events for the VTR alternatives and the feedstock preparation options. The damage ratio is chosen to best represent the amount of material that is affected by the event. The airborne release fraction and respirable fraction are based on previous studies that determined how an event might affect material involved in an event. The leak path factor was set at 1 to maximize the release for an event where filtration or building confinement was assumed to not exist. In some cases the leak path factor was less than 1 to account

Chernobyl release, of 100 million curies, a severe VTR reactor accident would be like 15 Chernobyl accidents. **62-61 cont'd**

NUREG-1250, [28] the 1987 NRC report only repeats what the Soviet experts have presented as the radiological release. The NRC quotes the Soviets as saying that an estimated total of about 50 million curies of noble gases (approximately 100 percent of the core inventory) and a total of about 50 million curies of other radionuclides (approximately 3 to 4 percent of the core inventory) were released to the environment over a period of 10 days (from April 26 to May 6). This statement adds 20 million curies to the 80 million curies estimated to be released in the INSAG table. Then the NRC report repeats the same INSAG table of total inventory and release fractions from the Soviets that I have provided above. NUREG-1250 was basically the accepted Chernobyl accident release estimate for perhaps at least a decade.

The Chernobyl release was likely on the order of at least 3 to 7 billion curies. In 1996, Argonne National Laboratory was estimating 30 percent of the core's total inventory of 9 billion curies was released (or about 3 billion curies), and scientists at Lawrence Livermore National Laboratory were estimating that about 80 percent of the core, or 7 billion curies, had been released. [29] [30] **62-62**

Keep in mind the wide range of radiological release estimates for the Chernobyl accident, from 80 million curies to 7 billion curies. Conditions of the Chernobyl accident created high altitude releases. Lower altitude releases stay closer to home, so to speak, with resultant higher contamination levels locally. The ability to determine an accident's radiological releases and where the fallout occurs, due to weather patterns, is limited. And the desire by the nuclear promotors to underestimate the release is real. This and other difficulties increase the uncertainty of obtaining accident compensation for property damage and damage to human health.

The VTR EIS Economic Costs of an Accident, It Admits are Speculative and This Inadequacy Must Be Addressed **62-63**

From Appendix D of the VTR EIS, "The economic impacts of the hypothetical beyond-design-basis reactor accident with loss of cooling are speculative. The MACCS2 computer program, which is used for the accident impact evaluations, has the capability to project economic costs, including population-dependent costs, farm dependent costs, decontamination costs, interdiction costs, emergency phase costs, and milk and crop disposal costs. These economic models were developed by Sandia National Laboratory, the MACCS2 model developer, and the NRC. The models have been used for U.S. nuclear power plant evaluations for decades. Evaluations using this MACCS2 model incorporated INL and ORNL-specific regional data developed with the SECPOP companion computer code to MACCS2. The models **62-62 cont'd**

[28] U.S. Nuclear Regulatory Commission, Washington, DC, Joint Agency Report, *Report on the Accident at the Chernobyl Nuclear Power Station*, NUREG-1250, January 1987. https://www.nrc.gov/docs/ML0716/ML071690245.pdf

[29] John M. LaForge, Ratical.org, Chernobyl at Ten: Half-lives and Half Truths, (cerca 1996). https://ratical.org/radiation/Chernobyl/Chernobyl@10p2.html#fn8

[30] World Information Service on Energy, Nuclear Monitor Issue #641, How Much Radiation Was Released by Chernobyl? January 27, 2006. https://www.wiseinternational.org/nuclear-monitor/641/how-much-radiation-was-released-chernobyl

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for physical barriers that would reduce the amount of material released. The release fractions in Appendix D, Table D–32, of this VTR EIS correspond to the isotope groups included in the MACCS release calculations. Elements are grouped by general chemical characteristics typically used for development of reactor accident releases. Some of the isotope groups contain elements of a different group because of the specific melting characteristics of the elements at the temperatures shown in the table. The text in Appendix D clearly indicates that the release fractions for the fuel melting region of ~1,100 degrees Celsius are assumed. The table indicates that the release fractions are "less than or equal to." To further clarify the accident calculations, text was added that indicates the release fractions used are the upper limit values. The comments does not provide any information that would indicate any of the impact data presented in the EIS should be reconsidered based on technical or scientific reasons.

62-35 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. As implemented in this EIS for accidents at VTR facilities, the MACCS2 model evaluates 50-year committed doses due to inhalation of aerosols containing respirable radionuclides and to direct exposure from radionuclides in the passing plume. This model represents the major portion of the dose that a noninvolved worker or member of the public would receive from a VTR or support facility accident. The long-term effects from exposure to radionuclides deposited on the ground and surface waters, from resuspension and inhalation of radionuclides, and from ingestion of contaminated crops also are modeled. These long-term pathways have been studied and found not to contribute as significantly to dose as inhalation, and they would be controllable through interdiction. For purposes of this EIS, both the near-term (early) and long-term (chronic) impacts are reported. The MACCS2 projected economic impacts are based on best-estimate engineering models as the current state of knowledge is ever changing. The MACCS2 computer program projected economic costs, including population-dependent costs, farm dependent costs, decontamination costs, interdiction costs, emergency phase costs, and milk and crop disposal costs based on local land use and economic conditions. The models projected economic costs within 50 miles for the severe accidents at

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projected economic costs within 50 miles for the severe accidents to be 290 and 3,500 million dollars at INL and ORNL, respectively. The models' projected economic costs for the ORNL region are much higher primarily due to the higher population density and the more varied land use in that area."

It is not just the accidents that the VTR EIS optimistically deems "beyond design basis" or "beyond extremely unlikely," the VTR EIS must provide a realistic economic cost analysis to southeast Idaho, for the many potential VTR accidents that may render serious or devastating economic damages to the airport, the hospitals and medical facilities, agriculture sector, automobiles, homes and so forth, even a modestly bad day at the VTR facility could cause damages exceeding $290 million dollars. The economic costs are harder for the Department of Energy to falsify after an accident; but really to easiest to compute prior to an accident. The VTR EIS must include an adequate accident economic cost assessment for southeast Idaho. 62-63 cont'd

Expanding Outdoor Storage of Spent Nuclear Fuel and Radioactive Waste Invites Disaster and Unacceptable Accident Risks 62-64

When the VTR EIS proposes storage and handling of various waste streams out-of-doors, outside confinement, while having whittled down the amount of material released with various assumptions pertaining to release factors, it is important to understand that for a release that would cause a 3-rem radiation dose at 330 ft from the accident, it can easily be 100 times higher, and that would mean a 300-rem radiation dose to the noninvolved worker. It is not the DOE's practice to evaluate the level of uncertainty in the predicted doses, but the range of doses is often very large, with the higher doses meaning death or vastly shortened life span. 62-65

The VTR EIS uses an 80 PE-Ci (plutonium-239 equivalent) limit for a transuranic (TRU) waste drum, stating the rationale is the limit for remote-handled TRU waste (see D.3.1.6 Beyond-Design-Basis Fire Involving TRU Waste Drum). But the VTR TRU waste could be either contact handled or remote handled waste. The limits for a contact-handled standard waste box (SWB) are 560 PE-Ci; other limits are as high as 1800 PE-Ci. [31] For supposedly solidified waste, aging over time can degrade to solidified waste. Waste drums have been found to have several times the expected level of TRU waste. The predominantly alpha emitters and the low energy gamma from americium-241 make verification of the radiological inventory in a drum difficult or impossible. The VTR EIS assumption of 80 PE-Ci in a waste drum may not be bounding of a single container's PE-Ci inventory and multiple containers may be involved in a release. The VTR EIS must reexamine radioactive waste containers and make sure that their assumptions bound the release. The VTR EIS must use bounding accident inventories in the material-at-risk and has not. 62-66

[31] Department of Energy, Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant, DOE/WIPP-02-3122, Revision 8, July 5, 2016. https://www.wipp.energy.gov/Library/Information_Repository_A/Class_3_Permit_Modifications/TID%20References/U.S.%20DOE.%202016..pdf

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INL and ORNL. The models' projected economic costs for the ORNL regions are much higher than for INL primarily due to the higher population density and the more varied land use. In any case, the long-term impacts are applied consistently between VTR alternatives and the feedstock preparation alternatives to allow a fair comparison.

62-36 Please refer to the response to comment 62-35.

62-37 Please refer to the responses to comments 62-6 and 62-29.

62-38 Please refer to the responses to comments 62-28 and 62-29. DOE acknowledges that many different perceptions of event frequency represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. A beyond-design-basis accident is recognized as a potential hazard; however, such an event is extremely unlikely because a large number of independent failures would have to happen before an accident could occur. DOE would have multiple engineered and administrative controls in place to prevent these failures. In the unlikely event an accident were to occur, the potential dose to the public is bounded by the accident analysis in the EIS. No events would be as severe as the beyond-extremely-unlikely event analyzed in this VTR EIS. The beyond-extremely-unlikely event evaluated in this VTR EIS is appropriately assigned an event frequency of 1×10^{-7} per year. In any case, the event frequency is applied consistently between VTR alternatives and thereby allows a fair comparison between the VTR alternatives.

62-39 Please refer to the responses to comments 62-29 and 62-34.

62-40 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. The accident analysis was conducted using the MELCOR Accident Consequence Code System, Generation 2 (MACCS2) computer program/code (WinMACCS, Version 3.11.2) to model accident conditions. MACCS2 was used to calculate radiation doses and health risks to the noninvolved worker, the maximally exposed offsite individual, and the population within 50 miles of the release point. The standard MACCS2 dose library was used. This library is based on Cancer Risk Coefficients for Environmental Exposure to Radionuclides: Federal Guidance Report 13 (EPA 1999) inhalation dose conversion factors. SecPop (Sector Population), an NRC computer program, provides estimates of population, land use, and economic values related to a specific site. It creates a site file that is needed by MACCS2 to perform a site-specific offsite consequence analysis of the health, economic, and environmental impacts of a hypothetical,

The VTR EIS Must Address the Cancer Incidence Risk, Including Accident Release of the Americium-241

The VTR EIS must include in its accident release from a reactor accident, the additional radionuclides from target and test materials. 62-67

The VTR EIS currently ignores cancer incidence. Americium and curium releases are enhanced in a sodium-cooled reactor accident. Americium has a known disproportional rate of causing thyroid cancer, not represented by cancer mortality. 62-68

What the VTR EIS has addressed as the "lanthanide group" in Table D-32 for the release fractions includes elements that are not lanthanides: americium and curium. These are far more releasable than the plutonium and uranium, according to Table D-32. Both americium and curium decay through a series of radioactive elements and are thus persistent sources of radioactivity for more than thousands of years. 62-69 For the americium-241, for the modest temperature of 1100 C, the release fraction is 0.3, from Table D-32. From Table D-42, for a single in-core fuel assembly, the amount of americium-241 is 4.91E1. There are 66 fuel assemblies, so this is 3240.6 curies of Am-241 for the in-core fuel. Then there are in addition 44 stored-in-vessel fuel assemblies with 220 days of decay, each assembly having 8.04E1 curies, so times 44 fuel assemblies are 3537.6 curies. Adding the 66 in-core fuel assemblies and the 44 out-of-core but in vessel fuel assemblies, the total for americium-241 is 6778.2 curies. (Note that the ingrowth of americium-241 from the decay of plutonium-241 actually increases the curies of americium-241 in the out-of-core fuel.) 62-70

For a release fraction of 0.3, the americium-241 released is 6778.2 curies multiplied by 0.3, to yield 2033.46 curies.

We are already seeing adverse health impacts from annual releases of americium-241 of typically less than 8.0E-3 curies per year. I am referring to the elevated incidence of thyroid cancer in each of the counties surrounding the INL and the well-known to the Department of Energy fact that americium is terrific at causing thyroid cancer, but you don't necessarily die from it. (See additional details on these facts in my previous comment submittal on the VTR [32].) It is understood that the tiny thyroids of the developing embryo and infant are more adversely affected by radiation and can cause a failure to thrive and other adverse health conditions before any cancer is developed. 62-71

The amount of cesium-137 released from the VTR accident, assuming a release fraction of 1.0 from Table D-32 and the 110 fuel assemblies is 841,060 curies. This is nearly the amount of cesium-137 that was thought to have been released from the Chernobyl accident. The estimated radiological releases from the Chernobyl nuclear catastrophe have shifted over the years and are still debated. With nuclear accidents, the amount of the radiological release and where it spreads to, can be somewhat characterized but even with environmental monitoring, remains elusive, 62-72

[32] See Tami Thatcher's first public comment submittal on the U.S. Department of Energy's Versatile Test Reactor Draft Environmental Impact Statement (DOE/EIS-0542) at http://www.environmental-defense-institute.org/publications/CommentVTRdEIS.pdf 62-71 cont'd

atmospheric release of radioactive material from a nuclear facility. The results cited in the comment are from the MACCS calculation for a hypothetical, beyond-design-basis reactor accident with loss of active and passive cooling. This accident is postulated to be initiated by an earthquake so severe that widespread damage and collapse of structures at MFC, the INL Site, and the surrounding area would be expected. Loss of life due to this earthquake damage would also be expected. The radiological consequences may appear high, but they are for a bounding (worst case), unmitigated accident. It is not correct that much about the radiological exposures to people within 50 miles is left to the imagination. Section D.4.9.5, and Tables D–33 and D–34, of the VTR EIS present the potential radiological impacts of this hypothetical accident. The discussion includes information on the potential impacts within 10 miles and the potential reduction of impacts if some mitigation actions were assumed.

62-41 Chapter 4, Sections 4.10 and 4.11, of this VTR EIS evaluate the potential human health impacts of normal operations and facility accidents, respectively. The results of the analysis (summarized in the Summary, Section S.9 and Chapter 2, Section 2.9) show that the impacts of normal operations and credible accidents would be small regardless of whether the reactor were located at ORNL or INL. Due to differences in the distribution of population around the two proposed locations, the potential human health impacts would be higher at ORNL. This in no way implies that DOE considers any person or group of people as "expendable" as the commenter suggests. Regardless of where the VTR were located, it would be designed and operated to protect workers, the public, and the environment and in compliance with applicable safety and health laws and regulations.

62-42 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. The purpose of this EIS is to assess the environmental impacts of the proposed action. The calculated impacts also allow a fair comparison between alternatives and options. Presentation of the number of curies in the reactor or the number of curies released does not allow for a meaningful comparison between VTR alternatives and feedstock preparation options. Specifying the number of curies released does not consider the importance of each radionuclide in terms of health effects (refer to the response to comment 62-28). The importance of weather conditions is considered in the MACCS

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particularly when the operator of the reactor along with the nuclear industry always seem to be motivated to minimize the appearance of the severity of the release. 62-72 cont'd

The VTR EIS focuses only on cancer fatality risk and not cancer incidence. Radiation-induced hereditary effects are also ignored. And many health conditions are worsened by radiation despite the nuclear industry fixation of only one adverse effect, which is death from cancer. 62-73

It is well known that a radiation exposure of 0.5 rem to a developing child in-utero doubles the risk of cancer and/or leukemia. This is a single 500 millirem dose.

It would appear that the Department of Energy, the manner in which it has limited the information in the VTR EIS, does not think that Idahoans care about their health, their children's health, their property, or their livelihoods. This assumption by the DOE is wrong. 62-74

The way that the information is hidden within the sprawling EIS document does suggest that DOE does not want the public to grasp what the VTR is gambling on. It is betting the public's life, economic health — it's betting your farm, your baby and your life — in order to conduct research to make nuclear promoter's like Bill Gates richer (he's a partner with TerraPower) and in order for the Department of Energy to irradiate materials in the most expensive, unreliable and unsafe way imaginable. 62-75

DEPARTMENT OF ENERGY'S TRACK RECORD ON ACCIDENTS MUST BE INCLUDED IN THE VTR EIS

The VTR EIS argues that its assumptions are reasonable or even conservative. But the fact is that during the last ten years when accidents at Department of Energy facilities have occurred, multiple assumptions made in safety analyses have been wrong and underestimated the likelihood of the accident and the amount of radiological material released. 62-76

When the VTR EIS shows low latent cancer fatality risks for a particular accident category, it is because of low-balled estimates of the likelihood of the accident and also the whittling down of the amount of material released during the accident, often reducing the release by a factor of 100 or more, by numerous assumptions regarding the assumed airborne-release-fraction and other factors. Simply put, the VTR EIS radiological risks and consequences from the wide range of possible accidents is in reality far larger than the VTR EIS is claiming.

The accidents for VTR nuclear fuel feedstock processing, for fuel fabrication, for waste handling from these processes, for handling the spent nuclear fuel from the reactor, for storage and pyrochemical processing of the spent nuclear fuel — these yield very large accident risks not only to workers involved directly, but also to noninvolved workers and also to the public. 62-77

An accident from the VTR reactor operation itself, while argued to be so rare, as to be "beyond-design-basis" is tucked deeply away in an appendix in the EIS but should be described on the first page of the EIS. If the severity of the radiological consequences of a VTR core disruption accident are comprehended, then no one would support the project. 62-78

The amount of radiological material-at-risk can be significantly larger than assumed, as has been the case in waste containers destined for the Department of Energy's defense waste facility, 62-79

calculations. The MACCS input requires meteorological information that is based on five years of measured weather data. MACCS samples the input weather data to obtain a statistical estimate of prevailing weather conditions during an accident simulation.

62-43 Please refer to the responses to comments 62-28 and 62-29. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. The purpose of this EIS is to assess the environmental impacts of the proposed action. The calculated impacts also allow a fair comparison between alternatives and options. Presentation of the number of curies in the reactor or the number of curies released does not allow for a meaningful comparison between VTR alternatives and feedstock preparation options. Specifying the number of curies released does not consider the importance of each radionuclide in terms of health effects.

62-44 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. The purpose of this EIS is to assess the environmental impacts of the proposed action. The calculated impacts also allow a fair comparison between alternatives and options. Presentation of the number of curies in the reactor or the number of curies released does not allow for a meaningful comparison between VTR alternatives and feedstock preparation options. Specifying the number of curies released does not consider the importance of each radionuclide in terms of health effects (refer to the response to comment 62-28). In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. The accident analysis for the EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators, such as earthquakes, tornados, wildfires, flooding, volcanoes, and human initiators. Accident scenarios considered include core disruptive accidents and sodium leaks or fires. The EIS also analyzes the impacts of potential accidents on workers and public health and safety. A description of emergency response and post-response cleanup in the event of an accident was included.

the Waste Isolation Pilot Plant (WIPP) in New Mexico. Due to the difficulty in estimating and surveying the amount of transuranic material loaded into waste containers such as 55-gallon drums, the amount of alpha emitters present can and has significantly exceeded what was expected to be in a waste drum. 62-79 cont'd

Prohibited materials were in waste drums, actually hundreds of waste drums, such as organic kitty litter the Los Alamos National Laboratory had loaded into waste drums to absorb liquids. The waste drum that exploded at WIPP, the Department of Energy's WIPP defense waste disposal facility, had far higher amounts of transuranic material than were expected in the drum. Materials in prohibited amounts were also the cause of another accident in Department of Energy waste. Beryllium and radioactive metal in pyrophoric form was found in exceedingly high amounts in the debris of the four drums that energetically popped off their lids and forcefully expelled powdery transuranic waste through a fabric enclosure that would have had a dozen workers present had the accident occurred a few hours earlier, at the Idaho National Laboratory in 2018.

The fraction of the radiological material that was released from a drum, in both of these accidents exceeded Department of Energy estimates in its nuclear safety documentation for the airborne-release-fraction (ARF). Therefore, the assumptions key to estimating how much material is released by an accident have often been proven wrong. And seems to be forgotten after an accident occurs. The VTR EIS must include evaluation of DOE's repeated safety failures, including multi-program safety program deficiencies, as found in DOE's 2014 WIPP accidents, the 2011 MFC plutonium inhalation at ZPPR and the 2018 four waste drum overpressurizations. 62-80

The VTR EIS must explain why anyone would think DOE's nuclear facility oversight and management is going to be adequate and is supportive of the very low accident likelihoods the VTR EIS asserts. 62-81

INL MFC's Plutonium Inhalation Event at ZPPR

Anyone familiar with the numerous workers exposed to inhalation of plutonium and americium from ZPPR fuel plates for several minutes from the 2011 accident at the Materials and Fuels Complex knows that the DOE was not conducting and implementing adequate nuclear safety analysis or other safety programs to protect workers. In the 2011 ZPPR facility management refused to address any of the safety oversight chairman's stated worker safety concerns when performing ZPPR plate inspections and directed workers to examine the plates in unsafe conditions caused multiple workers to inhale radionuclides that were still at detectable levels, based on urine and fecal bioassay, months after the event. [33]

According to The Center for Public Integrity investigation in 2017 titled "Nuclear Negligence" [34] that covered bad behavior around the Department of Energy Complex, INL's 62-80 cont'd

[33] Department of Energy, Office of Health, Safety and Security (HSS), Accident Investigation Report, "Plutonium Contamination in Zero Power Physics Reactor Facility (ZPPR) at the Idaho National Laboratory" accident 11/8/11 at the Materials and Fuels Complex (MFC). http://energy.gov/hss/downloads/investigation-november-8-2011-plutonium-contamination-zero-power-physics-reactor.

[34] Patrick Malone, Peter Cary, *The Center for Public Integrity*, "Nuclear Negligence – Part Five: The inhalation of plutonium by 16 workers is preceded and followed by other contamination incidents but the private contractor in

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62-45 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. The purpose of this EIS is to assess the environmental impacts of the proposed action. The calculated impacts also allow a fair comparison between alternatives and options. Presentation of the number of curies in the reactor or the number of curies released does not allow for a meaningful comparison between VTR alternatives and feedstock preparation options. Specifying the number of curies released does not consider the importance of each radionuclide in terms of health effects (refer to the response to comment 62-28). In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. The accident analysis for the EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators, such as earthquakes, tornados, wildfires, flooding, volcanoes, and human initiators. Accident scenarios considered include core disruptive accidents and sodium leaks or fires. The EIS also analyzes the impacts of potential accidents on workers and public health and safety. A description of emergency response and post-response cleanup in the event of an accident was included. DOE acknowledges that many different perceptions are represented in the comments received, but no comments were received that indicate any of the impact data presented in the EIS should be reconsidered based on technical or scientific reasons.

62-46 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions of event frequency represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. A beyond-design-basis accident is recognized as a potential hazard; however, such an event is extremely unlikely because a large number of independent failures would have to happen before an accident could occur. DOE would have multiple engineered and administrative controls in place to prevent these failures. In the unlikely event an accident were to occur, the potential

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MFC managers overseeing the ZPPR facility were warned 19 times by the Safety Oversight Chairman about worker safety issues concerning plutonium plate inspections but no action was taken. And Public Integrity reported that three legal settlements have resulted from the plutonium plate accident.

The VTR EIS ignores the Department of Energy's egregious record on nuclear facility safety and the finding that in each of three major accidents in the last decade, multiple DOE safety programs were not adequately implemented. The VTR EIS needs to explain why DOE's safety record is being ignored.

DOE Transuranic Waste Accidents at WIPP

Anyone familiar with the two accidents at the Waste Isolation Pilot Plant (WIPP) in New Mexico in 2014 knows that DOE was failing in nearly all programs for safety at WIPP, including 10 CFR 830 requirements.

WIPP's original safety basis under 10 CFR 830 had been extensively reviewed, more than any other DOE facility. Reviews by the Environmental Protection Agency and by the Defense Nuclear Facility Safety Board had been conducted. But subsequent changes to the WIPP safety basis, approved by DOE had reduced safety significantly. They made the assumption that a roof fall would never occur in an open panel and had no accident analysis for this. WIPP experienced a roof fall within a couple months of not bolting the ceiling in the underground mine. The accident investigation report also discovered that far more plutonium/americium was released from a single drum in the February 12, 2014 event than the safety analysis predicted was possible. [35]

INL Four Waste Drum Overpressurization Event in 2018

And anyone familiar with the cause of the four drums that blew their lids off at the INL's Radioactive Waste Management Complex in April 2018 understands that the Department of Energy took egregious shortcuts in each of these accidents, including failure to conduct nuclear safety analysis for a waste stream that they actually knew contained a very reactive form of uranium along with beryllium carbide. The DOE was actively involved with not meeting

62-80 cont'd

charge suffers only a light penalty," June 28, 2017 https://apps.publicintegrity.org/nuclear-negligence/repeated-warnings/

[35] Department of Energy Office of Environmental Management, Accident Investigation Report, "Phase 2 Radiological Releases Event at the Waste Isolation Pilot Plant February 14,2014," April 2015. http://wipp.energy.gov/Special/AIB_WIPP%20Rad_Event%20Report_Phase%20II.pdf See Sections 7.1 and 7.2. The release was found to have been from a single drum with stated inventory in plutonium-239 equivalent curies of 2.84 PE-Ci. But based on contamination on filters at Station A of 0.1 curies PE-ci far from the exploded drum in Panel 7, using conventional safety analysis assumptions the expected amount of material released to Panel 7 would not have exceeded 2.84E-4 PE-Ci — far less than what was measured downstream at Station A. The inventory in the drum appears to have been much higher than stated for WIPP drum and the release fractions may also be incorrect. This discrepancy in the transuranic inventory of the drum is in addition to the fact that forbidden inorganic "kitty litter" absorbent was placed in the drum which allowed an explosive combination of nitrates and organics. In my view, the extent to which the stated transuranic inventory was understated and actually not known does not appear to be adequately addressed by corrective actions recommended in the report. Alpha is difficult to monitor and easily shielded: DOE does not want you to know the degree that they say is in the drums may not conservatively bound what is actually in the drums.

dose to the public is bounded by the accident analysis in the EIS. No events would be as severe as the beyond-extremely-unlikely event analyzed in this VTR EIS. The beyond-extremely-unlikely event evaluated in this VTR EIS is appropriately assigned an event frequency of 1×10^{-7} per year. In any case, the event frequency is applied consistently between VTR alternatives and thereby allows a fair comparison between the VTR alternatives.

62-47 DOE disagrees with the statement that the event frequency estimate is a biased assertion and not an estimate based on data. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions of event frequency represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. A beyond-design-basis accident is recognized as a potential hazard; however, such an event is extremely unlikely because a large number of independent failures would have to happen before an accident could occur. DOE would have multiple engineered and administrative controls in place to prevent these failures. In the unlikely event an accident were to occur, the potential dose to the public is bounded by the accident analysis in the EIS. No events would be as severe as the beyond-extremely-unlikely event analyzed in this VTR EIS. The beyond-extremely-unlikely event evaluated in this VTR EIS is appropriately assigned an event frequency of 1×10^{-7} per year. In any case, the event frequency is applied consistently between VTR alternatives and thereby allows a fair comparison between the VTR alternatives.

62-48 DOE takes its responsibility for the safety and health of the workers and the public seriously. DOE is dedicated to maintaining records of facility configuration and maintaining transparency in operations. Facilities are operated in accordance with their approved safety basis authorization and maintained to reduce the likelihood and consequences of an accident. The EIS evaluates the impacts of seismically-initiated accidents.

62-49 DOE takes its responsibility for the safety and health of the workers and the public seriously. DOE is dedicated to maintaining records of facility configuration and maintaining transparency in operations. Facilities are operated in accordance with hazardous waste RCRA requirements required by the State of Idaho and also no conducting required nuclear safety analysis per 10 CFR 830. A causal analysis [36] has been issued for the four transuranic waste drums that blew off their lids last April at the U.S. Department of Energy's Radioactive Waste Management Complex. The causal analysis states that "Management failed to fully understand, characterize, establish and implement adequate process controls for treating waste which lacked documented origin or process information." Specifically, the requirements for meeting 10 CFR 830 were not met.

U.S. Department of Energy cleanup contractor Fluor Idaho has issued a report on the causes of the transuranic waste drums that blew their lids in April 2018 at the Idaho National Laboratory's Radioactive Waste Management Complex. [37] If DOE regulations and hazardous waste laws including the state-issued RCRA permit had been complied with, the accident would not have happened. A fire had occurred last December when a waste container with this form of uranium was opened at the Advanced Mixed Waste Treatment Facility. And despite this, a drum known to contain large amounts of the same form of uranium was sent to the Accelerated Retrieval Project V fabric enclosure despite its RCRA permit forbidding such material.

The drums one by one expelled their powdery radioactive contents throughout the ARP V enclosure just hours after workers had gone home.

The first smoldering drum set off fire alarms. The fire department responded, but because of radiation monitor malfunction they were unaware that radioactive airborne contamination inside the fabric tension membrane enclosure was far above normal. Radiological control personnel came to assist the fire fighters 43 minutes after requested. The responders had inadequate knowledge of the materials in the drums which also hampered their efforts.

The second drum exploded just after emergency responders exited the facility. The integrity of the enclosure could have been compromised by the heat and also by one of the ejected lids which penetrated a layer of the enclosure.

Dozens of possible chemicals were ascribed to this catch-all category for powdery material considered "homogeneous solids" of the kind from Rocky Flats nuclear weapons plant where Portland cement-like material had been added to drums with various chemical and finely divided radionuclide and metal wastes. [38]

No analyses were conducted for chemical compatibility and reactive and pyrophoric materials for the SD-176 waste as required by hazardous waste RCRA laws. On top of that, no nuclear safety analysis was conducted to mitigate the hazards of this new SD-176 waste stream.

The day of the accident, uranium from one drum was mixed with the unknown material in other drums to distribute the uranium among the drums. Now supplied with oxygen from the

[36] Idaho Cleanup Project Core, "Formal Cause Analysis for the ARP V (WFM-1617) Drum Event at the RWMC," October 2018. https://fluor-idaho.com/Portals/0/Documents/04_%20Community/8283498_RPT-1659.pdf

[37] Idaho Cleanup Project Core, "Formal Cause Analysis for the ARP V (WFM-1617) Drum Event at the RWMC," October 2018. https://fluor-idaho.com/Portals/0/Documents/04_%20Community/8283498_RPT-1659.pdf

[38] Idaho Completion Project, Bechtel BWXT Idaho, LLC for the Department of Energy, "Historical Background Report for Rocky Flats Plant Waste Shipped to the INEEL and Buried in the SDA from 1954 to 1971," ICP/EXT-04-00248, Revision 1, March 2005. https://ar.icp.doe.gov/images/pdf/200504/2005040400022KAH.pdf

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62-80 cont'd

their approved safety basis authorization and maintained to reduce the likelihood and consequences of an accident. The EIS evaluates the impacts of seismically-initiated accidents.

62-50 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions of event frequency represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. A beyond-design-basis accident is recognized as a potential hazard; however, such an event is extremely unlikely because a large number of independent failures would have to happen before an accident could occur. DOE would have multiple engineered and administrative controls in place to prevent these failures. In the unlikely event an accident were to occur, the potential dose to the public is bounded by the accident analysis in the EIS. No events would be as severe as the beyond-extremely-unlikely event analyzed in this VTR EIS.

The comment claims that the event frequency for the beyond-extremely-unlikely event should have a frequency of 0.1 per year based on events at EBR-I and Fermi-1. However, none of the events referred to in the comment would be associated with accident scenarios and consequences as severe as those postulated for the VTR beyond-extremely-unlikely event. Section D.3.3.1 of the VTR EIS presents a review of past sodium-cooled reactor operations and accidents and indicates that a great deal was learned about how to safely design and operate new sodium-cooled reactors. The section also discusses how the EBR-II reactor demonstrated through testing that a sodium-cooled reactor could be designed and operated safely under a wide range of upset conditions that would fail other types of reactors. Sections D.3.3.2 and D.3.3.3 of the VTR EIS present the safety basis for the VTR and illustrate that extremely unlikely accidents commonly associated with conventional light water reactors are mitigated by the VTR design and do not result in substantial releases. Thus, accidents initiated by events in the one in 10,000 to 1 in a million per year range do not result in a substantial release. In order to effectively bound the potential impacts of a serious VTR reactor accident, the safety analysts postulated a hypothetical, beyond-design-basis accident, likely initiated by a very, very severe earthquake that would collapse seismically-engineered structures. The beyond-

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repackaging, the uranium began oxidizing and heating up the drums. The heat enabled another chemical reaction that rapidly produced methane from the beryllium carbide [39] in the drums.

The DOE also violated its radioactive waste management regulations by not having a plan for disposing of the waste prior to processing it. Current Waste Isolation Pilot Plant (WIPP) waste acceptance criteria were not being applied. [40]

The cause of the accident appears to be the pervasive management culture that ignored DOE regulations and state and federal laws in order to streamline processing of the radioactive and chemically hazardous waste.

The DOE, Fluor Idaho and the Idaho Department of Environmental Quality all pretended that the waste was being treated in accordance with laws and regulations. But it wasn't. [41] [42]

The Department of Energy is reviewing whether to fine Fluor Idaho $580,700 over the four drums that exploded in April 2018 [43] [44] The letter from DOE white-washes the extent of Fluor Idaho's responsibility for the event because Fluor Idaho willfully ignored the actual contents of the drums, which contained beryllium as well as extraordinary amounts of uranium metal. People could easily have lost their lives had the explosions happened a few hours earlier and the containment fabric was very nearly breached which would have released an irremediable amount of powdery radioactive waste to the Idaho skies.

Thousands of repackaged drums of transuranic waste are still stored above ground and awaiting shipment to the Waste Isolation Pilot Plant (WIPP) in New Mexico.

62-80 cont'd

[39] U.S. Nuclear Waste Technical Review Board, "Management and Disposal of U.S. Department of Energy Spent Nuclear Fuel – Report to the United States Congress and the Secretary of Energy," December 2017. http://www.nwtrb.gov/our-work/reports/management-and-disposal-of-u.s.-department-of-energy-spent-nuclear-fuel-(december-2017) On p. 22 of this report, the NWTRB states that "Carbide-containing DOE SNF can create combustible gases such as methane and acetylene when contacted by water …if the coatings on the carbide particles are damaged." While what was in the transuranic (or uranium) waste drums was not spent nuclear fuel, the knowledge of potential reactions with carbide are well-known and yet no identification of this hazard was conducted for the waste being treated which they knew potentially contained beryllium carbide from Rocky Flats weapons production processes — that's likely why the uranium had not be "roasted."

[40] Department of Energy, Carlsbad Field Office, WIPP Waste Acceptance Criteria, DOE/WIPP-02-3122, Revision 8 Effective July 5, 2016. http://www.wipp.energy.gov/library/cra/CRA-2014/references/Others/US_DOE_2002_WIPP_Rev_6_TRU_Waste_Acceptance_Criteria_02_3122.pdf

[41] For more about the April transuranic waste drum ruptures at the Radioactive Waste Management Complex at the Idaho National Laboratory Idaho Cleanup Project, see past EDI newsletters on the April drum ruptures (May through November 2018) and my second Public Comment submittal on October 30 to the Idaho DEQ concerning renewal of the Advanced Mixed Waste Treatment Project RCRA permit renewal at www.environmental-defense-institute.org

[42] DOE Order 435.1, "Radioactive Waste Management," DOE Order 830 "Nuclear Safety Management" (contains hazard identification and Unreviewed Safety Question requirements) and federal and state Resource Conservation and Recovery Act (RCRA) laws.

[43] Exchange Monitor, "Fluor Idaho Has 30 Days to Contest $580K Penalty for Drum Blast," November 24, 2020. https://www.exchangemonitor.com/fluor-idaho-30-days-contest-580k-penalty-drum-blast/?printmode=1

[44] U.S. Department of Energy, Letter to Fred Hughes, Fluor Idaho, LLC, November 20, 2020. https://www.energy.gov/sites/prod/files/2020/11/f80/Preliminary%20Notice%20of%20Violation%20for%20Fluor%20Idaho_0.pdf

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extremely-unlikely event evaluated in the VTR EIS is appropriately assigned an event frequency of 1×10^{-7} per year.

62-51 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions of event frequency represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. A beyond-design-basis accident is recognized as a potential hazard; however, such an event is extremely unlikely because a large number of independent failures would have to happen before an accident could occur. DOE would have multiple engineered and administrative controls in place to prevent these failures. In the unlikely event an accident were to occur, the potential dose to the public is bounded by the accident analysis in the EIS. No events would be as severe as the beyond-extremely-unlikely event analyzed in this VTR EIS. The beyond-extremely-unlikely event evaluated in this VTR EIS is appropriately assigned an event frequency of 1×10^{-7} per year. In any case, the event frequency is applied consistently between VTR alternatives and thereby allows a fair comparison between the VTR alternatives.

62-52 As discussed in Appendix D, Section D.4.9.5, in the event of a beyond-design-basis accident, and without allowing for pre-release decay and emergency actions, the results of the MACCS modeling indicate very high, likely fatal doses near the reactor site. An individual remaining at the assumed location of the MEI for the entire plume passage would receive a fatal dose. Individuals, including members of the public that remained near the reactor site, could receive very high and potentially fatal doses.

62-53 Appendix D was revised to remove the sentence that includes the reference to the 1,000 rem dose. The statement was being interpreted differently than was intended. The intended information regarding risk of a latent cancer fatality from exposure to radioactive material is adequately and appropriately presented in the sentence that preceded the deleted sentence.

62-54 Please refer to the responses to comments 62-52 and 62-53.

62-55 In Table D–33, the dose to the noninvolved worker and the MEI from the hypothetical accident are reported in rem while the dose to the collective

DOE Failure to Implement Widely Acknowledged Radiation Accident Protocols

A 2014 event at the Idaho National Laboratory's FMF facility internally contaminated workers but this was not discovered until weeks had elapsed and workers had been exposed again to elevated airborne contamination during special processing in a leaking glovebox. [45] Battelle Energy Alliance failed to discuss why contamination swipes, hand-held alpha monitoring and step-in portal alpha monitors failed to identify the elevated contamination when the inadequately configured constant air monitor failed to identify the contamination. That curious lack of curiosity about why the elevated levels of airborne contamination was not identified until weeks later when contamination was found on constant air monitor filters and the DOE contractor inexplicably decided that no causal analysis was needed.

A 2018 Department of Energy Occurrence Report was issued for the June 5 injury at the Advanced Mixed Waste Treatment Project. A worker cleaning out a Supercompactor Glovebox got a puncture wound involving transuranic radionuclides. [46] At the October 25, 2018 Citizens Advisory Board meeting in Sun Valley, Fred Hughes admitted that chelation was required for the June 5, 2018 puncture wound event, although he had avoided discussing it. [47]

As I was aware of the Oak Ridge REACTS website that emphasized that **chelation of wounds involving transuranic radionuclides needs to be administered within 2 hours in order to limit bone uptake**, and that after 2 hours, the effectiveness of chelation is much less, I asked if chelation was administered within 2 hours of the injury. Fred Hughes said no. He did not address the reasons why. And the corrective actions for the occurrence report didn't address the issue of the tardy medical response.

Chelation following plutonium intake is recommended to commence within one hour of the intake or wound entry. Actinides such as plutonium are rapidly taken up by bone within two hours. [48]

62-82

[45] Department of Energy Occurrence Report NE-ID-BEA - - FMF – 2014- 0001. "MFC-704 FMF Suspect Contamination Found on CAM Filters," Sept 24, 2014. "On October 9, 2014, it was reported that low levels of transuranic contamination were detected on four separate filters, two each taken from a Continuous Air Monitor (CAM) and a Portable Low Volume Air Sampler operating in the Fuel Manufacturing Facility between August 25 through September 2. Multiple workers were found, weeks later, to have internal contamination as determined by bioassay. Battelle Energy Alliance wrote in the occurrence report that no cause analysis of the undetected elevated levels of airborne contamination was needed.

[46] Department of Energy Occurrence Report EM-ID—FID-AMWTF-2018-0004, "Operator Receives Puncture Wound Resulting in Internal Dose." Final report September 18, 2018.

[47] Idaho Cleanup Project Citizens Advisory Board (formerly the Idaho National Laboratory Citizens Advisory Board) meeting schedules and presentations at https://energy.gov/em/icpcab/idaho-cleanup-project-citizens-advisory-board-icp-cab Meeting held October 25, 2018.

[48] Nicholas Dainiak, MD, FACP et al., Radiation Emergency Assistance Center/Training Site, Oak Ridge Associated Universities, "REAC/TS Approach to Rapid Dose Estimation and Decontamination of Plutonium Following a Puncture Wound," Presentation May 10, 2017. https://radiation-medicine.de/fileadmin/user_upload/Praesentationen/Dainiak-ConRad2017.pdf Actinides (plutonium, americium and others) are absorbed through wounds rapidly, within 2 hours. The actinides are taken up strongly by bone and liver. "Early decorporation therapy (1-2 hours) with DTPA is required to reduce rapid translocation of actinides to tissues." In 2018, at a DOE site where a worker had a puncture wound involving 300 disintegrations/minute on an alpha meter, the wound was flushed and treatment with Ca-DTPA was initiated within 1 hour.

population is presented in person-rem. DOE agrees that the collective dose to the population within 50 miles, reported in "person-rem," is not directly comparable to the hypothetical individual doses presented. The population dose is calculated by the MACCS computer code and is based on, among other factors, the distance and direction to the offsite members of the population. Therefore, doses to members of the offsite population would vary substantially depending on wind direction and distance from the VTR. An event, such as a very severe earthquake postulated to initiate this event, would cause widespread regional damage, collapse of structures, and deaths independent of the possible radiation releases. Emergency actions at the VTR would mitigate the impacts. No credit was taken in the accident evaluations for emergency actions, including alarms, worker training, etc., that would mitigate the immediate impacts.

62-56 As indicated in the response to comment 62-40, the results cited in the comment are from the MACCS calculation for a hypothetical, beyond-design-basis reactor accident with loss of active and passive cooling. This accident is postulated to be initiated by an earthquake so severe that widespread damage and collapse of structures at MFC, the INL Site, and the surrounding area would be expected. Loss of life due to this earthquake damage would also be expected. The radiological consequences may appear high, especially within MFC, but they are for a bounding (worst case), unmitigated accident. Appendix D, Section D.4.9.5 and Tables D–33 and D–34 of this VTR EIS present the potential radiological impacts of this hypothetical accident to the noninvolved worker, MEI, and population within 50 miles of MFC and ORNL. As indicated in this EIS, the impacts, both radiological and nonradiological, could be very high and include fatalities.

The purpose of this EIS is to assess the environmental impacts of the proposed action. Consequences are addressed for people located at MFC. However, consequences to cars are not addressed. After an accident, DOE would be expected to take a range of mitigation and cleanup actions to minimize the spread of contamination and longer-term impacts of an accident. After an accident involving nuclear materials at a DOE facilities, compensation to the public would be available under the Price-Anderson Act and Amendments (see Chapter 7, Section 7.1). A description of emergency response and post-response cleanup in the event of an accident is included in this EIS.

62-57 DOE takes its responsibility for the safety and health of the workers and the public seriously. As presented in Chapter 3, Sections 3.1.11, 3.2.11, and 3.3.11, of this VTR EIS, DOE has robust emergency preparedness programs implemented at INL,

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At the Idaho National Laboratory, work with radionuclides including glovebox work, was conducted with disregard for lessons learned at other DOE facilities and was conducted without properly trained personnel to provide timely evaluation and treatment of radiologically contaminated skin injuries. **62-82 cont'd**

VTR EIS VIOLATES NEPA IN NUMEROUS CRUCIAL AREAS

SRS MOX Plant Through-Put Misrepresented and Violates NEPA

On page D-17, the VTR EIS explains that "The MOX facility was designed (at least initially) to process up to 3.5 metric tons of plutonium annually so its throughput was likely a factor of ~7 times the VTR needs." Despite what the MOX plant at SRS may have promised, the chemical "aqueous polishing" processes to remove impurities from the plutonium feed stock seems to have been a significant bottleneck and part of the reason for the cancellation of the never completed MOX facility, despite assumed low technical risk because MOX fuel is fabricated other countries. The VTR EIS appears to be misleading the reader regarding the costs and difficulties of "aqueous polishing." **62-83**

VTR EIS Relies on DOE/EIS-0203 Despite It's Inadequacy (DOE's Plan to Send Aluminum-Clad Fuel to SRS Misrepresented and Violates NEPA)

The VTR EIS states that regarding the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement* (SNF PEIS) (DOE/EIS-0203) (DOE 1995), the SNF PEIS analyzed, at a programmatic level, the potential environmental consequences over a 40-year period of alternatives related to the transportation, receipt, processing, and storage of SNF under the responsibility of DOE. It also addressed the site-wide actions anticipated to occur at the INL Site for waste and SNF management.

The VTR EIS must explain why the 40 years addressed beginning in 1997 is adequate for a 60-year VTR program beginning after 2021.

The VTR EIS misportrays DOE-EIS-0203 and ignores the state of complete disarray of the Department of Energy's stated reprocessing and spent nuclear fuel disposal programs. **62-84**

DOE decided to manage its SNF by type (fuel cladding and matrix material) at the Hanford Site, INL, and SRS. Under this decision, the fuel type distribution would be as follows:

- Hanford production reactor fuel would remain at the Hanford Site.
- Aluminum-clad fuel would be consolidated at SRS.
- Non-aluminum-clad fuels (including Naval SNF) would be transferred to INL.

Multiple problems and inadequacies arise due to reliance on the SNF PEIS. DOE had committed to construct and open Yucca Mountain by 1998. DOE has no program for disposal of spent fuel at Yucca Mountain or anywhere else. The DOE is NOT sending aluminum-clad fuel to SRS.

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ORNL, and SRS. Emergency planning for each site includes protocols and procedures for managing personnel who have been contaminated. These procedures have been in place for decades and include coordination with local hospitals. These same emergency procedures include actions that would reduce the possibility of exposure and consequences of an accidental release such as notifications to shelter in place or evacuate and imposing restrictions on access to contaminated areas.

62-58 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. The purpose of this EIS is to assess the environmental impacts of the proposed action. The calculated impacts also allow a fair comparison between alternatives and options. The importance of weather conditions is considered in the MACCS calculations. The MACCS input requires meteorological information that is based on five years of measured weather data. MACCS samples the input weather data to obtain a statistical estimate of prevailing weather conditions during an accident simulation.

62-59 The commenter is incorrect. The values provided by the commenter are for the entire radiological inventory of the VTR, not the amount of radioactive material that would be released in the hypothetical reactor accident. DOE acknowledges that the VTR fuel would contain a large inventory of radioactive material. However, the purpose of this EIS is to assess the environmental impacts of the proposed action. The number of curies per assembly is specified for each radionuclide in Table D–42 and Table D–43 for 6 percent burnup, 220 day decay, and 4 year decay fuel types. The fuel type and release fractions are specified for all accident scenarios. The release fractions for each scenario are applied to the appropriate radionuclide inventory through the MACCS calculations and are considered in the MACCS consequence calculations for the VTR. Specifying the number of curies released does not consider the importance of each radionuclide in terms of health effects (refer to the response to comment 62-28). For the hypothetical, beyond-design-basis reactor accident specified by the commenter, the release fractions in Table D–32 are specified for the isotope groups. The release fraction for an isotope group applies to all of the radionuclides listed in the isotope group.

62-60 The release fractions in Table D-32 correspond to the isotope groups included in the MACCS release calculations. The text in Appendix D clearly indicates that the release fractions for the fuel melting region of ~1,100 degrees Celsius are assumed. The table indicates that the release fractions are "less than or equal to." To further

The VTR EIS must explain why the serious problem that a fuel or high-level waste disposal program does not exist. 62-84 cont'd

Importing Plutonium from Other Countries and Activities to Support VTR Are Not Included in the Surplus Plutonium Disposition EIS and Pretending Otherwise Violates NEPA

The VTR EIS states: *Surplus Plutonium Disposition Supplemental Environmental Impact Statement* (DOE/EIS-0283-S2) (DOE 2015a) – This Supplemental EIS evaluated the potential environmental impacts of alternatives for the disposition of surplus plutonium, which had no previously assigned disposition path.

The importation of plutonium from Europe (France or the UK) for VTR fuel is not addressed in the Surplus Plutonium Disposition EIS and requires a new EIS. Pretending otherwise violates NEPA. 62-85

The VTR EIS includes both short-term and long-term latent cancer fatality estimates, but does not say what time duration is evaluated, i.e, 100 years or other, from the exposure by ingestion of contaminated food and inhalation of resuspended radionuclides. 62-86 The VTR EIS must address the many decades and more of elevated contamination levels and the impact to agriculture, and chronic health issues. 62-87

Lax packaging standards for plutonium may be the rule rather than the exception. The VTR EIS must explain the standards for plutonium packaging, Type B or Type C or other standards and what testing has been conducted for accident conditions. [49] 62-88

The activities and tradeoffs for the reduction of surplus plutonium in its EIS do not address creation of feedstock and fuel fabrication for the VTR and pretending otherwise violates NEPA. [50] 62-89

The VTR EIS Violates the WIPP EIS and DOE Waste EIS (DOE/EIS-0200)

The VTR EIS lists the *"Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement Eddy County, near Carlsbad, New Mexico* (DOE/EIS-0026-S-2) (DOE 1997b), but the VTR EIS fails to address the full extent of additional wastes that DOE plans to or hopes to send to WIPP. The VTR EIS mentions WIPP as the place to send VTR wastes without addressing whether or not WIPP has the capacity for 60 years of VTR operations. 62-90

[49] For example, Issues of packaging are described by Edwin Lyman, Union of Concerned Scientists, *Inadequacy of the IAEA's Air Transport Regulations: The Case of MOX Fuel*, undated, (accessed 2/25/2021) http://www.ccnr.org/lyman_casks.html He writes: "The consequence code MACCS2, developed for the U.S. NRC, was used to assess the consequences of the release of 5 kg of reactor-grade plutonium as a result of an air crash in an area with a population density of 250 persons/km2. For a buoyant release as a result of a hot fire, neutral atmospheric conditions and a light wind, committed effective doses resulting from the passage of the radioactive plume were as high as 52 Sievert (Sv) at 200 meters from the crash site, and remained above 50 mSv for more than 40 km (64 mi) from the crash site. There were more than 4300 cancers committed from the initial passage of the plume. The total number of cancers, including those resulting from resuspension of the ground contamination, exceeded 16,000 over a 100-year period." 62-88 cont'd

[50] U.S. Government Accountability Office, *NNSA's Long-Term Plutonium Oxide Production Plans Are Uncertain*, October 2019. https://www.gao.gov/assets/710/702239.pdf Multiple program changes in strategy between 1997 and 2008. 62-89 cont'd

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clarify the accident calculations, text is added that indicates the release fractions used are the upper limit values.

62-61 As indicated in the response to comment 62-59, the commenter is incorrect in the estimation of the potential release from the hypothetical, beyond-design-basis VTR accident and is making an incorrect comparison of potential radiological impacts. The commenter is citing the VTR inventory, expressed in total curies, rather than the amount that might be released in the hypothetical accident. The number of curies released is considered in the MACCS consequence calculations for the VTR.

Also, by focusing on the total curies of isotopes and not considering the potential health effects of each isotope, comparison made in the comment is not meaningful (refer to the response to comment 62-28). For example, as indicated in Table D–42, a VTR assembly with 6 percent burnup has more than 10 times the number of curies of krypton-88 than cesium-137. But the radiological impacts, on a per curie basis, are many orders of magnitude higher for cesium-137. Please also refer to the response to comment 6262.

62-62 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF. The Chernobyl nuclear reactor accident is outside the scope of the VTR EIS.

DOE notes that comparisons of the Chernobyl accident with the VTR hypothetical accident are not directly applicable. The NUREG-1250 report mentioned by the commenter indicates that Chernobyl data on radionuclide release is not directly relevant to other reactor designs because of the unique features and release mechanisms associated with the RBMK reactor design. The size of the VTR and RBMK reactors, and their radiological inventories, are not directly comparable either.

62-63 As described below, the MACCS2 computer code was used to provide an estimate of the economic impacts of the beyond-design-basis accident. Worker and public safety are DOE's highest priority, and INL workers are highly trained in performing their jobs. Education and training requirements, including those for safety and radiation protection, are commensurate with job functions. The purpose of this EIS is to assess the environmental impacts of the proposed action. DOE prepared the

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The VTR EIS violates NEPA regarding transuranic waste disposal and the illusion that WIPP can take future VTR related wastes.

The VTR EIS must disclose all the waste streams DOE has asserted will be sent to WIPP, despite being against the law. DOE has asserted that Hanford vitrification waste will go to WIPP, that INL's treated sodium-bearing waste will go to WIPP, that the nation's surplus plutonium will go to WIPP and even that the naval spent nuclear fuel will go to WIPP. 62-90

The VTR EIS Violates the DOE Waste EIS (DOE/EIS-0200) and Other EISs

The DOE/EIS-0200 EIS from 1997 cannot be used for the extended time that the VTR will be operating. 62-91

The Department of Energy's Radioactive Waste Manual for 435.1-1 for DOE Order 435.1 allows any concentration of the waste to be called "incidental" and non-HLW. [51] The DOE's Order will not limit the shallow disposal of its waste to Class A, B or C wastes. The DOE Order and its waste manual allows that DOE may authorize "alternate requirements" that exceed Class C concentrations. Very importantly, the radionuclides that the DOE may shallowly bury would exceed Class C concentrations for long-lived radionuclides. There would be no upper limit on the total amount or on the concentrations of long-lived radionuclides.

The methods, assumptions, and standards by which the DOE may use to assess the risk using a performance-based approach are ambiguous and flexible in DOE regulations. Experience shows DOE's performance assessments to be driven to select whatever set of assumptions needed to achieve what they think will give the appearance of acceptably low waste migration rates and acceptably low predicted groundwater contamination. Although not always admitted, the currently accepted state-of-the-art for performance assessments do not accurately or conservatively estimate the rate of contaminant migration or the resulting radiation doses, largely from groundwater ingestion at most disposal sites. 62-92

Citizens have no reason to trust DOE to make decisions that will provide reasonable assurance of the protection of human health and the environment, both because of its regulatory ambiguity and because of the DOE's long history of creating contamination that cannot be remediated at its DOE sites and also at sites for mining, milling and processing uranium.

Even if the DOE were to improve its Radioactive Waste Manual, the DOE generously applies interpretation of how to meet its Orders, Standards and Manuals and allows removal of any inconvenient requirement via Secretary approval. The DOE's Radioactive Waste Manual and DOE Order 435.1 was blatantly violated in 2018, without DOE Secretary approval, with regard to waste acceptance criteria for allowing waste to be brought into a DOE facility at the Idaho National Laboratory as reported in a causal analysis conducted for four transuranic waste drums that overpressurized, ejecting their contents. It was business as usual for the DOE.

[51] Department of Energy Radioactive Waste Manual 435.1-1 https://www.directives.doe.gov/directives-documents/400-series/0435.1-DManual-1/@@images/file

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EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. The accident analysis was conducted using the MELCOR Accident Consequence Code System, Generation 2 (MACCS2) computer program/code (WinMACCS, Version 3.11.2) to model accident conditions. MACCS2 was used to calculate radiation doses and health risks to the noninvolved worker, the maximally exposed offsite individual, and the population within 50 miles of the release point. The standard MACCS2 dose library was used. This library is based on Cancer Risk Coefficients for Environmental Exposure to Radionuclides: Federal Guidance Report 13 inhalation dose conversion factors. SecPop (Sector Population), an NRC computer program, provides estimates of population, land use, and economic values related to a specific site. It creates a site file that is needed by MACCS2 to perform a site-specific offsite consequence analysis of the health, economic, and environmental impacts of a hypothetical, atmospheric release of radioactive material from a nuclear facility.

62-64 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. The accident analysis was conducted using the MELCOR Accident Consequence Code System, Generation 2 (MACCS2) computer program/code (WinMACCS, Version 3.11.2) to model accident conditions. MACCS2 was used to calculate radiation doses and health risks to the noninvolved worker, the maximally exposed offsite individual, and the population within 50 miles of the release point. The standard MACCS2 dose library was used. This library is based on Cancer Risk Coefficients for Environmental Exposure to Radionuclides: Federal Guidance Report 13 inhalation dose conversion factors. SecPop (Sector Population), an NRC computer program, provides estimates of population, land use, and economic values related to a specific site. It creates a site file that is needed by MACCS2 to perform a site-specific offsite consequence analysis of the health, economic, and environmental impacts of a hypothetical, atmospheric release of radioactive material from a nuclear facility.

62-65 Worker and public safety are DOE's highest priority, and INL workers are highly trained in performing their jobs. Education and training requirements, including those for safety and radiation protection, are commensurate with job functions. The

The evidence shows that DOE doesn't comply with its regulations or state regulations. The Department of Energy claims it follows its own regulations and for example, "Activities that affect, or may affect, the safety of DOE nuclear facilities must also comply with the requirements of 10 CFR 830, Nuclear Safety Management."

When the Idaho National Laboratory wanted to bring two shipments of commercial spent nuclear fuel to INL for research, a draft supplemental analysis was developed by the DOE. That supplemental analysis relied on the existence of a spent nuclear fuel repository. Specifically, that supplemental analysis cited the Yucca Mountain repository and cited its EIS. [52] [53]

After decades of failed efforts to obtain a repository for spent nuclear fuel and high-level waste, the Department of Energy cannot even claim to have a plan or a program to obtain a repository. The DOE disposed of all the documents and public comment pertaining to last year's "consent-based siting" effort. The political realities are as insurmountable as the scientific difficulties to attempt to predict the concentrations of contaminants that migrate from a repository over thousands of years. **62-92 cont'd**

The DOE's failed spent nuclear fuel and high-level waste disposal program failures are not solved by simply omitting the Yucca Mountain EIS from mention in the VTR EIS. **62-93**

Ramifications of DOE's High-Level Waste Reclassification Remain Unexplained

In November 2018, the Department of Energy issued for public comment its proposal to allow the DOE to unilaterally reclassify its high-level waste (HLW) to non-HLW. [54]

The Idaho Cleanup Project (ICP) Citizens Advisory Board [55] subcommittee on DOE's Proposed High-Level Waste (HLW) Interpretation reviewed the comments describing the multitude of problems with DOE's proposal identified by the State of Idaho, [56] the Natural **62-94**

[52] See EDI comments to the Department of Energy on the U.S. Department of Energy Draft Supplement Analysis on Two Proposed Shipments of Commercial Nuclear Fuel to Idaho National Laboratory for Research and Development Purposes 2015 (DOE/EIS-0203-SA-07), July 2015 at our website.

[53] See the Yucca Mountain Environmental Impact Statement including DOE/EIS-0250F and supplement analysis DOE/EIS-0250F-S1.

[54] Federal Register, Request for Public Comment on the U.S. Department of Energy Interpretation of High-Level Radioactive Waste, A Notice by the Energy Department on October 10, 2018, extended to January 9, 2019. https://www.federalregister.gov/documents/2018/10/10/2018-22002/request-for-public-comment-on-the-us-department-of-energy-interpretation-of-high-level-radioactive Summary: "U.S. Department of Energy (DOE or the Department) provides this Notice and request for public comment on its interpretation of the definition of the statutory term "high-level radioactive waste" (HLW) as set forth in the Atomic Energy Act of 1954 and the Nuclear Waste Policy Act of 1982. This statutory term indicates that not all wastes from the reprocessing of spent nuclear fuel ("reprocessing wastes") are HLW, and DOE interprets the statutory term such that some reprocessing wastes may be classified as not HLW (non-HLW) and may be disposed of in accordance with their radiological characteristics." See the docket for the Department of Energy's Proposed Interpretation of High-Level Radioactive Waste ID: DOE_FRDOC_0001-3696, comments due January 9, 2019, on regulations.gov at https://www.regulations.gov/document?D=DOE_FRDOC_0001-3696

[55] Idaho Cleanup Project Citizens Advisory Board (formerly the Idaho National Laboratory Citizens Advisory Board) meeting schedules and presentations at https://energy.gov/em/icpcab/idaho-cleanup-project-citizens-advisory-board-icp-cab Meeting held June 21, 2018.

[56] John H. Tippets, Director, Idaho Department of Environmental Quality, Letter to Anne White, Assistant Secretary, Office of Environmental Management, U.S. Department of Energy, Subject: State of Idaho Comments

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purpose of this EIS is to assess the environmental impacts of the proposed action. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. The accident analysis for the EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators and human initiators associated with storing SNF in casks on storage pads, a practice that experience shows is a very safe method. The EIS also analyzes the impacts of potential accidents on workers and public health and safety. A description of emergency response and post-response cleanup in the event of an accident was included.

62-66 The scenario addressed by the comment is for a fire outside involving a waste drum with 23 grams of americium-241. TRU waste containing americium-241 could be generated by fuel production operations. The waste would be placed in containers and temporarily stored (or staged) pending shipment to an offsite disposal facility. A fire is postulated to occur in a 55-gallon drum because of poor housekeeping. The accident is assumed to occur outside confinement during handling. Based on the WIPP acceptance criteria, remote-handled waste is limited to 55-gallon drums with a maximum allowed load of 80 curies or about 23 grams of americium-241. The comment suggests there are numerous ways that could lead to a higher release. DOE has incorporated lessons learned from past events involving waste packaging. Current practices for TRU waste drum loading have multiple safety controls to ensure that WIPP limits are not exceeded. To avoid overloading a container, DOE is required to implement a system of controls to measure and track important waste components and to implement quality assurance measures to ensure the accuracy of container loading. DOE considers the characteristics of the material being loaded into a container to ensure that WIPP limits are not exceeded. DOE implements controls to assure that prohibited material such as pyrophoric material and nitrates are excluded from the waste.

Commenter No. 62 (cont'd): Tami Thatcher

Resources Defense Council (NRDC),[57] and others and gave up trying to respond directly on the DOE's problematic proposal. The ICP CAB focused instead on the reclassification of sodium-bearing waste currently managed as HLW at the INL and the hope of sending it to the Waste Isolation Pilot Plant (WIPP) in New Mexico. Another subcommittee plans to review HLW calcine stored at the INL. (The status of HLW at the Idaho National Laboratory's Materials and Fuels Complex remains a mystery.)

The State of Idaho pointed out in its comments about the DOE's HLW proposal that the Department of Energy had actually a defied request for information that Congress had codified into law last year. Specifically, DOE did not comply with Section 3139 of the National Defense Authorization Act for Fiscal Year 2018 (H.R. 2810) that required DOE to prepare and submit a report to Congress by February 1, 2018 on the classification of certain wastes.

Despite the complexity of the DOE's proposed HLW interpretation and the lack of information from the DOE about the ramifications of the HLW proposal on state agreements and current HLW commitments, no presentations were given to the CAB to attempt to explain DOE's proposal.

DOE has continually been prodding the Citizens Advisory Board (CAB) for the Idaho Cleanup Project to ditching the Idaho Settlement Agreement. [58]

For many years now, the Department of Energy has been pretending that they were on track to meet the Idaho Settlement Agreement milestones for removing spent nuclear fuel and high-level waste from the state of Idaho. The CAB has for years been assured, behind the scenes, that a repository would be available when there was a change in the country's political leadership. But despite having a Republican president and Republican majorities in both the House and Senate for the previous two years, funding has not been passed for reopening Yucca Mountain licensing activities. The seriousness of the difficulties of finding a repository for the HLW and spent nuclear fuel at the Idaho National Laboratory seems to be beginning to dawn on the CAB.

Some of the difficulty in understanding the ramifications of DOE's HLW reclassification effort is by design — the DOE does not want citizens or the CAB to understand what its proposed HLW reclassification will actually mean.

There is also a complex history pertaining to high-level waste. It is important to understand that there is a process for accepting some small percentage of radioactive waste remaining in storage tanks when efforts have been made to empty and clean the tanks. In Idaho, this acceptance process is the Section 3116 process that requires state and U.S. Nuclear Regulatory Commission involvement. This issue gets complicated by just how much of the waste is left behind, because even a few percent of the waste being left behind can mean millions of gallons of waste left behind at the DOE site at Hanford, Washington, which has not allowed the Section

62-94 cont'd

on U.S. Department of Energy Interpretation of High Level Radioactive Waste (83 FR 50909), January 9, 2019. See it on our website at http://www.environmental-defense-institute.org/publications/IDEQHLW.pdf

[57] The Natural Resources Defense Council (NDRC), "NRDC et al. Comments on Energy Department's Request for Public Comment on the Interpretation of High-Level Radioactive Waste," January 9, 2019. https://static1.squarespace.com/static/568adf4125981deb769d96b2/t/5c36635670a6add06a0aa079/1547068277020/NRDC+et+al.+Full+Comments+DOE+HLW+9+Jan+2019.pdf

[58] See more about Idaho's Settlement Agreement at https://www.deq.idaho.gov/inl-oversight/oversight-agreements/1995-settlement-agreement.aspx

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62-67 The purpose of this EIS is to assess the environmental impacts of the proposed action. The calculated impacts also allow a fair comparison between alternatives and options. One aspect of evaluating the impacts is to have a common MAR when evaluating the impacts from the VTR alternatives and the feedstock preparation options. For the hypothetical, beyond-design-basis accident, Instead of speculating on the MAR in targets and test materials, the EIS assumed the full inventory of high-burnup fuel in the reactor as the MAR, assumed all of it melted at 1,100 degrees Celsius (which results in very high release fractions (1 for noble gases, cesium, lanthanides, etc.), and 100 percent release to the atmosphere. No credit was take for any mitigative effects such as plate-out within the reactor or structures. These very conservative assumptions bound any realistic releases from the reactor under any accident conditions. Incremental increases in impacts from realistic releases from target and test materials would be negligible given the extraordinarily high releases assumed for the reactor fuel.

The accident analysis provides a means for comparing the consequences between alternatives and options. A standard methodology is used when determining health effects from an event to facilitate comparing effects from alternatives and options.

62-68 Please refer to the response to comment 62-25.

62-69 Release fractions are applied to the MAR to determine the source term for each event evaluated in the EIS. Since the purpose of the accident analysis is to provide a means for comparing the consequences between alternatives and options, the release fractions are applied consistently in the events for the VTR alternatives and the feedstock preparation options. The release fractions in Appendix D, Table D–32 of this VTR EIS correspond to the isotope groups included in the MACCS release calculations. Elements are grouped by general chemical characteristics typically used for development of reactor accident releases. Some of the isotope groups contain elements of a different group because of the specific melting characteristics of the elements at the temperatures shown in the table. The text in Appendix D clearly indicates that the release fractions for the fuel melting region of ~1,100 degrees Celsius are assumed. The table indicates that the release fractions are "less than or equal to." To further clarify the accident calculations, text was added that indicates the release fractions used are the upper limit values.

62-70 As implemented in this EIS for accidents at VTR facilities, the MACCS2 model evaluates 50-year committed doses due to inhalation of aerosols containing respirable radionuclides and to direct exposure from radionuclides in the passing

3116 process. See our EDI comments on DOE's HLW Reclassification for a discussion of the 3116 process. [59]

In contrast to accepting a small percentage of the waste left behind in tanks after emptying and washing the HLW tanks, the DOE wants to reclassify the bulk of certain HLW streams. When the entire amount of liquid sodium-bearing waste at the INL, now managed as HLW and classified as HLW — when that entire waste stream of 900,000 gallons of waste is reclassified from HLW, it becomes Low-level waste (LLW). If the sodium-bearing waste isn't currently HLW as DOE sometimes postures, then why is DOE having the ICP CAB study the issue of its reclassification from being HLW? Importantly, the DOE has tremendous latitude to dispose of LLW on its DOE sites.

A subset of LLW is of unlimited radioactivity and that is known as waste that is Greater-Than-Class C (GTCC) waste. Low-level waste that is GTCC can include transuranic waste of unlimited concentrations. Only when DOE's transuranic waste meets the criteria as being defense-related and acceptable for disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico can it be disposed of at WIPP. WIPP currently requires state and EPA permitting and has laws that govern what it will accept for disposal. HLW, for example, has been prohibited by law from disposal at WIPP. Reclassified sodium-bearing waste, having been HLW tank waste, is also currently prohibited at WIPP.

The DOE is trying to muddy the water by confusing the tank closure Section 3116 process that applies in Idaho **with the unlawful reclassification of the entire bulk amount of the HLW**, whether sodium-bearing waste or calcine.

The DOE is also refusing to acknowledge to the public and to the ICP CAB — to a degree I consider unethical — the serious cloud over the legality of its proposal to reclassify the bulk of its HLW. The court found that DOE's vague approach using its DOE Order and Manual 435.1 to allow unspecified "alternate requirements" would be unacceptable because it would allow DOE to reclassify waste on whim. For example, the DOE could allow cost savings to be the overriding waste classification criteria, not safety of human health and the environment. The court dismissed the case as unripe because the DOE had not yet reclassified its HLW.

See details of the legal challenges to DOE's HLW reclassification in the State of Idaho's HLW comment submittal, [60] the National Resources Defense Council (NRDC) comment submittal,[61] and also the book *Fuel Cycle to Nowhere*. [62]

62-94 cont'd

[59] High-level Waste Reclassification comment submittals at http://www.environmental-defense-institute.org/index.html (http://www.environmental-defense-institute.org/publications/CommentDOEHLW.pdf and http://www.environmental-defense-institute.org/publications/EDIComHLW6.pdf)

[60] John H. Tippets, Director, Idaho Department of Environmental Quality, Letter to Anne White, Assistant Secretary, Office of Environmental Management, U.S. Department of Energy, Subject: State of Idaho Comments on U.S. Department of Energy Interpretation of High Level Radioactive Waste (83 FR 50909), January 9, 2019. See it on our website at http://www.environmental-defense-institute.org/publications/IDEQHLW.pdf

[61] The Natural Resources Defense Council (NDRC), "NRDC et al. Comments on Energy Department's Request for Public Comment on the Interpretation of High-Level Radioactive Waste," January 9, 2019. https://static1.squarespace.com/static/568adf4125981deb769d96b2/t/5c36635670a6add06a0aa079/1547068277020/NRDC+et+al.+Full+Comments+DOE+HLW+9+Jan+2019.pdf

[62] Richard Burleson Stewart and Jane Bloom Stewart, *Fuel Cycle to Nowhere – U.S. Law and Policy on Nuclear Waste*, Vanderbilt University Press, 2011, ISBN 978-0-8265-1774-6.

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plume. This model represents the major portion of the dose that a noninvolved worker or member of the public would receive from a VTR or support facility accident. The long-term effects from exposure to radionuclides deposited on the ground and surface waters, from resuspension and inhalation of radionuclides, and from ingestion of contaminated crops also are modeled. These long-term pathways have been studied and found not to contribute as significantly to dose as inhalation, and they would be controllable through interdiction. For purposes of this EIS, both the near-term (early) and long-term (chronic) impacts are reported.

62-71 This EIS provided information on the cancer rates in the area of interest around the INL Site (Chapter 3, Section 3.1.10). It is not the purpose of this EIS to establish a cause for the cancer rates. Cancer is caused by both external factors (e.g., tobacco, infectious organisms, chemicals, and radiation) and internal factors (inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). Risk factors for cancer include age, alcohol, cancer-causing substances, chronic inflammation, diet, hormones, immunosuppression, infectious agents, obesity, radiation, sunlight, and tobacco use. Therefore, to determine the cause of any incidence of cancer can be very difficult as there are many confounding factors. The Centers for Disease Control and Prevention (CDC) does not identify any non-cancer health effects from doses of less than 10 rad to the embryo or fetus (CDC 2019). The estimated annual exposure to any individual from any of the VTR operations would be much less than 10 rad.

62-72 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. The purpose of this EIS is to assess the environmental impacts of the proposed action. The calculated impacts also allow a fair comparison between alternatives and options. Presentation of the number of curies in the reactor or the number of curies released does not allow for a meaningful comparison between VTR alternatives and feedstock preparation options. Specifying the number of curies released does not consider the importance of each radionuclide in terms of health effects (refer to the response to comment 62-28).

62-73 This EIS (as is common practice in DOE EISs that include alternatives with potential radiological impacts) uses population and maximally exposed individual dose and latent cancer fatality as the measure of health impacts on the public. DOE

Commenter No. 62 (cont'd): Tami Thatcher

VTR Waste Disposal Violates NEPA and requires a New Programmatic EIS

The VTR EIS is violating NEPA in the VTR EIS by waving at old, inadequate EISs, and by avoiding admitting the true extent to which the Department of Energy recently decided to reclassify any DOE waste, whether spent nuclear fuel or high-level waste resulting from pyrochemical processing, as low-level waste. 62-95

The Department of Energy's at-whim regulations can shallowly bury low-level radioactive waste over the Snake River Plain aquifer and has for years.

Waste that is not accepted by any other waste disposal facility such as Greater-Than-Class-C waste is buried over the Snake River Plain aquifer. Waste that would have more stringent disposal requirements, such as "high-level waste" is simply reclassified at-whim to be "low-level radioactive waste."

The waste disposal "performance assessment" requirements and evaluation of adequacy is up to DOE's at-whim criteria. Environmental monitoring is funded and overseen by the Department of Energy. Even the data used by the U.S. Environmental Protection Agency radiological monitoring programs is only available if DOE's handmaiden's deliver the air filters, etc. to the EPA. Hence, months and even years of data blackouts are common from ocean docks to the Columbia River to Hanford and to the INL. 62-96

The distance for the waste that the performance assessment criteria must be applied must be stipulated. Otherwise the DOE could select 50 miles or 500 miles or whatever distance it takes for their analysis to dilute the contamination to meet the selected contamination standard. So, the DOE is disposing of and apparently intends to save money by disposal of vast amounts of

recognizes that these are not the only potential impacts from radiation exposure. As the commenter notes, cancer incidence is also an impact, and the morbidity rate is higher than the mortality rate. The mortality rate used by DOE when making estimates of risk uses a conversion factor of 6×10^{-4} (the conversion factor used in this EIS), while the morbidity conversion factor suggested for use is 8×10^{-4}. Consistent use of the cancer mortality rates across all alternatives and fuel production options allows for an assessment of the differences in impacts between the alternatives. Adding the morbidity rate to the assessment would not add to the ability to differentiate between alternative impacts. Cancer is caused by both external factors (e.g., tobacco, infectious organisms, chemicals, and radiation) and internal factors (inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). Risk factors for cancer include age, alcohol, cancer-causing substances, chronic inflammation, diet, hormones, immunosuppression, infectious agents, obesity, radiation, sunlight, and tobacco use.)

With regard to radiation exposure to a developing child in utero, the CDC states that a dose equivalent to 500 chest x-rays, the equivalent of 5 rem (the dose from a single chest x-ray is about 10 millirem), would increase the lifetime risk of cancer for that child by about 2 percent (CDC 2011). The CDC does not identify any non-cancer health effects from doses of less than 10 rad to the embryo or fetus (CDC 2019). The estimated annual exposure to any individual member of the public from any of the VTR operations would be much less than 10 rad. Under all VTR alternatives and fuel production options, the estimated maximum dose to any individual is much less than 1 millirem.

62-74 Worker and public safety are DOE's highest priority, and INL workers are highly trained in performing their jobs. Education and training requirements, including those for safety and radiation protection, are commensurate with job functions. DOE prepared this VTR EIS in accordance with the requirements in the Council on Environmental Quality (CEQ) and DOE NEPA-implementing regulations. Chapter 4 of the EIS evaluates the potential environmental impacts of the VTR and associated facilities, including the reactor fuel production facilities, on a site-by-site basis, clearly showing the impacts that would occur at the Idaho National Laboratory (INL) Site. To facilitate the public's understanding of the impacts that could occur at any of the sites, the Summary (Section S.9) and Chapter 2 (Section 2.9) summarize the VTR and associated post-irradiation and spent fuel management facilities impacts that would occur at INL and Oak Ridge National Laboratory and the reactor fuel production impacts that would occur at INL and the Savannah River Site. The extremely long-lived radioactive waste that may be Greater-Than-Class C on the Savannah River Site as well as Hanford and the Idaho site. [63] [64] [65] [66] [67] [68] [69] [70] [71]

This isn't about scrapping a fine layer of radioactive waste off tank walls — this is about the bulk of HLW being diluted, then it's concentration of radioactivity evaluated to "alternate criteria" that allow exceeding Class C concentrations for long-lived radionuclides and then enormous quantities of HLW being shallow buried onsite using Performance Assessments full of inadequately evaluated assumptions and inadequate technical basis.

The approach by the DOE at the Savannah River Site was to ignore the long-lived and highly mobile fission products technetium-99 and iodine-129. But the U.S. Nuclear Regulatory Commission pointed out that this wasn't sound. Later it was determined that these ignored fission products dominate the projected radiation doses. [72]

DOE would have citizens believe that when HLW becomes low-level waste, no matter the quantity, that it doesn't need deep geologic disposal. But low-level Greater-Than-Class C waste and TRU waste have long been recognized to need the kind of isolation from the biosphere provided by deep geologic disposal.

High-level waste is waste from reprocessing spent nuclear fuel and uranium targets for producing plutonium. It contains fission products such as cesium-137 and strontium-90 that

62-96 cont'd

[63] Department of Energy, Nuclear Energy, Idaho Field Office, "Basis for Section 3116 Determination for the Idaho Nuclear Technology and Engineering Center Tank Farm Facility," DOE/NE-ID-11226, November 2006. https://www.energy.gov/sites/prod/files/em/FinalINTECTFFWDBasisDocument.pdf

[64] DOE-ID, 2003b, Performance Assessment for the Tank Farm Facility at the Idaho National Engineering and Environmental Laboratory, DOE/ID-10966, Rev. 1, April 2003 (Errata December 2, 2003).

[65] C. M. Barnes et al., "Feed Composition for the Sodium-Bearing Waste Treatment Process," INEEL/EXT-2000-01378, Rev. 3, September 2003. https://inldigitallibrary.inl.gov/sites/STI/STI/3156999.pdf#search=INEEL%2FEXT%2D2000%2D01378

[66] B. Jennifer Davis, John S. Contardi, and Lawrence T. Ling, "A Regulatory Analysis of Incidental Waste," January 19, 2001, Available on adams.nrc.gov ML010120200.

[67] Gregory Suber Nuclear Regulatory Commission, NRC Waste Incidental to Reprocessing Program: Overview of Consultation and Monitoring Activities at the Idaho National Laboratory and the Savannah River Site – What We Have Learned – 12470, undated, on NRC Adams database.

[68] U.S. Nuclear Regulatory Commission Technical Evaluation Report for the U.S. Department of Energy Idaho National Laboratory Site Draft Section 3116 Waste Determination for Idaho Nuclear Technology and Engineering Center Tank Farm Facility," October 2006. ML062490142 at https://www.nrc.gov/docs/ML0624/ML062490142.pdf

[69] U.S. Nuclear Regulatory Commission Review of the Idaho National Engineering and Environmental Laboratory Draft Waste Incidental to Reprocessing Determination for Sodium-Bear Waste. (2002) on Adams database, no author and no date.

[70] "Tank Waste retrieval, processing, and On-site Disposal at Three Department of Energy Sites: Final Report, The National Academies Press, 2006. https://www.nap.edu/read/11618/chapter/14

[71] Victor Stello, Jr., U.S. NRC, "NRC Licensing of the Disposal of High-Level Hanford Defense Wastes," SECY-88-238, August 19, 1988. On NRC's Adams database. This policy letter highlights the disagreement between the Department of Energy and the Nuclear Regulatory Commission over what is and is not high level waste. The NRC has regulatory oversight of long-term storage and disposal of HLW. The DOE denied that reprocessing water at Hanford was HLW.

[72] Dr. Christianne Ridge, U.S. Nuclear Regulatory Commission, "NRC Perspective on Science and Technology for the Department of Energy's Defense Environmental Cleanup Program," December 5, 2017. On NRC's Adams Database.

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summaries also show the impacts that would occur if both the VTR and reactor fuel production activities were located at INL. A review of the summary of impacts shows that the proposed VTR and reactor fuel production capabilities do not pose a threat to the health, property, or livelihood of all residents of Idaho.

62-75 DOE prepared this environmental impact statement (EIS) in accordance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) and DOE NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500 through 1508 and 10 CFR Part 1021, respectively). The VTR EIS is structured to provide required summary information early in the document and successively more detailed information in subsequent sections. The VTR EIS provides a succinct summary of impacts, including potential health impacts, in both the Summary and Chapter 2. No attempt was made to hide information. Supporting documentation in both the main body and the appendices of the EIS are necessary to provide a complete picture of the analysis performed and the resulting impacts.

The selection of a sodium-cooled reactor for the VTR was the result of an assessment of alternatives that considered many reactor types, and some non-reactor options, to meet the need for a fast-neutron test facility. Life cycle, annual operating and maintenance, and capital investment costs were evaluation criteria for selection of the reactor. As the most mature of the reactor technologies evaluated, characterizing the design as "the most expensive, unreliable and unsafe way imaginable" is not accurate. (Any reactor design selected for the VTR project would have to be designed to meet all DOE safety requirements and goals. Many of these are identified in Chapters 4 and 7, and Appendices C and D, of this EIS.) Both the FFTF and PRISM, reactors with design features that have been incorporated into the VTR design, have had safety evaluation reports issued by the NRC. The EIS provides an accident analysis (Chapter 4, Section 4.11) that the VTR can be operated safely.

62-76 Worker and public safety are DOE's highest priority, and INL workers are highly trained in performing their jobs. Education and training requirements, including those for safety and radiation protection, are commensurate with job functions. The purpose of this EIS is to assess the environmental impacts of the proposed action. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different

Commenter No. 62 (cont'd): Tami Thatcher

cause about half of the radioactivity of recently reprocessed HLW. The waste from uranium targets may have fewer fission products. However, DOE SNF reprocessing and its target material may include more transuranic radionuclides.

Fission products such as iodine-129 and technetium-99 are a small fraction of the activity in the HLW, yet due to their very long half-life and their high mobility, they can dominate the radiological hazard to groundwater by leaching from the disposal site. The radioactive half-life of iodine-129 is 15.7 million years and the half-life of technetium-99 is 213,000 years. What appears to be a small curie level for I-129 and Tc-99 can pose a large hazard to groundwater from leaching radioactive waste.

In addition to fission products that are created in an operating nuclear reactor, transuranic radionuclides are created in a reactor by the successive absorption of neutrons. The transuranic radionuclides, those having more than the 92 protons that uranium has, include various isotopes of plutonium, americium, curium, neptunium, and others. These transuranic radionuclides either have very long a half-life or decay into progeny that have long half-lives. And they must decay through a long series of radionuclides before finally becoming a stable isotope of lead. For example, plutonium-241 decays to americium-241 that has a 430-year half-life but it decays to neptunium-237, then to protactinium-233 then to uranium-233 with a 160,000-year half-life and so forth. Plutonium-241 is a beta emitter rather than an alpha emitter is so the DOE doesn't count Pu-241 as an alpha emitter when it classifies transuranic waste. The transuranic radionuclides emit not only alpha particles but beta and gamma radiation. The actinides, which are uranium and transuranic radionuclides, pose serious health hazards from exceeding small curie amounts when inhaled or ingested. While DOE argues that the transuranics are easily bound to soil, other experts know that the chemistry of the waste, water and soil can allow leaching of transuranics from the buried waste at higher rates than assumed by the DOE.

Uranium-233 is an entirely man-made fissile material also used to make nuclear weapons. Plutonium-241 decays to Am-241 which decays to Np-237 which decays to U-233. Man-made U-233 has a decay series is similar to that of U-238 and U-235. Radium-225 results from U-233 decay series, while radium-223 results from U-235 decay series, radium-226 results from U-238 decay series, and radium-224 and radium-228 result from thorium-232 decay series. Drinking water monitoring typically only assesses radium-226 and radium-228.

The length of time that some of the radionuclides in the DOE's radioactive waste will be a hazard to human health isn't just 500 years, or 10,000 years. As decay progeny are produced by radioactive decay, radionuclides like plutonium, americium, curium and neptunium as well as uranium and thorium become more radioactive over time, over hundreds of thousands of years and beyond one million years.

The lowest concentration limits for low-level radioactive waste are Class A. When the concentration of a radionuclide's activity per volume or per gram exceeds the U.S. Nuclear Regulatory Commission's Class C as specified in 10 CFR 61.55, the low-level waste is referred to as Greater-Than-Class C (or GTCC). GTCC waste can be as radioactive or more radioactive than spent nuclear fuel. GTCC waste includes no limit to the concentration of radioactivity in the

62-96 cont'd

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perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. The accident analysis for the EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators, such as earthquakes, tornados, wildfires, flooding, volcanoes, and human initiators. Accident scenarios considered include core disruptive accidents and sodium leaks or fires. The EIS also analyzes the impacts of potential accidents on workers and public health and safety.

62-77 As noted in the response to comment 62-76, DOE used current safety analyses and computer modeling to estimate the results of design-basis and beyond-design-basis accidents. Accident scenarios for fuel production and spent fuel storage are included in this EIS. The details of the analysis, including the calculated risks from the various accidents are reported in Appendix D and summarized in Chapter 4. These analyses show that for most accidents, there would be a low risk to workers and the public.

62-78 A beyond-design-basis accident is recognized as a potential hazard; however, such an event is extremely unlikely because a large number of independent failures would have to happen before an accident could occur. DOE has multiple engineered and administrative controls in place to prevent these failures. In the unlikely event an accident were to occur, the potential dose to the public is bounded by the accident analysis in this EIS. In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. The accident analysis for this EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators, such as earthquakes, tornados, wildfires, flooding, volcanoes, and human initiators. Accident scenarios considered include core disruptive accidents and sodium leaks or fires. The EIS also analyzes the impacts of potential accidents on workers and public health and safety. A description of emergency response and post-response cleanup in the event of an accident was included.

62-79 The purpose of this EIS is to assess the environmental impacts of the proposed action. The calculated impacts also allow a fair comparison between alternatives and options. One aspect of evaluating the impacts is to have a common MAR when evaluating the impacts from the VTR alternatives and the feedstock preparation waste. GTCC waste includes very long-lived radionuclides including I-129, Tc-99, Pu-238, Pu-239, and others.

So, when the DOE wants to say HLW is now "low level waste" or "low activity waste" it is important to understand that this does not mean the waste does not pose a serious long-term hazard to human health and the environment. Levels of alpha-emitters above 100 nanocurie/gram were not expected to be produced by NRC licensees except in spent nuclear fuel and HLW and the NRC's regulations for surface disposal for Classes A, B and C radioactive waste were not created with Greater-Than-Class C levels of transuranic waste.

DOE's HLW, even waste it may refer to as "low activity waste" usually has levels of alpha-emitters above 100 nanocurie/gram. Under DOE's proposal, DOE provides no standards for how DOE will classify or reclassify waste. DOE can reclassify HLW and dispose of it how it chooses on its DOE sites despite the waste exceeding Class C levels of alpha-emitters. DOE provides in its manual for managing radioactive waste that DOE may authorize ***alternative requirements*** for waste classification and characterization.

Under Order 435.1, DOE manages waste incidental to reprocessing as either low-level waste or transuranic waste based on the waste's specific radioisotopic inventory. DOE defines *transuranic waste*, or TRU, as waste that is contaminated with alpha-emitting radionuclides (greater than uranium on the periodic table) with half-lives greater than 20 years and concentrations greater than 100 nanocuries per gram. If the TRU is not considered as originating from defense programs to make it eligible to be disposed of at the WIPP facility, then the waste is classified by DOE as ***low-level waste***.

According to the NRC's radioactive waste concentrations for defining classes of low-level waste, the DOE's transuranic waste would exceed Class C concentrations and be Greater-Than-Class C low-level radioactive waste. The NRC's definition for alpha-emitting radionuclides is slightly different and more restrictive than the DOE's. The NRC's definition in 10 CFR 61.55 includes alpha-emitting transuranics with half-lives greater than 5 years. The NRC also has limits for beta-emitting transuranics, plutonium-241 and curium-242, which decay through many decay progenies before a stable non-radioactive isotope results. The NRC's 10 CFR 61.55 applies to NRC licensees or NRC licensed facilities; therefore, the DOE does not use 10 CFR 61.55 unless it plans to dispose of its waste at an NRC-licensed disposal facility.

Whenever the DOE disposes of radioactive waste at the Nevada National Security Site, it means that the waste classification exceeded what was allowed at commercial nuclear disposal facilities such as the one in Clive, Utah.

The DOE has used undefined and imprecise terms such as "low activity" waste to try to diminish the appearance that the waste poses a serious hazard and must be isolated from the biosphere for the length of time that the waste is hazardous if in our air, soil or water.

The length of time that the waste is hazardous is usually thought of as at requiring at least 10 half-lives. But this only applies when the radioactive decay results in a stable isotope. When the radionuclide requires many decay progenies before reaching a stable nuclide, the half-life of each of the progeny must be considered and believe it or not, the DOE often ignores this.

62-96 cont'd

options. The MAR includes radionuclides that are significant in determining the consequences of events. A standard methodology is used when determining health effects from an event to facilitate comparing effects from alternatives and options. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. Comments regarding transuranic waste container assay issues are outside of the scope of this EIS.

62-80 DOE considered the range of historical accidents involving nuclear materials in developing the accident scenarios presented in the VTR EIS. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact of the proposed project. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. Other INL Site activities and historical incidences are outside the scope of this VTR EIS.

62-81 DOE takes its responsibility for the safety and health of the workers and the public seriously. EBR-II and FFTF demonstrated safe operation with sodium. Using past reactor operating experience and knowledge gained from extensive inherent safety testing at EBR-II and FFTF, along with advanced analysis tools, the VTR is being designed to safely operate with sodium as the coolant.

DOE would require safety analysis of configurations, tests, and experiments associated with the VTR to show that the VTR would continue to operate safely under the new conditions and in compliance with the DSA. Safe operation of the VTR and support facilities is paramount. DOE is committed to maintaining the safety basis for the VTR and all fuel production and support facilities in compliance with 10 CFR Part 830.

Appendix D discusses how the VTR is being designed to ensure safety throughout proposed operating conditions. The VTR design is also resilient under potential accident or upset conditions. DOE guidance for design of the VTR focuses on reducing or eliminating hazards, with a bias towards preventive, as opposed to mitigative, design features and a preference for passive over active safety systems. This general approach creates a design, which is reliable, resilient to upset, and has low potential consequences of accidents. Safe operation of the VTR is ensured by reliable systems design to ensure preservation of the key reactor safety functions.

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The VTR EIS Violates NEPA Regarding Safe Disposal of Spent Nuclear Fuel

62-97

The VTR EIS waves at EISs that are already inadequate and completely inadequate for the 60-year VTR operation and the many decades or longer following that, regarding radioactive waste including spent nuclear fuel, which DOE may decide rename as "pixy dust" in the future.

Final Waste Management Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste **(DOE/EIS-0200) (DOE 1997a)]** This DOE/EIS-0200 is not for spent nuclear fuel, but at MFC, spent nuclear fuel is renamed to high-level waste and then is renamed to low-level radioactive waste. This out-of-date EIS being cited is proof of how poorly the DOE is conducted its planning and its waste storage and disposal, i.e., via non-existent programs.

The VTR EIS must admit when a program relied upon in an EIS it points to, is actually flailing or completely non-existent, as DOE/EIS-0200 and also DOE-EIS-0203, ***Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement*** **(SNF PEIS) (DOE/EIS-0203) (DOE 1995)** [73]

Although the DOE/EIS-0203 from 1995 was to address spent nuclear fuel for 40 years through 2035, its failures began early and not only did it not obtain one repository, it failed to, by 2010 as required, name the second repository. For the VTR EIS to call out the DOE/EIS-0203 document is laughable were the problem not so deadly for millennia and also such a cost burden on future generations. The Department of Energy has failed to find a way to safely isolate spent fuel from the environment. The State of Nevada fought the DOE's efforts because the state officials saw and took note of the fraudulent metal corrosion studies, the fraudulent water infiltration models and the rapidly shifting strategies for the Yucca Mountain repository design.

When the VTR EIS points to other DOE EIS's to handle the spent nuclear fuel and other wastes the VTR project generates, it ought to have considered the timeframe that the supporting EIS's covered, and whether the economic or technical factors have changed over time, making assumptions and expectations of those supporting EISs highly inadequate to protect the public.

62-98

The extensive environmental polluting and health impacts from the isotope production program reveals the inadequacy of the NI PEIS, ***Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility*** **(NI PEIS) (DOE/EIS-0310) (DOE 2000b).** The VTR EIS must evaluate the entire environmental monitoring program for the INL, via an independent look at its inadequacies, weeks and months of unexplained gaps, and review technical indefensible explanations which go to any excuse to avoid attributing radiological contamination to the INL.

62-97 cont'd

If the americium in our environment was simply from past weapons testing, counties in Idaho that had more nuclear weapons testing fallout than those surrounding the INL would also be affected. The Department of Energy's environmental surveillance contractor, promotes technical

[73] See https://www.energy.gov/sites/prod/files/2015/05/f22/EIS-0203-FEIS-Summary_0.pdf

These key safety functions are (1) reactivity control, (2) fission- and decay-heat removal, (3) protection of engineered fission product boundaries, and (4) shielding.

Refer to Section 2.7, "VTR Facility Accidents," of this CRD for additional discussion of this topic.

62-82 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF. The details of the response to previous incidents are outside the scope of the VTR EIS. DOE would operate the VTR and associated facilities in compliance with all applicable regulations, permits, and agreements.

62-83 The process of aqueous polishing has been used for many years in preparing plutonium for the nuclear weapons stockpile, so there are many years of experience with the process. The aqueous polishing discussion on which the EIS analysis is based comes from up-to-date technical information developed by Savannah River National Laboratory.

62-84 Chapter 1, Section 1.6, of this VTR EIS identifies related NEPA documents. These are documents that address a subject that has some nexus with the VTR project. In some cases, the listed NEPA document may be the basis for previous NEPA decisions that are the basis for ongoing actions that VTR would participate in (e.g., disposal of transuranic waste at WIPP). In other cases, the VTR project is not reliant on specific action evaluated in or decisions following the cited EIS, but it deals with a related project. Please refer to the response to comment 62-15 that relates to the management or waste and SNF that would be generated by the VTR project.

62-85 Chapter 2, Section 2.6, of this VTR EIS indicates that DOE's preferred source of plutonium for VTR fuel is from existing DOE inventories and DOE is exploring the possibility of acquiring plutonium from foreign sources. The section points the reader to Appendix F where the potential impacts of transporting plutonium from Europe and receiving it in the United States are evaluated. Once received in the United States, the plutonium would undergo feedstock preparation and fuel fabrication as described in the EIS sections addressing reactor fuel production. If DOE were to acquire plutonium from foreign sources for VTR fuel production, it would have nothing to do with the NNSA Surplus Plutonium Disposition Program.

indefensible fiction, however, and attributes the elevated levels of americium around the INL to be from past nuclear weapons testing. 62-98 cont'd

The Nuclear Industry Continues to Pretend that the Technology for Confining Long-lived Radioactive Waste for Millenia Exists – It Doesn't and The Fiction Violates NEPA

62-99

The DOE has been telling the public that the technology for confining radioactive waste is not a problem — but may be true for the short-term in some cases but it is not true for disposal of radioactive waste in the long term. Unfortunately, the DOE does not have the technology to isolate the radioactive waste past a few decades. DOE does not have the technology to isolate the waste for 500 years. And DOE definitely does not have the technology to isolate the waste adequately for over 1 million years. The waste the DOE wishes to dispose of in shallow land burial has long-lived, mobile and radiotoxic radionuclides that the DOE cannot confine over time and cannot ensure the contrived slow steady trickle out predicted by its technically unjustified performance assessment models.

For light-water reactor (LWR) spent nuclear fuel disposal, a study found that the radiotoxicity of the radionuclides that leach out of buried waste is typically dominated by the actinides, which are the uranium, thorium and transuranic radionuclides. [74] [75] But studies of estimated groundwater contamination from the same repository, Yucca Mountain, have yielded radiation doses ranging from 1 rem/yr to 1000 rem/yr in studies prior to 1995 (dominant contributors have included C-14, Cs-135, Np-237, Tc-99, I-129, Pb-210, U-234, and Ra-226), [76] and doses below 1 rem/yr assuming perfect performance of titanium drip shields (dominated by Tc-99 and I-129). [77]

VTR EIS RADIATION RISKS INADEQUATELY CHARACTERIZED

62-100

While the official cancer fatality risk per rem rate used by DOE in the VTR EIS is 6E-4 fatal cancers per rem, underestimates the cancer fatality risk, it ignores the higher cancer fatality risk

62-99 cont'd

[74] Peter Swift, Sandia National Laboratories, ASTM-26 Workshop on Spent Fuel Disposal, Avignon, France, June 18, 2013, "Impact of Waste Characteristics on Disposal Options for Used Nuclear Fuel and High-Level Radioactive Waste," SAND2013-4208C, 2013. https://www.osti.gov/servlets/purl/1080027

[75] Transuranics are radionuclides often having extremely long half-lives. Many decay progenies may be created before reaching a stable, non-radioactive state. See our factsheet at http://www.environmental-defense-institute.org/publications/decayfact.pdf. See also an ANL factsheet at https://www.remm.nlm.gov/ANL-ContaminationFactSheets-All-070418.pdf

[76] Institute for Energy and Environmental Research, Science for Democratic Action, "Centerfold for Technoweenies," Vol. 4. No. 4, Fall 1995, p. 8-9. https://ieer.org/wp/wp-content/uploads/2012/02/4-4.pdf

[77] U.S. Nuclear Regulatory Commission, "U.S. Department of Energy's Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada – Final Report," NUREG-2184, May 2016. https://www.nrc.gov/docs/ML1612/ML16125A032.pdf "The peak estimated annual individual radiological dose over the one-million-year period at any of the evaluated locations is 1.3 mrem [0.013 mSv]. This maximum dose is associated with pumping and irrigation at the Amargosa Farms area, and the estimated radiological dose at other potential surface discharge locations is lower. The NRC staff concludes that the estimated radiological doses are SMALL because they are a small fraction of the background radiation dose of 300 mrem/yr [3.0 mSv/yr] (including radon), and much less than the NRC annual dose standards for a Yucca Mountain repository in 10 CFR Part 63 {15 mrem [0.15 mSv] for the first 10,000 years, and 100 mrem [1 mSv] for one million years, after permanent closure}."

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62-86 As implemented in this EIS for accidents at VTR facilities, the MACCS2 model evaluates 50-year committed doses due to inhalation of aerosols containing respirable radionuclides and to direct exposure from radionuclides in the passing plume. This model represents the major portion of the dose that a noninvolved worker or member of the public would receive from a VTR or support facility accident. The long-term effects from exposure to radionuclides deposited on the ground and surface waters, from resuspension and inhalation of radionuclides, and from ingestion of contaminated crops also are modeled. These long-term pathways have been studied and found not to contribute as significantly to dose as inhalation, and they would be controllable through interdiction. For purposes of this EIS, both the near-term (early) and long-term (chronic) impacts are reported.

62-87 The requirements for an EIS are identified in NEPA and the Council on Environmental Quality (CEQ) and DOE NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500 through 1508 and 10 CFR Part 1021, respectively). Section 102 of NEPA establishes procedural requirements, applying that national policy to proposals for major Federal actions significantly affecting the quality of the human environment by requiring Federal agencies to prepare a detailed statement on (1) The environmental impact of the proposed action; (2) any adverse environmental effects that cannot be avoided; (3) alternatives to the proposed action; (4) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and (5) any irreversible and irretrievable commitments of resources that would be involved in the proposed action. The information provided in this VTR EIS (especially Chapters 3, "Affected Environment," and 4, "Environmental Consequences") has met those requirements.

62-88 Appendix E of the VTR EIS details the packaging needs for each fuel and waste types. Plutonium is transported in the DOE and DOT-certified Type B packages. Each Type B package meets the standards as discussed in Section E.3.1 of Appendix E, per the specification in the 49 CFR Part 173, Subpart I, "Class 7 (Radioactive) Materials." Type C packages are used for air transports, which is not relevant to this EIS.

62-89 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF. The impacts of feedstock preparation and fuel

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per rem to women, children and the unborn. The VTR EIS ignores the long known non-fatal cancers and severe hereditary effects associated with radiation exposure and reported by the International Commission on Radiation Protection, i.e., ICRP-60 of 1991. The VTR EIS goes further – and ignores long known acute fatality rates for doses above say, 300 rem.

The dozen SL-1 emergency responders that were honored by DOE and said to have doses less than 25 rem, were noted by various observers to have all died of cancer within about 10 years. Their actual doses were likely higher than admitted to. **Even so, the VTR EIS statement, more than once, to say that 1000 rem would not cause cancer relates to misapplication of their own cancer per rem approach, whether due to sloppiness or deliberate deceptiveness.**

On page D-11, the VTR EIS states that the probability coefficients for determining the likelihood of fatal cancer, given a dose, are taken from the *1990 Recommendations of the International Commission on Radiological Protection* (ICRP 1991) and DOE guidance (DOE 2004b). For low doses or low dose rates, probability coefficients of 6.0×10^{-4} fatal cancers per rem and person-rem are applied for workers and the general public, respectively (DOE 2003). For cases where the individual dose would be equal to or greater than 20 rem, the LCF risk is doubled (NCRP 1993).

So, mathematically, 6.0E-4 fatal cancer per rem times 2 is 12.0E-4 fatal cancers per rem. And 1000 times 12.0E-4 is 1.2 (and the MEI is one person, so this is assumed to be a probability near one). I guess this was the reasoning for **the statement in the VTR EIS that "Unless the exposure is quite high (~ 1000 rem), the expected LCF [latent cancer fatalities] would be 0."** But, again, this neglects the well-known early fatality consequence of impending death for doses above 300 rem and death, within hours, of receiving 1000 rem. The VTR reactor accident dose to the MEI is acknowledged to be mostly the early dose rather than a later chronic ingestion dose. ***62-100 cont'd***

Also note that the VTR EIS admits that the fuel feedstock and fuel fabrication risks are so high as to be about equivalent to that of a commercial light-water-reactor (LWR) accident, when located at the Oak Ridge National Laboratory, due to the larger nearby population. See Appendix D, page D-80, Table D-35 and fuel feedstock and fabrication accidents summarized in Table D-31. These tables focus on estimated average doses to the overall population and do not reflect that the contamination from these operational accidents would be economically devastating even when the stated population latent-cancer-fatality (LCF) risk is low. There are so many ways to have a significant accident not involving the reactor, which have rather high likelihoods, that at least one significant accident involving VTR fuel feedstock or fuel fabrication can be expected. ***62-101***

Either a severe accident involving the VTR reactor or an accident involving the radiological contamination from any of a variety of VTR fuel feedstock and fuel fabrication accidents may also involve agriculture interdiction, loss of market for agricultural products, loss of tourism, loss of property values, contaminated automobiles, and so forth. This would be true even for accidents with fewer predicted immediate fatalities and fewer predicted cancers than the beyond-design-basis VTR reactor accident.

The VTR EIS ignores the reality of the consequences to citizens of southeast Idaho in order to grease the wheels for hoped-for profits for aspiring reactor builders.

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fabrication are analyzed in this VTR EIS. The Surplus Plutonium Disposition Program is outside the scope of this VTR EIS.

62-90 Transuranic wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for disposal at the WIPP in New Mexico. If the DOE defense plutonium were used to produce VTR driver fuel, the transuranic waste generated as part of the reactor fuel production options would meet the criterion of being defense related. The WIPP Land Withdrawal Act (LWA) (P.L. 102-579 as amended by P.L., 104-201) requires waste disposed at WIPP to (1) meet the definition of "transuranic waste" (WIPP LWA Section 2(18)) and (2) be generated by atomic energy defense activities (WIPP LWA Section 2(19)). Additionally, waste must meet the WIPP LWA, WIPP Hazardous Waste Facility Permit, WIPP waste acceptance criteria, and other applicable requirements. Compliance with these requirements may be demonstrated by acceptable knowledge, non-destructive assay, and other established methods. The waste stream must comply with the WIPP Waste Acceptance Criteria and the WIPP Permit Waste Analysis Plan by passing a transuranic waste certification audit, an inspection by the U.S. Environmental Protection Agency, and New Mexico Environment Department (NMED) approval of the final audit report.

The WIPP LWA stipulates that the transuranic waste capacity of the WIPP facility is a total transuranic waste volume capacity limit of 175,600 cubic meters (6.2 million cubic feet). As of April 3, 2021, the WIPP facility has disposed of 70,115 cubic meters of transuranic waste. This transuranic waste disposal volume is about 40 percent of the total TRU waste volume allowed by Public Law 102-579 as amended by Public Law 104-201. TRU waste volume estimates such as those provided in NEPA documents, are not intended to demonstrate compliance with the WIPP Land Withdrawal Act TRU waste volume capacity limit. TRU waste volumes projected in NEPA documents will be incorporated, as appropriate, into future ATWIR [Annual Transuranic Waste Inventory Report] TRU waste inventory estimates.

The Department is conducting preliminary planning to evaluate options to be able to continue uninterrupted transuranic waste disposal operations up to the total transuranic waste volume capacity limit. Additional transuranic waste disposal panels that would provide capacity to dispose of transuranic waste up to the WIPP LWA total transuranic waste volume capacity limit may be authorized under a future permit modification. The WIPP Permit, consistent with Resource Conservation Recovery Act regulations at 40 CFR 270.42, can be modified by submittal of a Permit

The DOE/EIS-0200 includes estimates of transuranic waste drum accidents, estimating such accidents to be about as frequent as 1 in 10,000 years or 1.0E-4/yr. Yet the Department of Energy has had two accidents in the last 5 years that were supposed to be 1 in 10,000 years or less. Does this say something about the DOE's accident likelihood estimates? (See the WIPP accident and 4-drum expulsion of waste at the INL)

The DOE/EIS-0200 actually includes radiation induced genetic effects in Table 8.4-7. The hazard of radiation induced genetic effects isn't new, yet the VTR EIS excludes them from consideration. In fact, the range of doses that the public will be bathed in over the long term and just how long, how many years were considered in the "long-term" population doses leaves much to the imagination as it is not explained. **62-102**

Regarding transuranic waste storage outdoors, the accident scenario developed for a remote-handled 55-gallon drum (described in Section D.3.2.2) uses the assumption that the airborne release factor (ARF) can be low, 6.0E-3, and the respirable fraction can be 0.01. There are numerous ways that the TRU waste drum or standard waste box scenario may yield a higher release. The VTR EIS must consider how easily americium-241 is shielded and may not be properly estimated inside a container. The VTR EIS must consider overloading, above stated assumed disposal requirements for WIPP. Americium-241 is rather easily shielded due to its low energy gamma ray and other plutonium and transuranic radionuclides, with primarily alpha emission, are exceedingly difficult to detect once placed in a container. Overloaded containers destined for WIPP as packaged by the Department of Energy may actually be the rule more than the exception. It must explain why it considers that WIPP will accept the waste from this commercial reactor research venture, why only a single remote-handled drum is considered, why an overloaded contact-handled 55-gallon drum or a standard waste box was not considered, why multiple containers were not included in the scenario, why pyrophoric radionuclides or chemicals were assumed to be excluded from the waste, and why nitrates were not assumed to be present in the TRU waste container. It would seem that the number of containers involved, the possibility of higher than regulatory limits of plutonium-americium are present and the presence of materials that increase the radiological release, such as increased airborne-release-factor (ARF) and respirable fraction (RF) have not been considered. It is not justified why the VTR EIS thought the TRU waste drum accident scenario was bounding. The Department of Energy has, in recent years, had multiple instances of loading prohibited materials and incompatible chemicals and higher than allowed amounts of radioactive waste into containers. The Department of Energy has had multiple instances of inadequate fire protection measures, fire protection procedures and fire protection emergency response. See the 2014 WIPP accident and the 2018 INL four waste drum overpressurization event that caused four drums to forcefully pop their lids and expel transuranic waste, due to loading prohibited and incompatible materials into transuranic waste drums destined for the Waste Isolation Pilot Plant (WIPP) in New Mexico. **62-103**

Infertility and Other Adverse Effects of Neutron Dose Ignored by VTR EIS **62-104**

Neutron exposures can occur despite the absence of an operating nuclear reactor. Radiation workers who work near radioactive materials such as uranium, plutonium, curium, californium and other fissile or fissionable materials can receive neutron exposures. Hot cell, glove box and **62-105**

Modification Request (PMR) and decision by NMED to approve the PMR. Both Class 2 and Class 3 PMRs include a public comment period as a step in the regulatory process. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD. Also, please refer to the response to comment 62-15.

62-91 Please refer to the response to comment 62-15.

62-92 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF. Comments on the adequacy of waste disposal regulations and guidance are outside the scope of this VTR EIS. For information on spent fuel storage and disposal, please see Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

62-93 The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. VTR SNF is expected to be compatible with the acceptance criteria for any interim storage facility or permanent repository. Please refer to the response to comment 62-15.

62-94 Chapter 1, Section 1.3, of this VTR EIS describes the purpose and need for the VTR and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF. Comments related to the HLW interpretation are outside the scope of the VTR EIS. DOE has and will continue to provide briefings to stakeholders, as requested. DOE is transparent in its actions related to the HLW interpretation – information can be found at https://www.energy.gov/em/program-scope/high-level-radioactive-waste-hlw-interpretation.

62-95 This VTR EIS appropriately describes and evaluates the activities that would be performed as part of the VTR project in Chapters 2 and 4. Based on the commenters other comments, it is assumed that the referenced EISs deal with spent nuclear fuel

Commenter No. 62 (cont'd): Tami Thatcher

waste containers, as well as fissile material handling can involve neutron doses which are often inadequately monitored and their harm may be underestimated.

Oddly, neutrons ejected from the spontaneous fission of the materials are not shielded by thick metal. To shield fission neutrons, materials rich in hydrogen are used, including water, concrete, and paraffin.

The human body is a great neutron sponge. Each collision with a hydrogen causes the neutron to change direction. This is repeated until the neutron runs out of energy. The damage from neutron exposure is very effective at creating double strand DNA breaks.

Special monitoring is needed in order to estimate neutron exposure. And even if conducted, a worker may not be told what portion of their radiation dose is from neutron exposure. Additionally, the placement of the source of the neutrons in relation to the person's gonads (ovaries or testes) may be causing a larger gonad dose than implied by the whole body averaged dose that is communicated to workers.

Metal jock strap? Lead apron? Sorry. These can lower gamma radiation but they are not effective against densely ionizing high linear-energy transfer (high LET) neutron dose. The double-strand DNA breaks from neutron exposure are more complex and less repairable than from more sparsely ionizing gamma radiation. [78]

How much do these radiation workers know about the non-cancer health effects of neutron exposure? According to a working group considering neutron exposure, "studies of human exposure to neutron radiation are extremely limited" and the neutron radiation component of the A-bomb dose reconstruction for Hiroshima and Nagasaki was at most 1 percent of the total absorbed radiation dose. Using experimental data, it is assumed that the relative biological effectiveness (RBE) of the A-bomb neutrons is 10 times greater than that of gamma radiation. But other experts think the RBE may be higher, in the range of 20-50. [79]

Furthermore, IARC documents that in experiments with mice, neutron exposure clearly increased the incidence in:

- Myeloid leukemia and malignant lymphoma including thymic lymphoma
- Benign and malignant tumors of the lung and the mammary gland
- Benign and malignant tumors of the ovary
- Benign and malignant tumors of the liver
- Benign and malignant tumors of the Harderian gland
- Tumors of the pituitary and adrenal gland.

62-105 cont'd

[78] Agnes Schipler and George Iliakis, Nucleic Acids Res., "DNA double-strand-break complexity levels and their possible contributions to the probability for error-prone processing and repair pathway choice," Published online 2013 Jun 25. doi: 10.1093/nar/gkt556 or https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3763544/

[79] International Agency for Research on Cancer, 2012 https://www.ncbi.nlm.nih.gov/books/NBK304359/

and waste management. Please refer to the response to comment 62-12 and the discussion in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD. The management of existing spent nuclear fuel or high-level radioactive waste (HLW) and comments related to the HLW interpretation are outside the scope of the VTR EIS.

62-96 Please refer to the response to comment 62-15. As noted in that response, all radioactive waste generated by the VTR project would be sent off site for disposal. Other subject included in this comment (e.g., waste disposal at the INL Site, performance assessments, waste categorization) are outside the scope of this VTR EIS.

62-97 Please refer to the response to comment 62-84. As indicated there, Chapter 1, Section 1.6, identifies other NEPA documents that have some nexus with the VTR project, but that does not mean that the project is necessarily dependent on them. The commenter calls out two specific EISs in the comment. DOE/EIS-200 addressed waste management and was the NEPA analysis that supported programmatic decisions regarding waste management and disposal across the DOE complex. Disposal of VTR project waste would occur within the context of and consistent with those decisions. DOE/EIS203 addressed management of SNF across the DOE complex and waste management and environmental restoration activities at the INL Site. The VTR project would operate within the general framework for SNF management established by the records of decision following preparation of that EIS. Please see Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

62-98 The INL Site environmental surveillance programs collect and analyze samples or direct measurements of air, water, soil, biota, and agricultural products from the INL Site and offsite locations in accordance with DOE Order 458.1, "Radiation Protection of the Public and the Environment, Radiation Protection of the Public and the Environment"; DOE-HDBK-1216-2015, "Environmental Radiological Effluent Monitoring and Environmental Surveillance"; and DOE-STD-1196-2011, "Derived Concentration Technical Standard." The purpose of DOE Order 458.1 is to establish requirements to protect the public and the environment against undue risk from radiation associated with radiological activities conducted under the control of DOE pursuant to the Atomic Energy Act of 1954, as amended. Monitoring activities are performed to generate measurement-based estimates of the amounts or concentrations of contaminants in the environment. Measurements are performed by sampling and laboratory analysis or by "in place" measurement of contaminants

The IARC studies also show that neutrons were also tested for carcinogenicity in mice exposed prenatally, and in mice after male parental exposure. In adult animals, the incidences of leukemia and of ovarian, mammary, lung and liver tumors were increased in a dose-related manner, although the incidence often decreased at high doses. **Prenatal and parental exposure of mice resulted in increased incidences of liver tumors in the offspring** (IARC, 2000).

So, knowing your neutron exposure is important. And both the dose and the harm may be higher than the whole-body dose estimate reported to workers at Department of Energy sites.

Metal does not shield neutrons. To illustrate this point, dose reconstructions showed that spent fuel storage casks at the Idaho National Laboratory in the 1980s at Test Area North had dose rates of about 30 mrem/hr gamma and 40 mrem/hr neutron. [80] The metal cask attenuates the gamma radiation, but does not appreciably affect the neutron field. According to a NIOSH report, neutron radiation levels were discovered in the nearby offices where people were not monitored for neutron dose. Each of three casks were in the area of the offices for two weeks.

The Materials Test Reactor at the Test Reactor Area (now the ATR Complex) had neutron beam ports. There would seem to have been potential for unmonitored neutron dose inside and outside the facility. The Test Reactor Area also had TRA-635 with Californium-252 and the TRA Hot Cell Cave with Cf-252 on filters. (See ORAUT-TKBS-0007-6, Table 6-11 for a listing of some INL areas with potential neutron exposure.)

So, even if you did not work at a glove box or near drums of transuranic waste, you still may have gotten more neutron exposure than you realized.

62-105 cont'd

Spontaneous fission neutron yields for various radionuclides are shown in Table 2 based on N. Ensslin's Table 11-1. [81] The neutrons are emitted at various energies, not shown. Notice the range of neutron spontaneous fission yield is very for californium-252, curium-242 and -244 and plutonium-238, -240 and -242. And note the extraordinarily high curium neutron yields. Curium in the VTR SNF will be more releasable in an accident, according to the VTR EIS. But additional neutron harm VTR operations may impose adverse health impacts beyond cancer fatality, the only health effect the VTR EIS has included.

62-106

[80] National Institute for Occupations Safety and Health at cdc.gov, ORAU TEAM Dose Reconstruction Project for NIOSH, "Idaho National Laboratory and Argonne National Laboratory-West Occupational External Dosimetry, ORAUT-TKBS-0007-6, 2011. https://www.cdc.gov/niosh/ocas/pdfs/tbd/inl-anlw6-r3.pdf Section 6.3.4.2.3 Test Area North Fuel Storage Casks.

[81] N. Ensslin, Chapter 11. The Origin of Neutron Radiation, https://fas.org/sgp/othergov/doe/lanl/lib-www/la-pubs/00326406.pdf

62-105 cont'd

62-106 cont'd

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in environmental media. The INL Site environmental surveillance programs meet or exceed requirements within these governing documents and have been determined through technical review to effectively characterize levels and extent of radiological constituents in the environment and distinguish INL Site-related contributions from those typically found in the environment at background levels. The Annual Site Environmental Report (ASER) describes the quality assurance program to ensure validity of results from the environmental surveillance programs. Quality assurance is an integral part of every aspect of an environmental monitoring program, from the reliability of sample collection through sample transport, storage, processing, and measurement, to calculating results and formulating the report. Monitoring performed by the INL Management and Operations (M&O) contractor; the Idaho Cleanup Project Core contractor; the INL Environmental Surveillance, Education, and Research (ESER) Program contractor (independent from the M&O contractor); and the Idaho Department of Environmental Quality (DEQ) INL Oversight Program demonstrate that impacts from the INL are low and consistent with the emissions reported in annual INL radionuclide National Emission Standards for Hazardous Air Pollutants (NESHAP) reports. DOE contractors' ambient air monitoring data are reported annually in the ASER which are available at http://idahoeser.com/Publications.html. DEQ's INL Oversight Program Annual Reports are available at DEQ's INL Oversight Monitoring Program website (https://www.deq.idaho.gov/idaho-national-laboratory-oversight/inl-oversight-program/).

62-99 Chapter 1, Section 1.3, of this VTR EIS, describes the purpose and need for the VTR, and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing SNF. DOE and commercial waste disposal facilities would be operated in compliance with all applicable regulations, permits, and licenses. Comments on the ability of waste disposal facilities to limit the migration of contaminants are outside the scope of this VTR EIS. For information on spent fuel storage and disposal, please see Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

62-100 The dose-to-consequence factor (0.0006 LCFs per rem or person-rem) does not underestimate cancer fatality risks, contrary to the commenter's statement. According to the Interagency Steering Committee on Radiation Standards (ISCORS), this conversion factor closely approximates the mortality rate for external exposures

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62-106 cont'd

Table 2. Spontaneous fission neutron yields.

Isotope A	Number of Protons Z	Number of Neutrons N	Total Half-Life	Spontaneous Fission Half-Life (yr)	Spontaneous Fission Yield (n/s-g)	Spontaneous Fission Multiplicity V	Induced Thermal Fission Multiplicity V
Th-232	90	142	1.41 E10yr	<1 E21	< 6 E-8	2.14	1.9
U-232	92	140	71.7 yr	8 E13	1.3	1.71	3.13
U-233	92	141	1.59 E5 yr	1.2 E17	8.6 E-4	1.76	2.4
U-234	92	142	2.45 E5 yr	2.1 E16	5.02 E-3	1.81	2.4
U-235	92	143	7.04 E8 yr	3.5 E17	2.99 E-4	1.86	2.41
U-236	92	144	2.34 E7 yr	1.95 E16	5.49 E-3	1.91	2.2
U-238	92	146	4.47 E9 yr	8.20 E15	1.36 E-2	2.01	2.3
Np-237	93	144	2.14 E6 yr	1.0 E18	1.14 E-4	2.05	2.70
Pu-238	94	144	87.74 yr	4.77 E10	2.59 E3	2.21	2.9
Pu-239	94	145	2.41 E4 yr	5.48 E15	2.18 E-2	2.16	2.88
Pu-240	94	146	6.56 E3 yr	1.16 E11	1.02 E3	2.16	2.8
Pu-241	94	147	14.35 yr	(2.5 E15)	(5 E-2)	2.25	2.8
Pu-242	94	148	3.76 E5 yr	6.84 E10	1.72 E3	2.15	2.81
Am-241	95	146	433.6 yr	1.05 E14	1.18	3.22	3.09
Cm-242	96	146	163 days	6.56 E6	2.10 E7	2.54	3.44
Cm-244	96	148	18.1 yr	1.35 E7	1.08 E7	2.72	3.46
Bk-249	97	152	320 days	1.90 E9	1.0 E5	3.40	3.7
Cf-252	98	154	2.646 yr	85.5	2.34 E12	3.757	4.06

a. Data source: N. Ensslin, Chapter 11, The Origin of Neutron Radiation, Table 11-1. https://fas.org/sgp/othergov/doe/lanl/lib-www/la-pubs/00326406.pdf
b. Units for fission yield neutron/(second-gram); fission multiplicity Greek letter v, represents the number of neutrons emitted per spontaneous fission.
c. Units for spontaneous fission yield (n/s-g), neutrons/(second – gram).
d. The average energies are from 4 to 6 MeV (mega electron volts) (see Table 11-3 from N. Ensslin.)

VTR EIS IGNORING UPWARD SPIRAL OF INL RADIOLOGICAL EMISSIONS

62-107

From new reactors, to high-assay low-enriched fuel processing, to unfettered radiological releases from INL's new test range, radiological emissions have now gone up by a factor of 170, see Table 3.

The EA ignores many the ongoing radiological releases including the decision by the U.S. Department of Energy to allow the DOE to release long-lived radionuclides to air and soil at the Idaho National Laboratory, from the Expanding Capabilities at the National Security Test Range and the Radiological Response Training Range at Idaho National Laboratory (DOE/EA-2063) at

and generally provides a high sided estimation of risk from internal doses (ISCORS 2002). Additionally, this conversion factor was developed for a population with characteristics consistent with the population of the United States; it therefore considers the higher risk per rem to women and children. With regard to radiation exposure to a developing child in utero, the Centers for Disease Control and Prevention (CDC) states that a dose equivalent to 500 chest x-rays, the equivalent of 5 rem (the dose from a single chest x-ray is about 10 millirem), would increase the lifetime risk of cancer for that child by about 2 percent (CDC 2011). The CDC does not identify any non-cancer health effects from doses of less than 10 rad to the embryo or fetus (CDC 2019). The estimated annual exposure to any individual member of the public from any of the VTR normal operation activities would be much less than 10 rad. Under all VTR alternatives and fuel production options, the estimated maximum dose to any individual member of the public is much less than 1 millirem. This EIS (as is common practice in DOE EISs that include alternatives with potential radiological impacts) uses population and maximally exposed individual dose and latent cancer fatality as the measure of health impacts on the public. DOE recognizes that these are not the only potential impacts from radiation exposure. As the commenter notes, cancer incidence is also an impact, and the morbidity rate is higher than the mortality rate. The mortality rate used by DOE when making estimates of risk uses a conversion factor of 6×10^{-4} (the conversion factor used in this EIS), while the morbidity conversion factor suggested for use is 8×10^{4}. Consistent use of the cancer mortality rates across all alternatives and fuel production options allows for an assessment of the differences in impacts between the alternatives. Adding the morbidity rate to the assessment would not add to the ability to differentiate between alternative impacts.

DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. The accident analysis was conducted using the MELCOR Accident Consequence Code System, Generation 2 (MACCS2) computer program/code (WinMACCS, Version 3.11.2) to model accident conditions. MACCS2 was used to calculate radiation doses and health risks to the noninvolved worker, the maximally exposed offsite individual, and the population within 50 miles of the release point.

Table 3. Estimated annual air pathway dose (mrem) to Idaho communities from normal operations to the maximally exposed offsite individual from proposed projects, including the estimated dose from expanding capabilities at the Ranges based on DOE/EA-2063.

Current and Reasonably Foreseeable Future Action	Estimated Annual Air Pathway Dose (mrem)
National Security Test Range	0.04[e]
Radiological Response Training Range (North Test Range)	0.048[d]
Radiological Response Training Range (South Test Range)	0.00034[a]
HALEU Fuel Production (DOE-ID, 2019)	1.6[a]
Integrated Waste Treatment Unit (ICP/EXT-05-01116)	0.0746[h]
New DOE Remote-Handled LLW Disposal Facility (DOE/ID 2018)	0.0074[a]
Recapitalization of Infrastructure Supporting Naval Spent Nuclear Fuel Handling (DOE/EIS 2016)	0.0006[c]
TREAT (DOE/EA 2014)	0.0011[a]
DOE Idaho Spent Fuel Facility (NRC, 2004)	0.000063[a]
Plutonium-238 Production for Radioisotope Power Systems (DOE/EIS 2013)	0.00000026[b]
Total of Reasonably Foreseeable Future Actions on the INL Site	1.77[g]
Current (2018) Annual Estimated INL Emissions (DOE2019a)	0.0102[f]
Total of Current and Reasonably Foreseeable Future Actions on the INL Site [**DOE WOULD INCREASE INL'S AIRBORNE RELEASES BY OVER 170 TIMES**]	1.78[g]

Table notes:
a. Dose calculated at Frenchman's Cabin, typically INL's MEI for annual NESHAP evaluation.
b. Receptor location is not clear. Conservatively assumed at Frenchman's Cabin.
c. Dose calculated at INL boundary northwest of Naval Reactor Facility. Dose at Frenchman' Cabin likely much lower.
d. Dose calculated at INL boundary northeast of Specific Manufacturing Capability. Dose at Frenchman's Cabin likely much lower.
e. Sum of doses from New Explosive Test Area and Radiological Training Pad calculated at separate locations northeast of MFC near Mud Lake. **Dose at Frenchman's Cabin likely much lower. PLEASE NOTE THAT THE PUBLIC AT MUD LAKE IS CLOSER TO THE RELEASE THAN TO FRENCHMAN'S CABIN.**
f. Dose at MEI location (Frenchman's Cabin) from 2018 INL emissions (DOE 2019a). The 10-year (2008 through 2017) average dose is 0.05 mrem/year.
PLEASE NOTE THAT MANY RADIOLOGICAL RELEASES ARE IGNORED AND NOT INCLUDED IN THE RELEASE ESTIMATES IN NESHAPS REPORTING.
g. This total represents air impact from current and reasonably foreseeable future actions at INL. It conservatively assumes the dose from each facility was calculated at the same location (Frenchman's Cabin), which they were not.
h. Receptor location unknown, according to the Department of Energy, the agency that is supposed to know the receptor location.

62-107 cont'd

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The standard MACCS2 dose library was used. This library is based on Cancer Risk Coefficients for Environmental Exposure to Radionuclides: Federal Guidance Report 13 inhalation dose conversion factors. Dose based consequences of the proposed action, as detailed in the EIS, are derived from the Annals of the ICRP; Publication 103, The 2007 Recommendations of the International Commission or Radiological Protection, and in consideration of the latest available scientific information of the biology and physics of radiation exposure.

Appendix D was revised to remove the sentence that includes the reference to the 1,000 rem dose. The statement was being interpreted differently than was intended. The EIS does not ignore acute fatality rates. For a discussion of the prompt fatality risks, refer to Appendix D, Section D.4.9.7.

62-101 The comment stating "that the fuel feedstock and fuel fabrication risks are so high as to be about equivalent to that of a commercial light-water-reactor (LWR) accident, when located at the Oak Ridge National Laboratory [ORNL], due to the larger nearby population" is not accurate. Fuel feedstock and fuel fabrication activities would not occur at ORNL, only at the Savannah River Site and/or INL. Table D–31 indicates the total risk of fuel production operations at SRS is 1×10^{-5} annual LCF risk while Table D–80 indicates the mean risk of NRC LWRs with evacuation as 2×10^{-2}. Thus the annual risk of VTR fuel production at SRS are about a factor of 2,000 lower than mean LWR risks.

Table D–31 indicates the total risk of reactor and support operations at ORNL is 1×10^{-4} annual LCF risk while Table D–80 indicates the mean risk of NRC LWRs with evacuation as 2×10^{-2}. Thus the annual risk of VTR operations at ORNL are about a factor of 200 lower than mean LWR risks.

As indicated in footnote "d" of Table D–31, the cited long-term impacts include doses due to radiological exposures over a longer period after the plume passes. These doses include ingestion of contaminated foods, water, etc., direct exposure to deposited materials, and resuspension and inhalation of deposited materials. For purposes of the EIS, no interdiction or mitigation is assumed, but such measures would likely occur. The long-term risk reported includes both the near-term and long-term impacts without mitigation. Please note that the cited NRC LWR severe accident risks do assume evacuation and mitigation of the impacts, which substantially reduces the long-term impacts.

The DOE safety process uses a prescribed method to calculate impacts and establish safety controls that limit potential radiological impacts on the receptors. Consequences for receptors as a result of plume passage are determined without

Commenter No. 62 (cont'd): Tami Thatcher

The VTR EIS Must Include More Comprehensive Listing of Radionuclides, To Facilitate Environmental Monitoring and for Radionuclide Migration Studies

62-108

The VTR EIS has left out of Table D-43, the 4-year cooled VTR fuel, many of the radionuclides that can dominate waste disposal, even if not deemed to dominate accident releases in the near-term. The VTR EIS needs to include these radionuclides, especially because these VTR wastes may never leave Idaho for permanent disposal elsewhere.

Table 4. A list of radionuclides that tend to dominate radioactive waste disposal hazard.

Radionuclide	Half-Life (Primary decay mode)	Typical Decay Progeny	Drinking Water Federal Maximum Contaminant Level (MCL)	Waste Leaching Parameter Kd (m^3/kg): (Possible radionuclide origin)
High activity fission products				
Cesium-137	30.2 year (beta)	Barium-137m	160 pCi/L	Kd: screening value 5 Rood for Hanford
Strontium-90	29.1 year (beta)	Yttrium-90	8 pCi/L	Kd: screening 0.1 by Rood Kd: 0.001 to 0.006 in an NRC review of an INL study
Long-lived fission products				
Iodine-129	17 million yr (beta, gamma)		1 pCi/L	Kd: 0.3 to 15 by Rood Kd: 0.002 to 0.03 NRC review Kd: 0 to 3 in INL study for RHLLW
Technetium-99	213,000 year (beta)		900 pCi/L	Kd: screening 78.1 Rood Kd: 0.001 to 5 depending on concrete or grout mixed with it, NRC Kd: 0 to .1 RHLLW
Selenium-79	65,000 year (beta)		? (Se-75 is 900 pCi/L)	Kd: ?
Cesium-135	2.3 million yr (beta)		900 pCi/L	Kd: ?
Activation Products				

regard for emergency response measures and, thus, are more conservative than would be expected if evacuation, sheltering, or other measures to reduce or prevent impacts were explicitly modeled. For purposes of this VTR EIS, the hypothetical receptors are assumed to be unaware of the accident and to remain in the plume for the entire passage with no emergency actions taken for protection.

Projected economic costs of severe accidents are presented in Appendix D, Section D.4.9.8, of this VTR EIS. The MACCS2 projected economic impacts are based on best-estimate engineering models as the current state of knowledge is ever changing. The MACCS2 computer program projected economic costs, including population-dependent costs, farm dependent costs, decontamination costs, interdiction costs, emergency phase costs, and milk and crop disposal costs based on local land use and economic conditions. The models projected economic costs within 50 miles for the severe accidents at INL and ORNL. The models' projected economic costs for the ORNL regions are much higher than for INL primarily due to the higher population density and the more varied land use. In any case, the long-term impacts are applied consistently between VTR alternatives and the feedstock preparation alternatives to allow a fair comparison.

62-102 Worker and public safety are DOE's highest priority, and INL workers are highly trained in performing their jobs. Education and training requirements, including those for safety and radiation protection, are commensurate with job functions. The purpose of this EIS is to assess the environmental impacts of the proposed action. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. Please refer to the response to comment 62-100.

62-103 The scenario addressed by the comment is for a fire outside involving a waste drum with 23 grams of americium-241. TRU waste containing americium-241 could be generated by fuel production operations. The waste would be placed in containers and temporarily stored (or staged) pending shipment to an offsite disposal facility. A fire is postulated to occur in a 55-gallon drum because of poor housekeeping. The accident is assumed to occur outside confinement during handling. Based on the WIPP acceptance criteria, remote-handled waste is limited to 55-gallon drums with a maximum allowed load of 80 curies or about 23 grams of americium-241.

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Radionuclide	Half-Life (Primary decay mode)	Typical Decay Progeny	Drinking Water Federal Maximum Contaminant Level (MCL)	Waste Leaching Parameter Kd (m^3/kg): (Possible radionuclide origin)
Tritium	12.3 year (weak beta)		20,000 pCi/L	Kd: 0.0, firm
Carbon-14	5730 year (beta)		2,000 pCi/L	Kd: 0.25 to 5.0 NRC Kd: 0 to 2.0, RHLLW
Chlorine-36	301,000 year (beta, EC)		700 pCi/L	Kd: 0.0, firm
Niobium-94	20,000 year (beta)		?	(RHLLW disposal exceeds Class C for Nb-94)
Nickel-59	76,000 year (beta)		300 pCi/L	(RHLLW disposal exceeds Class C for Ni-59)
Nickel-63	96 year (beta)		50 pCi/L	(RHLLW disposal exceeds Class C for Ni-63)
Zirconium-93	1.5 million yr (beta)		2000 pCi/L	?
Actinides (include thorium, protactinium, uranium, neptunium, plutonium, americium, curium, californium and others)				
Thorium-230	77,000 year (alpha)	Radium-226 Many others	15 pCi/L	Kd: 40 to 2000 Rood (Pu-238 and U-238 parent decay progeny)
Protactinium-231	33,000 year (alpha)	Radium-223 Many others	15 pCi/L	Kd: screening 0.1 Rood (Pu-239 and U-235 parent decay progeny)
Uranium-238	4,470 million yr (alpha)	Uranium-234, Thorium-230, Radium-226 Many others	10 pCi/L Total U 30 microgram/L	Kd: 0.6 to 79 Rood Kd: 1.6 to 10 RHLLW (From ore, or enrichment or reprocessing. Primary constituent of

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The ARF and RF values of 6×10^{-3} and 0.01, respectively, are the bounding values for thermal stresses to composite solids from DOE-HDBK-3010-94 and are deemed appropriate. The comment suggests there are numerous ways that could lead to a higher release. DOE has incorporated lessons learned from past events involving waste packaging. Current practices for TRU waste drum loading have multiple safety controls to ensure that WIPP limits are not exceeded. To avoid overloading a container, DOE is required to implement a system of controls to measure and track important waste components and to implement quality assurance measures to ensure the accuracy of container loading. DOE considers the characteristics of the material being loaded into a container to ensure that WIPP limits are not exceeded. DOE implements controls to assure that prohibited material such as pyrophoric material and nitrates are excluded from the waste. DOE has multiple fire protection measures, fire protection procedures, and fire protection emergency response procedures to preclude involving multiple drums in a major fire that would threaten the integrity of multiple containers. DOE is committed to maintaining adequate controls to prevent container overloading and fires that affect multiple containers.

62-104 Worker and public safety are DOE's highest priority, and INL workers are highly trained in performing their jobs. Education and training requirements, including those for safety and radiation protection, are commensurate with job functions. The purpose of this EIS is to assess the environmental impacts of the proposed action. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons.

Worker doses from neutron exposure are a component of the collective total effective dose (TED) monitored and reported by INL and DOE. (In 2007 DOE updated the models for calculating dose resulting in changes to the neutron dose assessment methodology.) Estimates of worker doses for the VTR were based on reported worker collective TEDs. Therefore, the estimate of worker dose includes a neutron dose component. Protection of workers from neutron radiation is an integral part of the design and operation of the VTR. VTR fuel would be located within either the reactor vessel (located underground and within a concrete silo) or within transfer or storage casks. The casks would be constructed with both

Commenter No. 62 (cont'd): Tami Thatcher

Radionuclide	Half-Life (Primary decay mode)	Typical Decay Progeny	Drinking Water Federal Maximum Contaminant Level (MCL)	Waste Leaching Parameter Kd (m^3/kg): (Possible radionuclide origin)
				depleted uranium.)
Uranium-234	240,000 year (alpha)	Thorium-230 Many others	Total U 30 microgram/L	Kd: (see U-238) (From ore or Pu-238 parent decay. Contributes significantly to activity despite low mass contribution)
Uranium-235 (Fissile material)	700 million yr (alpha)	Pa-231 Ra-223 Many others	Total U 30 microgram/L	Kd: (See U-238) (From ore or Pu-239 parent decay, or enrichment of fuel in fissile U-235)
Uranium-233 (Fissile material)	160,000 year (alpha)	Radium-225 Many others	Total U 30 microgram/L	Kd: (See U-238) (Reactor-made or from Pu-241, Am-241, or Np-237 parent decay)
Uranium-236	23 million yr (alpha)	Thorium-232 Many other	Total U 30 microgram/L	Kd: (See U-238) (Reactor-made or from Pu-244, Pu-240, Curium-244 (Cm-244) parent decay)
Neptunium-237	2,144 million yr (alpha)	Uranium-233 Radium-225 Many others	15 pCi/L	Kd: ? (Reactor-made or from Pu-241 or Am-241 parent decay)
Plutonium-238	88 year (alpha)	Uranium-234 Thorium-230 Radium-226 Many others	15 pCi/L	Kd: screening 0.1 Rood Kd: 22 to 1480 RHLLW (Reactor-made or from Pu-242, Am-242, Np-238 or

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high density materials for gamma and alpha radiation and low density material for neutron radiation protection. All casks would be designed to keep exposure to workers within DOE limits.

The neutron dose to workers at INL (on the order of tens of millirem) is well below levels identified as having an impact on fertility. The U.S. NRC states that doses of 25 rem can cause temporary sterility in men. While no such specific level is identified for women, the dose that could affect fertility in women is generally presumed to be higher than that for men.

62-105 Please refer to the response to comment 62-104.

62-106 Please refer to the response to comment 62-104.

62-107 It appears that this comment relates to a different NEPA document prepared by DOE, the *Final Environmental Assessment for Expanding Capabilities at the National Security Test Range and the Radiological Response Training Range at Idaho National Laboratory* (DOE/EA-2063). The factor of 170 calculated by the commenter reflects an increase in the annual dose from current operations (0.102 millirem to the maximally exposed individual) to a cumulative dose from current operations plus all reasonably foreseeable future actions. The foreseeable future actions include actions that may or may not ultimately happen at the INL Site. The VTR EIS has a similar cumulative impact assessment, which is presented in Chapter 5, Section 5.3.10. The results of the assessment in this EIS are similar. The commenter's factor of 170 is roughly accurate for the cumulative impacts assessment of the VTR EIS. But even with this increase from cumulative actions, the dose to the maximally exposed individual is less than 2 millirem. This is well below any regulatory limits for dose to an offsite individual (10 millirem is the dose limit [40 CFR Part 61, Subpart H] for airborne releases from a DOE facility).

62-108 The VTR radiological waste would be disposed in the same manner as current wastes. As stated in the EIS, Chapter 4, Section 4.9, "Wastes would be managed within the current waste management systems and sent off site for treatment and/or disposal." The VTR project fully intends to ship all radioactive waste to offsite disposal facilities. The failure to carry out an intended action of any of the alternatives is not required to be evaluated in the EIS. Sufficient information has been provided in the EIS to assess the impacts of handling, shipping, and disposing all waste; a full listing of the isotopic content of the waste is not required. Since the waste have been determined to be within the acceptance criteria of the appropriate waste disposal sites and would not result in the site exceeding capacity limits, disposal at these sites does not result in impacts beyond those previously analyzed.

Commenter No. 62 (cont'd): Tami Thatcher

Radionuclide	Half-Life (Primary decay mode)	Typical Decay Progeny	Drinking Water Federal Maximum Contaminant Level (MCL)	Waste Leaching Parameter Kd (m^3/kg): (Possible radionuclide origin)
				Cm-242 parent decay)
Plutonium-239 (Fissile material)	24,000 year (alpha)	Uranium-235 Many others	15 pCi/L	Kd: screening 0.1 Rood Kd: 22 to 1480 RHLLW (Reactor-made or from Curium-237, Pu-243, Am-243, Np-239 or Cm-243 parent decay)
Plutonium-240	6,500 year (alpha)	Uranium-236 Many others	15 pCi/L	Kd: (See Pu-239) Reactor-made or from curium-248 or 244 parent decay)
Plutonium-241	14.4 year (beta)	Americium-241 Neptunium-237 Uranium-233 Many others	300 pCi/L	Kd: (See Pu-239) (Reactor-made) Erroneously ignored in classifying transuranics because it is a beta emitter rather than an alpha emitter.
Plutonium-242	380,000 year (alpha)	Uranium-238 Many others	15 pCi/L	Kd: (See Pu-239) (Reactor-made or from Cm-246 decay)
Curium-242	0.45 year (alpha)	Plutonium-238 Uranium-234 Many others	15 pCi/L	Kd: (See Pu-239) (Reactor-made, target irradiation) Short half-life has been erroneously used to ignore its transuranic decay product, Pu-238.
Curium-244	18 year (alpha)	Plutonium-240 Uranium-236 Many others	15 pCi/L	Kd: (See Pu-239) (Reactor-made, target irradiation)

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Commenter No. 62 (cont'd): Tami Thatcher

Radionuclide	Half-Life (Primary decay mode)	Typical Decay Progeny	Drinking Water Federal Maximum Contaminant Level (MCL)	Waste Leaching Parameter Kd (m^3/kg): (Possible radionuclide origin)
				Short half-life has been erroneously used to ignore its transuranic decay product, Pu-240.
Americium-241	430 year (alpha)	Neptunium-237 Uranium-233 Many others	15 pCi/L	Kd: (See Pu-239) (Reactor-made or from Pu-241 parent decay)
Radium-226	1600 year (alpha)	Radon-222 Many others	5 pCi/L for radium-226 and radium-228 combined	Kd: 8 to 173 Rood (From Pu-238, U-238, U-234 parent decay)
Radium-228	5.75 year (beta)	Thorium-228 Radium-224 Many others	5 pCi/L for radium-226 and radium-228 combined	Kd: ? (From Pu-240, U-236, or Th-232 parent decay)

Table notes: Table only highlights the dominant decay mode, selected decay progeny, and selected parent progeny and is not exhaustive. Not all fission products, activation products or actinides have been included in the table. Dominant radionuclides highlighted are from spent nuclear fuel repository studies and from a few DOE low-level waste disposal studies and will differ according to the wastes disposed of and the characteristics that allow migration of radionuclides over time. Picocurie/liter (pCi/L), Kd in milliliter per gram.

The parameter Kd in cubic meters per kilogram strongly influences the prediction of waste migration into groundwater. A wide range of values have been used in various studies for the DOE. Kd values are often not only inconsistent, they are selected without adequate technical basis. Zero (0.0) is the most mobile with water infiltration to groundwater.

Arthur Rood, K-Spar Inc, Scientific Consulting, Submitted to Washington State Health Department, "Final Report Groundwater Concentrations and Drinking Water Doses with Uncertainty for the U.S. Ecology Low-Level Radioactive Waste Disposal Facility, Richland Washington," February 2004. https://www.doh.wa.gov/Portals/1/Documents/Pubs/320-031_appIV_w.pdf

U.S. Nuclear Regulatory Commission Technical Evaluation Report for the U.S. Department of Energy Idaho National Laboratory Site Draft Section 3116 Waste Determination for Idaho Nuclear Technology and Engineering Center Tank Farm Facility, October 2006. https://www.nrc.gov/docs/ML0624/ML062490142.pdf

Idaho National Laboratory, "Evaluation of Groundwater Impacts to Support the Natural Environmental Policy Act Environmental Assessment for the INL Remote-Handled Low-Level Waste Disposal Project," INL/EXT-10-19168, Rev. 3, August 2011. Tables 4 and 9.

Regarding waste classification errors for plutonium-241, curium-242 and curium-244, see IEER.ORG publication, *Science for Democratic Action*, "The Curious Case of Curium-242, Curium-244 and Plutonium-241," Volume 6, Number 1, May 1997.

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Commenter No. 62 (cont'd): Tami Thatcher

Understanding the decay series of natural uranium and thorium, as well as for transuranic radionuclides is very important in understanding the hazard. The uranium-238 and uranium-235 decay series are commonly found, but the decay series for plutonium and for man-made uranium-233 are not so commonly found. So frequent are conceptions about these radionuclides that I am including simple tables to show the decay series.

Four decay series are presented in Tables 5 through 8 below:

the uranium-238 decay series known as the uranium series;

the thorium-232 decay series known as the thorium series;

the uranium-235 decay series known as the actinium series, and

the uranium-233 decay series which is man-made and remains officially nameless.

I have included these decay series tables here for three reasons: (1) unless you have a degree in radiochemistry, you need to have the names of the nuclides spelled out along with their short-hand symbol identifier (such as U, Pu, Np), (2) it is difficult to locate decay series that are complete with man-made decay chains feeding in, and (3) it is important to understand the specific decay series that a radionuclide belongs to as you study drinking water, lung count results and environmental radionuclide emissions data.

62-109 These decay series show the man-made actinides that may also decay through the same series in grey. The decay series depict alpha decay as progressing downward and reducing the atomic mass by 4. Beta decay by electron emission is depicted as progressing upward diagonally to the right. Beta decay flips a neutron into a proton and stays at the same atomic mass. Isotopes of the same chemical element have the same number of protons but can have variable numbers of neutrons and variable atomic mass. The half-lives of the various radionuclides range from millions or billions of years to milli-seconds.

Along with alpha and beta decays at various energy levels, gamma photon emissions of various energy levels can also occur which can be detected by gamma spectrometry.

So, while uranium, thorium and plutonium are thought of primarily as alpha particle emitters, gamma radiation is also emitted and decay progeny may emit beta particles rather than alpha particles along with gamma radiation at various energy levels measured in kiloelectron volts (keV).

Weak or low energy gamma emissions require less shielding than higher energy gamma emissions. Uranium decay progeny of Th-231, Th-234 and Pa-234, all beta emitters, have high specific activity in curies per gram that require some protection of workers.

Sources of uranium-238 include natural soil and rock sources, mill tailings, depleted uranium, reactor fuel melting from reactor accidents, and spent fuel reprocessing. Sources of uranium-234 decay progeny can include man-made plutonium-238 that is present in various materials and processes at the INL.

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62-109 Thank you for presenting the discussion on the radioactive decay chains. Each regulated INL Site facility determines airborne effluent concentrations from its regulated emission sources as required under State and Federal regulations. Ambient air monitoring performed by the INL M&O contractor; the Idaho Cleanup Project Core contractor; the INL ESER Program contractor (independent from the M&O contractor); and the Idaho DEQ INL Oversight Program demonstrate that impacts from the INL are low and consistent with the emissions reported in annual INL radionuclide NESHAP reports. DOE contractors' ambient air monitoring data are reported annually in the Annual Site Environmental Reports which are available at http://idahoeser.com/Publications.html. DEQ's INL Oversight Program Annual Reports are available at DEQ's INL Oversight Monitoring Program website (https://www.deq.idaho.gov/idaho-national-laboratory-oversight/inl-oversight-program/). As shown in Chapter 4, Section 4.10 of this VTR EIS, the potential annual contribution to the maximally exposed individual offsite dose from VTR-related activities would be small, 0.0096 millirem.

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Sources of thorium-232 include natural thorium-232 in rock and soil. Sources of thorium-232 can also include man-made plutonium-240 and uranium-236 resulting from neutron capture in a reactor.

Sources of uranium-235 include natural uranium in rock and soil but are typically considered to be of small enough abundance to be ignored. But this decay series should not be ignored where large amounts of depleted, enriched or natural uranium are released to the environment.

of the U-235 decay series also include plutonium-239 which decays to uranium-235. Dispersion of reactor fuel from reactor accidents and spent fuel reprocessing can spread uranium-235 in the environment. Waste water disposal from HEU spent fuel reprocessing has put uranium-236 in the Snake River Plain Aquifer. Fuel reprocessing and calcining and reactor fuel melt tests or accidents spread various radionuclides present in nuclear fuels to air and soil.

Depleted uranium is uranium that is left over after extraction of uranium-235. Enriched uranium includes more than 0.72 percent up to 93.5 percent U-235 enrichment. Commercial nuclear power reactors typically use 3 to 5 percent enrichment. Enriched uranium also includes increased amounts of uranium-234 which cannot be separated from the uranium-235. Most depleted uranium includes between 0.2 and 0.4 percent uranium-235. Depleted uranium composition can vary and can include uranium-236 if it resulted from reactor fuel reprocessing. The health harm caused by inhalation or ingestion of depleted uranium includes illness and increased risk of birth defects. [82] [83]

62-109 cont'd

Uranium-233 is not naturally occurring. This weapons fissile material can only be produced in a reactor or by the higher actinide decays shown including plutonium-241 and americium-241 decay. Uranium-233 has been dispersed by its production, separation and limited use in nuclear weapons testing. Disposal of americium-241 following plutonium purification may be a significant source. It can also result from spent fuel reprocessing particularly of high enriched uranium fuel because of the high buildup of neptunium-237 in HEU reactor operations.

Higher actinides such as californium, curium, americium and neptunium may be produced using target material in nuclear reactors in order to produce weapons related materials or to produce a heat source for radiothermal generators such as plutonium-238 which is used as a power supply in spacecraft. [84] These materials have been disposed of routinely to an open-air evaporation pond at the INL's ATR Complex. These materials have not necessarily been included in required federal reporting under the National Emissions Standards (NESHAPs) because they are not monitored but only estimated. Therefore, whenever unplanned releases are occurring via escaping resin beads, for example, the emissions would be underestimated.

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[82] Rosalie Bertell, International Journal of Health Services, "Depleted Uranium: All the Questions About DU and Gulf War Syndrome Are Not Yet Answered," 2006. p. 514 https://ntp.niehs.nih.gov/ntp/roc/nominations/2012/publiccomm/bertellattachmentohw.pdf

[83] Depleted Uranium Education Project, *Depleted Uranium Metal of Dishonor How the Pentagon Radiates Soldiers & Civilians with DU Weapons*, 1997. ISBN:0-9656916-0-8

[84] Transuranics are radionuclides often having extremely long half-lives. Many decay progenies may be created before reaching a stable, non-radioactive state. See our factsheet at http://www.environmental-defense-institute.org/publications/decayfact.pdf. See also an ANL factsheet at https://www.remm.nlm.gov/ANL-ContaminationFactSheets-All-070418.pdf

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62-109 cont'd

Table 5. Uranium-238 decay series.

Californium	Cf-250 *						
Curium	Cm-246 *		Cm-242				
Americium	↓	Am-242 /^	↓				
Plutonium	Pu-242	↓	Pu-238				
Neptunium	↓	Np-238 /^	↓				
Uranium	U-238		U-234				
Protactinium	↓	Pa-234 /^	↓				
Thorium	Th-234 /^		Th-230				
Radium			Ra-226				
Radon			Rn-222				
Polonium			Po-218		Po-214		Po-210
Bismuth			↓	Bi-214 /^	↓	Bi-210 /^	↓
Lead			Pb-214 /^		Pb-210 /^		Pb-206 (stable)

Table notes: Alpha decay downward reduces the atomic mass by 4; beta decay upward diagonally to the right flips a neutron to a proton and stays at the same atomic mass. In the table, arrow symbols downward are used to show the progression of some alpha decays if there was space to show the arrow. Movement upward and to the right is shown by /^ which is a lame keyboard attempt to look like an arrow. Man-made actinides are shown in grey.

* Decay series to Cf-250 and Cm-246 not shown which include Cm-250, Pu-246, Am-236 and Bk-250.

Sources of uranium-238 include natural soil and rock sources, depleted uranium, reactor fuel melting from reactor accidents, and spent fuel reprocessing. Sources of uranium-234 decay progeny can include plutonium-238.

62-109 cont'd

Table 6. Thorium-232 decay series.

Californium	Cm-252		Cf-248				
Curium	Cm-248		Cm-244				
Americium	↓		↓				
Plutonium	Pu-244		Pu-240				
Neptunium	↓	Np-240/^	↓				
Uranium	U-240/^		U-236				
Protactinium			↓				
Thorium			Th-232		Th-228		
Actinium			↓	Ac-228/^	↓		
Radium			Ra-228/^		Ra-224		
Radon					Rn-220		
Polonium					Po-216		Po-212
Bismuth					↓	Bi-212/^	↓
Lead					Pb-212/^	↓	Pb-208 (stable)
Thallium						Tl-208/^	

See table notes for Table 5. Sources of thorium-232 include natural thorium-232 in rock and soil. Plutonium-240 and uranium-236 which results from neutron capture in a reactor also decay to thorium-232. Depleted uranium can include uranium-236. The higher actinides that decay to plutonium-240 are not shown but include californium-252 and -248, curium-248 and -244, plutonium-244, and neptunium-240.

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62-109 cont'd

Table 7. Uranium-235 decay series.

Californium	Cf-251						
Berkelium	↓	Bk-247					
Curium	Cm-247	↓	Cm-243				
Americium	↓	Am-243	↓				
Plutonium	Pu-243 ↗	↓	Pu-239				
Neptunium		Np-239 ↗	↓				
Uranium			U-235				
Protactinium			↓	Pa-231			
Thorium			Th-231 ↗	↓	Th-227		
Actinium				Ac-227 ↗	↓		
Radium				↓	Ra-223		
Francium				Fr-223 ↗	↓		
Radon					Rn-219		
Polonium					Po-215		
Bismuth					↓	Bi-211 ↗	
Lead					Pb-211 ↗	↓	Pb-207 (stable)
Thallium						Tl-207 ↗	

See table notes for Table 5. Sources of uranium-235 include natural uranium in rock and soil. It should not be ignored where enriched uranium is released to the environment. Plutonium-239 also decays to uranium-235 and higher actinides (californium, curium, americium and neptunium) are shown. Dispersion of reactor fuel from reactor accidents and spent fuel reprocessing can spread uranium-235 in the environment.

62-109 cont'd

Table 8. Uranium-233 decay series.

Californium	Cf-241					
Curium	Cm-245					
Americium	↓	Am-241				
Plutonium	Pu-241 ↗	↓				
Neptunium		Np-237				
Uranium		↓	U-233			
Protactinium		Pa-233 ↗	↓			
Thorium			Th-229			
Actinium			↓	Ac-225		
Radium			Ra-225 ↗	↓		
Francium				Fr-221		
Radon				↓		
Astatine				At-217		
Polonium				↓	Po-213	
Bismuth				Bi-213 ↗	↓	Bi-209
Lead				↓	Pb-209 ↗	↓
Thallium				Tl-209 ↗		Tl-205

See table notes for Table 5. Uranium-233 is not naturally occurring. This weapons fissile material can only be produced in a reactor or by the higher actinide decays shown including plutonium-241 and americium-241 decay. Higher actinides (californium, curium, americium and neptunium) are shown. Uranium-233 can and has been used in nuclear weapons testing. Its dispersion can also result from various weapons production and separations processes. Disposal of americium-241 following plutonium purification may be a significant source. It can also result from spent fuel reprocessing particularly of high enriched uranium fuel because of the high buildup of neptunium-237 in HEU reactor operations.

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Frankly, the NESHAPs reporting by the INL appears to lack validation and may substantially understate INL's airborne emissions of transuranics and other radionuclides. And these very long-lived radionuclides are continuing to be released and to build up in our air, soil and water. 62-109 cont'd

DOE's Environmental Monitoring Lied About the History and Continues to Hide the Truth about INL Radiological Contamination

The DOE must not be allowed to continue its inadequate radiological monitoring of the Idaho National Laboratory radiological emissions or of its waste disposal sites. DOE's past and ongoing coverup of radiological contamination is not protective of human health and the environment.

DOE has failed to disclose past radiological releases and the DOE continues to coverup ongoing intentional and accidental releases. Extensive americium-241 contamination at the ATR Complex was known long ago but the DOE and the U.S. Geological Survey deliberately withheld the information. The DOE has long given presentations to the public that deliberately withheld information about long-lived radionuclide contamination. Even now, when filters are evaluated and found to have americium-241, plutonium-238 and plutonium-239, for example, the DOE and state pretend to not know the source of the radionuclides.

Monitoring of waste burial sites for CERCLA at INL has often been inadequate and biased to hide contamination findings by reduced monitoring and reduced reporting. Spotty monitoring means "no discernable trend could be found." 62-110

At the Idaho National Laboratory, formerly the Idaho National Engineering and Environmental Laboratory, the Idaho National Engineering Laboratory, and the National Reactor Testing Station, historical releases were monitored yet not actually characterized as to what and how many curies were released. When asked by the governor in 1989 to provide an estimate of the radionuclides released from routine operations and accidents, the Department of Energy issued the "INEL Historical Dose Evaluation." [85] [86] It has been found to have underestimated serious releases by sometimes 10-fold. Furthermore, the past environmental monitoring used all along to claim no significant releases had occurred were not used in the INEL Historical Dose Evaluation. The environmental records that could have been used against the Department of Energy were destroyed. Americium and plutonium releases were often omitted from the INEL HDE.

The waste incidental to reprocessing requirements under the Section 3116 law required U.S. Nuclear Regulatory Commission oversight to some degree for closure of DOE's HLW tanks at

[85] US Department of Energy Idaho Operations Office, "Idaho National Engineering Laboratory Historical Dose Evaluation," DOE-ID-12119, August 1991. Volumes 1 and 2 can be found at https://www.iaea.org/inis/inis-collection/index.html

[86] Environmental Defense Institute's comment submittal on the Consent-based Approach for Siting Storage for the nation's Nuclear Waste, July 31, 2016. http://www.environmental-defense-institute.org/publications/EDIXConsentFinal.pdf

62-110 DOE takes its responsibility for the safety and health of the workers and the public seriously. The INL Site environmental surveillance programs collect and analyze samples or direct measurements of air, water, soil, biota, and agricultural products from the INL Site and offsite locations in accordance with DOE Order 458.1, "Radiation Protection of the Public and the Environment, Radiation Protection of the Public and the Environment"; DOE-HDBK-1216-2015, "Environmental Radiological Effluent Monitoring and Environmental Surveillance"; and DOE-STD-1196-2011, "Derived Concentration Technical Standard." The purpose of DOE Order 458.1 is to establish requirements to protect the public and the environment against undue risk from radiation associated with radiological activities conducted under the control of DOE pursuant to the Atomic Energy Act of 1954, as amended. Monitoring activities are performed to generate measurement-based estimates of the amounts or concentrations of contaminants in the environment. Measurements are performed by sampling and laboratory analysis or by "in place" measurement of contaminants in environmental media. The INL Site environmental surveillance programs meet or exceed requirements within these governing documents and have been determined through technical review to effectively characterize levels and extent of radiological constituents in the environment and distinguish INL Site-related contributions from those typically found in the environment at background levels. The Annual Site Environmental Report (ASER) describes the quality assurance program to ensure validity of results from the environmental surveillance programs. Quality assurance is an integral part of every aspect of an environmental monitoring program, from the reliability of sample collection through sample transport, storage, processing, and measurement, to calculating results and formulating the report. Monitoring performed by the INL M&O contractor; the Idaho Cleanup Project Core contractor; the INL ESER Program contractor (independent from the M&O contractor); and the Idaho Department of Environmental Quality (DEQ) INL Oversight Program demonstrate that impacts from the INL are low and consistent with the emissions reported in annual INL radionuclide NESHAP reports. DOE contractors' ambient air monitoring data are reported annually in the ASER which are available at http://idahoeser.com/Publications.html. DEQ's INL Oversight Program Annual Reports are available at DEQ's INL Oversight Monitoring Program website (https://www.deq.idaho.gov/idaho-national-laboratory-oversight/inl-oversight-program/).

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INL and SRS. The NRC oversight was publicly available such as an NRC monitoring report from 2007. [87] 62-110 cont'd

INL's Forever Contamination is Already So Obscene, DOE Hides the Data

The CERCLA cleanup at the Idaho National Laboratory is leaving behind roughly 55 "forever" radioactively contaminated sites of various sizes, and about 30 "forever" asbestos, mercury or military ordnance sites. [88] [89] The areas contaminated with long-lived radioisotopes that are not being cleaned up will require institutional controls in order to claim that the "remediation" is protective of human health. People must be prevented from coming into contact with subsurface soil or drinking water near some of these sites — forever.

The Department of Energy downplays the mess and usually doesn't specify how long the controls are required when the time frame is over thousands of years: they just say "indefinite." In some cases, the DOE earlier had claimed that these sites would be available for human contact in a hundred or so years. [90] [91] You can find a summary that includes the "forever" sites at https://cleanup.icp.doe.gov/ics/ic_report.pdf 62-111

Institutional control of "forever" contamination means they put up a sign, maybe a fence or a soil cap — and assume it will be maintained for millennia. "Don't worry about the cost. And besides," they always add, "you and I won't be here." The DOE acknowledges that the soil cap they plan to put over the RWMC will require maintenance, basically annually, for millennia.

DOE continues to find more contaminated sites and expectations are not always met by remediation. [92] And the DOE has never stopped burying long-lived radioactive waste over the Snake River Plain aquifer.

Frequently cited stringent EPA standards such as 4 rem/yr in drinking water are emphasized. But cleanup efforts often won't come close to achieving the advertised standards.

DOE argued against digging up meaningful amounts of transuranic and other long-lived radioactive waste at the Radioactive Waste Management Complex. Only the most egregious

[87] "U.S. Nuclear Regulatory Commission Plan for Monitoring Disposal Actions Taken By The U.S. Department of Energy at the Idaho National Laboratory Idaho Nuclear Technology and Engineering Center Tank Farm Facility in Accordance with the National Defense Authorization Act of Fiscal Year 2005," April 13, 2007. On NRC's Adams Database. 62-110 cont'd

[88] INL Waste Area Group Institutional Controls Report. Dated March 25, 2016. https://cleanup.icp.doe.gov/ics/ic_report.pdf from the EPA page: https://cleanup.icp.doe.gov/ics/

[89] ibid. INL Waste Area Group Institutional Controls Report. I counted the "forever" radioactive sites as those with termination date for institutional controls stated as "indefinite" or as "not specified." I counted the chemical sites for asbestos, PCPs, mercury or ordnance similarly. The size of the mess actually ranges from some small number of curies to the huge waste inventory at the RWMC. 62-111 cont'd

[90] Department of Energy Idaho Operations Office, *Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory Site,* Fiscal Years 2010-2014, DOE/ID-11513, December 2015.

[91] Federal Facility Agreement and Consent Order New Site Identification (NSI), "TRA-04: TRA-712 Warm Waste Retention Basin System (TRA-712 and TRA-612), NSI-26002. Signed by the Department of Energy in August of 2015. See Idaho National Laboratory Federal CERCLA Cleanup documents at www.ar.icp.doe.gov

[92] US Department of Energy, "Environmental Assessment for the Replacement Capability for Disposal of Remote-Handled Low-Level Radioactive Waste Generated at the Department of Energy's Idaho Site," Final, DOE/EA-1793, December 2011. http://energy.gov/sites/prod/files/EA-1793-FEA-2011.pdf

62-111 The INL Site cleanup and remediation activities are beyond the scope of the VTR EIS. Additionally, the operation of the WCS facility near Andrews County, Texas is also beyond the scope of the VTR EIS. However, all INL Site activities are planned and budgeted in coordination with all the other INL Site activities including those focused on site cleanup and remediation. The VTR EIS evaluations did not identify any construction or operation characteristics with the potential to directly or through any pathways substantially contribute to contamination at the INL Site. Additionally, while LLW, MLLW, and TRU (or GTCC-like) wastes could be generated under the VTR Alternatives and Reactor Fuel Production Options, all generated wastes would be shipped off site for treatment and disposal. LLW and MLLW disposal capabilities will not exist at the INL Site during the proposed action. The Radioactive Waste Management Complex (RWMC) at the INL Site stopped receiving LLW in April 2021. All activities at RWMC will focus on Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) closure activities beginning in January 2022. This site will be closed in accordance with the Record of Decision for Radioactive Waste Management Complex Operable Unit 7-13/14 (DOE-ID/EPA/IDEQ 2008). This would minimize or eliminate the potential for conflicts with ongoing cleanup of the INL Site.

GTCC-like LLW is not defense waste and is not currently eligible for disposal in WIPP. GTCC-like waste would remain in storage until a disposal facility is established. Comments related to the HLW interpretation are outside the scope of the VTR EIS. SNF would be generated under the proposed action. The SNF assemblies would be stored within the VTR reactor vessel until decay heat generation is reduced to a level that would allow fuel transfer and storage of the fuel assemblies with passive cooling. After allowing time for additional radioactive decay, the SNF would be transferred to a fuel treatment facility. Following treatment, the SNF would be placed in dry storage casks and stored on site in compliance with all regulatory requirements and agreements until it is transported off site to an interim storage facility or a permanent repository. Again, this would minimize or eliminate the potential for conflicts with ongoing cleanup. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal;" Section 2.6, "Snake River Plain Aquifer;" and 2.10, "Ongoing INL Site Cleanup," for additional discussion of those topics.

chemically laden waste is being removed. [93] [94] The DOE hasn't decided how much it will bury at the replacement for the RWMC, the Remote Handled Low-Level Waste disposal facility at the Idaho National Laboratory. The RHLLW facility allows disposal of Greater-Than-Class-C long-lived radionuclides that are expected to migrate into the Snake River Plain aquifer. The concentrations of Nickel-59, Nickel-63 and Niobium-94 are expected to exceed Class C and could not be disposed of at a commercial low-level waste disposal facility. The computations to provide the Performance Assessment for the rate at which the radionuclides will migrate into the aquifer are based on unsupported assumptions regarding optimistic selection of properties to slow the estimated rate of migration, assumption of uniform mixing in the aquifer while ignoring the known presence of "fast paths," the presumed lack of flooding, and stable geology for the need million and more years. The DOE hopes to increase the amount of radionuclides buried over the aquifer without so much as even the pretense of a soil cap to slow the migration of radionuclides into the aquifer. The DOE continues to bury radioactive waste over our Snake River Plain aquifer. [95] The DOE has failed to be truthful about past aquifer contamination migration to the south of the Idaho National Laboratory, as I describe in *Tritium at 800 pCi/L in the Snake River Plain Aquifer in the Magic Valley at Kimama: Why This Matters*. [96]

The INL appears to being ignoring the transport of radionuclides from buried waste to the surface by upward diffusion through the unsaturated soils. In an Environmental Assessment (EA) for shallow burial of the nation's entire GTCC inventory at the Andrews, Texas WCS facility, [97]

62-111 cont'd

[93] U.S. Department of Energy, 2008. Composite Analysis for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11244. Idaho National Laboratory, Idaho Falls, ID and U.S. Department of Energy, 2007. Performance Assessment for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11243. Idaho National Laboratory, Idaho Falls, ID. Available at INL's DOE-ID Public Reading room electronic collection. (Newly released because of Environmental Defense Institute's Freedom of Information Act request.) See https://www.inl.gov/about-inl/general-information/doe-public-reading-room/

[94] See the CERCLA administrative record at www.ar.icp.doe.gov (previously at ar.inel.gov) and see also Parsons, Alva M., James M. McCarthy, M. Kay Adler Flitton, Renee Y. Bowser, and Dale A. Cresap, Annual Performance Assessment and Composite Analysis Review for the Active Low-Level Waste Disposal Facility at the RWMC FY 2013, RPT-1267, 2014, Idaho Cleanup Project. And see Prepared for Department of Energy Idaho Operations Office, Phase 1 Interim Remedial Action Report for Operable Unit 7-13/14 Targeted Waste Retrievals, DOE/ID-11396, Revision 3, October 2014 https://ar.inl.gov/images/pdf/201411/2014110300960BRU.pdf

[95] US Department of Energy, "Environmental Assessment for the Replacement Capability for Disposal of Remote-Handled Low-Level Radioactive Waste Generated at the Department of Energy's Idaho Site," Final, DOE/EA-1793, December 2011. http://energy.gov/sites/prod/files/EA-1793-FEA-2011.pdf and see EDI's report "Unwarranted Confidence in DOE's Low-Level Waste Facility Performance Assessment – The INL Replacement Facility Will Contaminate Our Aquifer for Thousands of Years" at http://www.environmental-defense-institute.org/publications/rhllwFINALwithFigs4.pdf

[96] Thatcher, T.A., Environmental Defense Special Report, *Tritium at 800 pCi/L in the Snake River Plain Aquifer in the Magic Valley at Kimama: Why This Matters*, 2017. www.environmental-defense-institute.org/publications/kimamareport.pdf

[97] U.S. Department of Energy, Environmental Assessment for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste at Waste Control Specialists, Andrews County, Texas, DOE/EA-2082, October 2018. https://www.energy.gov/sites/prod/files/2018/11/f57/final-ea-2082-disposal-of-gtcc-llw-2018-10.pdf The inventory of GTCC and GTCC-like waste is about 12,000 cubic meters (420,000 cubic feet) in volume and contains about 160 million curies of radioactivity. "Since the site is in a semi-arid environment, most of the transport of radionuclides to the environment is expected to be through upward diffusion of volatile radionuclides, including helium-3, carbon-14, argon-39, krypton-85, iodine-129, and radon-222, to the surface rather than via groundwater." "The peak dose is dominated by upward diffusion of

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Commenter No. 62 (cont'd): Tami Thatcher

that EA found that burial of GTCC waste at the WCS facility, at the Andrews County, Texas waste site would be dominated by upward diffusion of volatile radionuclides. This means the estimates of air emissions may be omitting this contribution for INL air emissions.

The DOE uses the excuse that it does not define a category of low-level waste in the way the NRC does — the DOE does not declare it has GTCC waste because it doesn't require that classification but the DOE admits it had "GTCC-like" waste.

According to the Environmental Assessment EA-2082 for disposal of the nation's GTCC waste at Andrews County, Texas, "GTCC-like waste refers to DOE-owned or generated LLW and non-defense transuranic (TRU) waste that is without a disposal path and has characteristics sufficiently similar to those of GTCC LLW such that a common disposal approach has been proposed."

The DOE, however, must determine whether its low-level waste exceeds Class C, and is GTCC, before sending waste to NRC-licensed disposal facilities.

What the DOE rely prefers to obscure is the fact that "up to 87 percent of the current and projected volume of 8800 cubic meters of GTCC wastes cited in DOE EIS [98] has TRU nuclides greater than 100 nanocuries/gram (nCi/gm)." [99]

Therefore, when the DOE proposes reclassification of HLW to low-level waste, which will often be GTCC low-level waste, and the DOE is only performing this reclassification because it does not have a deep geologic repository, it means that the DOE will be using shallow burial of the HLW at DOE sites.

Deep geologic disposal has long been advocated for the disposal of the nation's GTCC waste, and has been advocated in NRC regulations. The DOE's EIS for disposal of GTCC waste has long advocated disposal at WIPP; however, currently WIPP prohibits disposal of this GTCC waste.

Part of the reason the deep geologic disposal has long been advocated for HLW, GTCC and TRU waste is that it was hoped that geological features would isolate that waste and not require active institutional controls for geologic time frames, for over one million years. But what the Department of Energy has been saying at the Idaho National Laboratory is that they are relying on active institutional controls to perform basically annual maintenance on the soil cap that is placed over buried waste at the Radioactive Waste Management Complex. This type of silliness was sought to be avoided in the advocating for deep geologic disposal. But now we know that

62-111 cont'd

technetium-99." "Because of the geologic conditions at the site, as well as the license mitigation measures, releases would not be expected until well after most of the radionuclides had decayed away. Only very long-live [sic] radionuclides would be expected to remain…Transport of radionuclides from the waste to the surface or underlying groundwater would still be limited by diffusion through the unsaturated soils." The EA provides effective dose after loss of institutional control that increases over time, higher at 100,000 years after closure. Because the radionuclides ingested are not delineated, the effective dose which may appear low may in reality cause serious developmental problems or premature death to children.

[98] Department of Energy, Environmental Impact Statement for Greater-Than-Class C Waste.

[99] U.S. Nuclear Regulatory Commission, Policy Issue Notation Vote, "Historical and Current Issues Related to Disposal of Greater-Than-Class C Low-Level Radioactive Waste," SECY-15-0094, July 17, 2015.

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Commenter No. 62 (cont'd): Tami Thatcher

obtaining adequate isolation of waste, such as spent nuclear fuel and HLW, has turned out to be far more difficult that people hoped.

The DOE's Environmental Impact Statement of disposal of GTCC has recommended that it be disposed of at WIPP and found that disposal at DOE sites via shallow burial yielded excessive radiological releases. A single alternate to WIPP for disposal of GTCC has also been proposed at Andrews County, Texas, where arid climate and natural clay deposits are thought to limit the migration of contaminants. But there is a strong profit-motive for owners of the Andrews County waste disposal site to show a favorable disposal analysis.

The DOE has disposed of some of its GTCC "low-level" radioactive waste as well as spent fuel irradiation targets by shallow burial at the Idaho National Laboratory's Radioactive Waste Management Complex as well as at other its other DOE sites. The DOE continues to bury GTCC concentrations of INL wastes at the INL's remote-handled low-level waste disposal facility at the ATR Complex, claiming that the migration of contaminates will limit the groundwater contamination.

The EA allows the careless disposal of spent nuclear fuel over the Snake River Plain aquifer if DOE deems the spent nuclear fuel to be related to research. This artificial definition defies science and is simply to shortcut proper disposal to isolate the material from soil, air and groundwater. The VTR EIS must explain the quantities of material from reactor irradiation programs, including spent nuclear fuel, that it has buried at INL and what amount it plans to bury at INL from the VTR program.

62-111 cont'd

The VTR EIS not only misrepresents various VTR reactor, fuel and waste handling accident risks and consequences, it mispreprents the inevitable waste disposal problems. ***62-112*** The VTR EIS must acknowledge the cost of continued and indefinite storage of high-level waste and spent fuel at the INL, particularly for the VTR program. The VTR EIS must address the gyrating, flailing, failed and non-existent disposal and waste disposition programs. ***62-113*** The VTR EIS must address the long-term costs, especially now that DOE is on track to miss the 2035 Settlement Agreement milestones because it has no spent nuclear fuel and high-level waste repository. ***62-114*** The VTR EIS has avoided the truth because it people understood the truth, they would oppose the VTR project. ***62-1 cont'd***

62-112 Worker and public safety are DOE's highest priority, and INL workers are highly trained in performing their jobs. Education and training requirements, including those for safety and radiation protection, are commensurate with job functions. The purpose of this EIS is to assess the environmental impacts of the proposed action. DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions are represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons.

Refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD regarding the comment regarding waste disposal.

62-113 Please refer to the response to comment 62-15.

62-114 Please refer to the response to comment 62-15.

Commenter No. 63: Doug True, Senior Vice President and Chief Nuclear Officer, Nuclear Energy Institute

From: TRUE, Doug
Sent: Tuesday, March 2, 2021 2:02:25 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Cc: Wagner, John Charles
Subject: [EXTERNAL] NEI Comments on the "Draft Versatile Test Reactor Environmental Impact Statement"

March 2, 2021

Mr. James Lovejoy
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Ave, MS 1235
Idaho Falls, ID 83415

Subject: NEI Comments on the "Draft Versatile Test Reactor Environmental Impact Statement"

Dear Mr. Lovejoy:

The Nuclear Energy Institute (NEI) expresses its strong support for the development of the Environmental Impact Statement for the Versatile Test Reactor (VTR) and continued engagement with stakeholders. *63-1*

The Versatile Test Reactor, authorized in the Nuclear Energy Innovation and Capabilities Act of 2017, will be an invaluable strategic national research asset that the United States lacks. Currently, the only fast neutron research facility available to U.S. companies is in Russia and is slated to shut down in the next few years. A U.S. based fast neutron irradiation capability is necessary to support the continuous development of new materials and fuels that could help improve the efficiency and operations of advanced reactors that will soon be deployed and lower the cost of future advanced reactors. In particular, it will help improve future fuel design iterations as has been done with LWR technology in recent decades utilizing facilities such as the Advanced Test Reactor. Although the first advanced reactors will be deployed without benefitting from VTR, the experimental capabilities provided by the VTR will be crucial for the continued evolution of advanced reactor technology. *63-2*

In summary, the fast neutron irradiation capability provided by the VTR will place the U.S. in the forefront of R&D capabilities internationally and we appreciate DOE's efforts to expeditiously develop and deploy VTR.

Sincerely,
Doug True

Doug True | *Senior Vice President and Chief Nuclear Officer*
1201 F Street, NW, Suite 1100 | Washington, DC 20004
[redacted]
nei.org

63-1 DOE acknowledges your preference for the VTR project. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

63-2 Thank you for your comment.

Commenter No. 63 (cont'd): Doug True, Senior Vice President and Chief Nuclear Officer, Nuclear Energy Institute

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Commenter No. 63 (cont'd): Doug True, Senior Vice President and Chief Nuclear Officer, Nuclear Energy Institute

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NEI
NUCLEAR ENERGY INSTITUTE

March 2, 2021

Mr. James Lovejoy
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Ave, MS 1235
Idaho Falls, ID 83415

Subject: NEI Comments on the "Draft Versatile Test Reactor Environmental Impact Statement"

Dear Mr. Lovejoy:

The Nuclear Energy Institute (NEI)[1] expresses its strong support for the development of the Environmental Impact Statement for the Versatile Test Reactor (VTR) and continued engagement with stakeholders.

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In summary, the fast neutron irradiation capability provided by the VTR will place the U.S. in the forefront of R&D capabilities internationally and we appreciate DOE's efforts to expeditiously develop and deploy VTR.

Sincerely,

Douglas E. True

c: John Wagner, Laboratory Director, INL

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[1] The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.

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Commenter No. 64: Don Hancock, Southwest Research and Information Center

SOUTHWEST RESEARCH AND INFORMATION CENTER
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March 2, 2021

Mr. James Lovejoy
Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415 via email: VTR.EIS@nuclear.energy.gov

Dear Mr. Lovejoy:

Southwest Research and Information Center (SRIC) is a 50-year-old nonprofit organization that throughout its history has been extensively involved in nuclear waste issues, especially regarding the Waste Isolation Pilot Plant (WIPP). SRIC has commented on dozens of Department of Energy (DOE) National Environmental Policy Act (NEPA) documents. SRIC also has commented on NEPA documents related to surplus plutonium disposition for more than 20 years. SRIC provides the following comments regarding the Versatile Test Reactor (VTR) Draft Environmental Impact Statement (DEIS), 86 FR 9335-36, February 12, 2021.

64-1 1. DOE must complete an adequate Programmatic Environmental Impact Statement (PEIS) regarding Surplus Plutonium Disposition, before proceeding with the VTR EIS. The DEIS mentions the 1999 Surplus Plutonium Disposition EIS (DOE/EIS-0283),[1] but it does not mention the 1996 PEIS and the resulting Record of Decision (ROD) of January 21, 1997, 62 FR 304. That ROD included four decisions: to (1) immobilize some or all surplus plutonium for disposal in a geologic repository, (2) fabricate some surplus plutonium into mixed oxide (MOX) fuel for irradiation in commercial reactors, (3) consolidate storage of pit plutonium at Pantex, and (4) consolidate storage of non-pit plutonium at the SRS. **64-2** The PEIS did not analyze disposition of surplus plutonium in a VTR, or any similar nuclear reactor. The PEIS and ROD also did not include geologic disposal at WIPP, in fact it specifically excluded WIPP along with 26 other disposition options.[2]

64-1 cont'd Both disposition pathways in the ROD – immobilization and MOX – have been abandoned by DOE. Therefore, the PEIS is out of date and has been de facto deemed inadequate by DOE and cannot provide the basis for the now proposed dilute and dispose at WIPP alternative, nor disposition of surplus plutonium in the VTR.

[1] DEIS at 5-9.
[2] DOE/EIS-0229 at 2-13 and 2-15.

64-1 Chapter 1, Section 1.3, of this VTR EIS, describes the purpose and need for the VTR, and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). Comments on the Surplus Plutonium Disposition Program are outside the scope of this VTR EIS. DOE and NNSA are engaged in two separate National Environmental Policy Act (NEPA) actions for the VTR and the Surplus Plutonium Disposition Program because the purpose and need for each program is quite different. The VTR project responds to the need for a test facility to provide a reactor-based fast-neutron source and associated facilities that meet identified user needs for a testing capability to support development of next-generation nuclear reactors—many of which require a fast-neutron spectrum for operation. The purpose of the action proposed by the Surplus Plutonium Disposition Program is to reduce the threat of nuclear weapons proliferation worldwide by dispositioning surplus plutonium in the United States in a safe and secure manner, ensuring that it can never again be readily used in nuclear weapons. Each NEPA effort will fully evaluate the potential environmental impacts of its respective proposed actions so they are available for public review. As discussed in Chapter 2, Section 2.6, one possible source of plutonium for VTR driver fuel is DOE/NNSA excess plutonium managed by the Surplus Plutonium Disposition Program. If this material were used for fuel, there would be coordination between the two programs. As discussed in Section 2.6, DOE/NNSA could propose in the future to make a portion of the excess plutonium available as feedstock for VTR driver fuel. Such a decision to allow use of excess plutonium as feedstock for VTR fuel production would be subject to future NEPA analysis. That analysis would evaluate the different activities that would be required to make excess plutonium available as feedstock as opposed to preparing it for disposition in accordance with current planning.

64-2 This VTR EIS is not analyzing an option for the disposition of the surplus plutonium. The EIS evaluates the use of this plutonium as a domestic supply source for use in the VTR driver fuel. In addition, given the time that the PEIS and its ROD were published in 1996, there were no knowledge of future actions being considered 20 years later. Furthermore, surplus plutonium disposition and WIPP facility operations are beyond the scope of this VTR EIS. The estimated transuranic (TRU) waste and SNF that would be generated by VTR Alternatives and Reactor Fuel Production Options activities are not surplus plutonium. Please also refer to the response to comment 64-3.

Commenter No. 64 (cont'd): Don Hancock, Southwest Research and Information Center

SRIC and many other organizations have advocated for a new PEIS for more than a decade.[3] In December 2018, the National Academy of Sciences (NAS) issued the *Disposal of Surplus Plutonium at the Waste Isolation Pilot Plant Interim Report.* Finding 6 was: **64-1 cont'd**

> Based on limited information regarding the NEPA strategy for the dilute and dispose program and the fact that DOE-NNSA's dilute and dispose plans derive from a similar program managed by DOE-EM to dilute and dispose of 6 MT of surplus plutonium, the committee finds that a full programmatic environmental impact statement (PEIS) of the dilute and dispose option, encompassing all sites, transportation, and activities involved in the dilute and dispose process rather than a supplemental EIS would help ensure the proper scope and scale of the proposed change. As much as 42.2 MT of surplus plutonium is being considered for disposal at WIPP, including 34 MT related to the PMDA. This represents the majority of the United States' declared excess plutonium and its processing would stress the sites, transportation, and activities well beyond the current disposition plans for 6 MT.

In 2020, the NAS final report *Review of the Department of Energy's Plans for Disposal of Surplus Plutonium in the Waste Isolation Pilot Plant,*[4] Recommendation 5-5 states:

> **The Department of Energy should implement a new comprehensive programmatic environmental impact statement (PEIS) to consider fully the environmental impacts of the total diluted surplus plutonium transuranic waste inventory (up to an additional 48.2 metric tons) targeted for dilution at the Savannah River Site and disposal at the Waste Isolation Pilot Plant (WIPP). Given the scale and character of the diluted surplus plutonium inventory, the effect it has on redefining the character of WIPP, the involvement of several facilities at several sites to prepare the plutonium for dilution, a schedule of decades requiring sustained support, and the environmental and programmatic significance of the changes therein, a PEIS for the whole of surplus plutonium that considers all affected sites as a system is appropriate to address the intent and direction of the National Environmental Policy Act and would better support the need for public acceptance and stakeholder engagement by affording all the opportunity to contemplate the full picture.**

The NAS Panel found that the PEIS is needed from a technical standpoint. Thus, there is no adequate legal or technical basis for proceeding with the DEIS. Instead, DOE (NE and other agencies of DOE) should proceed with a new, comprehensive PEIS to consider storage and disposition of all surplus plutonium. Until an adequate final PEIS and Record of Decision (ROD) is issued, NE should not proceed with the VTR DEIS, nor should other DOE organizations implement actions tiering off the 1996 PEIS and subsequent NEPA documents. **64-1 cont'd**

2. <u>The DEIS inclusion of WIPP is contrary to law, DOE-New Mexico agreements, and the social contract with New Mexico</u>.
The DEIS states: "Transuranic waste resulting from activities using DOE excess plutonium could be eligible for disposal at the WIPP facility." at 2-17, footnote 13. The DEIS also states: "The alternatives and options evaluated in this EIS would generate an estimated 24,000 cubic meters **64-3** **64-1 cont'd**

[3] http://sric.org/nuclear/docs/20100917_SRIC_Surplus_Pu_Comments.pdf
[4] http://nap.edu/25593

64-3 Surplus plutonium disposition and WIPP facility operations are beyond the scope of the VTR EIS. The TRU waste and SNF estimated to be generated by VTR Alternatives and Reactor Fuel Production Options activities are not surplus plutonium. TRU wastes from VTR Alternatives and Reactor Fuel Production Options would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico. If the DOE defense plutonium were used to produce VTR driver fuel, the TRU waste generated as part of the reactor fuel production options would meet the criterion of being defense related. The WIPP Land Withdrawal Act (LWA) (P.L. 102-579 as amended by P.L., 104-201) requires waste disposed at WIPP to (1) meet the definition of "transuranic waste" (WIPP LWA Section 2(18)) and (2) be generated by atomic energy defense activities (WIPP LWA Section 2(19)). Additionally, waste must meet the WIPP LWA, WIPP Hazardous Waste Facility Permit, WIPP waste acceptance criteria, and other applicable requirements. Compliance with these requirements may be demonstrated by acceptable knowledge, non-destructive assay, and other established methods. The waste stream must comply with the WIPP Waste Acceptance Criteria and the WIPP Permit Waste Analysis Plan by passing a TRU waste certification audit, an inspection by the U.S. Environmental Protection Agency (EPA), and New Mexico Environment Department (NMED) approval of the final audit report.

The WIPP LWA stipulates that the TRU waste capacity of the WIPP facility is a total TRU waste volume capacity limit of 175,600 cubic meters (6.2 million cubic feet). As of April 3, 2021, the WIPP facility has disposed of 70,115 cubic meters of TRU waste. This TRU waste disposal volume is about 40 percent of the total TRU waste volume allowed by Public Law 102-579 as amended by Public Law 104-201. TRU waste volume estimates such as those provided in NEPA documents, are not intended to demonstrate compliance with the WIPP Land Withdrawal Act TRU waste volume capacity limit. TRU waste volumes projected in NEPA documents will be incorporated, as appropriate, into future ATWIR [Annual Transuranic Waste Inventory Report] TRU waste inventory estimates.

The Department is conducting preliminary planning to evaluate options to be able to continue uninterrupted TRU waste disposal operations up to the total TRU waste volume capacity limit. Additional TRU waste disposal panels that would provide capacity to dispose of TRU waste up to the WIPP LWA total TRU waste volume capacity limit may be authorized under a future permit modification. The WIPP of TRU waste." at 2-53. The DEIS further states: "The Proposed Action alternatives and options would provide preparation and packaging capabilities for the TRU waste that would be generated; TRU waste would be shipped to the WIPP facility for disposal." at 4-70. Chapters 4 and 5 also include various analyses of waste transportation to WIPP.

Aside from the contradictory statements that TRU waste could or would be disposed at WIPP, the DEIS is inadequate in including that facility. WIPP was never supposed to handle 34 metric tons (MT) of surplus plutonium, nor any waste from the VTR. Indeed, when WIPP was authorized in 1979[5], and when subsequent agreements and the social contract with New Mexico were made, there was no plan to bring any surplus plutonium to WIPP. WIPP was never to be the disposal site from any commercial waste, as would be generated by the VTR. Thus, 34 MT of surplus plutonium cannot be disposed at WIPP without first changing federal law, agreements with New Mexico, and the WIPP social contract. The VTR EIS must either eliminate any consideration of WIPP as a disposal site, or it must explicitly state that federal law would have to be changed, and agreements with New Mexico and the WIPP social contract would be violated.

Regarding WIPP's capacity, the WIPP Land Withdrawal Act (LWA)[6] and the DOE-New Mexico Consultation & Cooperation (C&C) Agreement[7] limit the volume to 6.2 million cubic feet (175,564 cubic meters-m^3) of defense transuranic waste. As of February 20, 2021, 99,058.82 m^3 had been emplaced.[8]

The NAS Report calculates that 48.2 MT of surplus plutonium requires approximately 160,000 55-gallon containers,[9] so each metric ton requires about 3,335 55-gallon drums. Thus 34 MT of surplus plutonium equals about 113,400 drums, or about 23,800 m^3. That number of containers requires approximately two panels.

64-3 cont'd

Those empty panels do not exist. Much of WIPP's capacity has not been used because of emplacing more than 5,200 empty containers (dunnage), mismanagement at WIPP and the generator sites that shipped and emplaced waste without using underground space efficiently, and the impacts of salt creep, especially in panel 1. As attached Chart 1 shows, more than 21,000 m^3 of permitted capacity was not used in the first six panels. Because of the radiation release in 2014, panel 7 cannot be filled to capacity, which further increases the shortfall amount. There is no requirement that the State of New Mexico and its citizens allow construction of new panels for surplus plutonium or VTR waste to compensate for DOE practices that created the shortfall by not fully using permitted capacity. In its NEPA documents, NE must recognize those facts.

Because of not using permitted capacity, WIPP also does not have room for all of the legacy TRU waste that was supposed to go to WIPP. The NAS Report Figure S-5 shows that the legacy TRU amounts to about the legal capacity limit before the Volume of Record (VOR).

[5] Public Law 96-164, Section 213.
[6] http://www.emnrd.state.nm.us/WIPP/wipplandwithdrawal.html
[7] https://www.wipp.energy.gov/Library/Information_Repository_A/Supplemental_Information/Consultation%20and%20Cooperation%20Agreement.pdf
[8] https://www.wipp.energy.gov/general/GenerateWippStatusReport.pdf
[9] http://nap.edu/25593, at 36 and 103.

Permit, consistent with Resource Conservation Recovery Act regulations at 40 CFR 270.42, can be modified by submittal of a Permit Modification Request (PMR) and decision by NMED to approve the PMR. Both Class 2 and Class 3 PMRs include a public comment period as a step in the regulatory process.

The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as SNF annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM. Regardless of the source of plutonium used for VTR driver fuel, after treatment the VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. The VTR SNF would be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also addresses the management of TRU waste that does not meet the criterion of being generated by atomic energy defense activities and refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

Commenter No. 64 (cont'd): Don Hancock, Southwest Research and Information Center

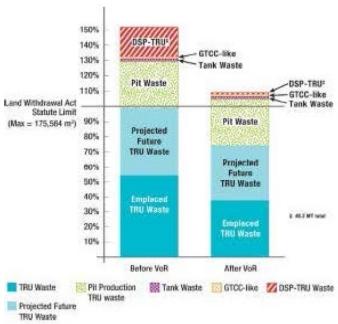

FIGURE S-5 DOE-reported emplaced and future transuranic wastes estimates (DOE-CBFO, 2018a, 2019a) and additional wastes, identified by the committee. Additional wastes are: DSP-TRU, Greater-than-Class-C-like (GTCC-like) TRU wastes, tank wastes, and TRU waste generated from pit production. The graphs illustrate the impact of the Volume of Record (VoR) recalculation, in particular the large reduction in DSP-TRU waste volumes. Both graphs also show that the Land Withdrawal Act statutory limit is likely to be exceeded. DSP-TRU volumes have been subtracted from TRU waste estimates. See Table 3-2.

64-3 cont'd

Given the unused capacity in panels 1-7, there is not room for all of the legacy TRU waste. Thus, to allocate any space for the 34 MT of surplus plutonium or VTR waste would mean that very substantial amounts of legacy defense TRU waste would remain at the storage sites. The WIPP Permit currently states that disposal ends in 2024,[10] while the VTR is to operate for 60 years, much beyond the WIPP lifetime. In its NEPA documents, NE must recognize those facts.

64-4

Using WIPP for 34 MT of surplus plutonium or VTR waste also violates the social contract between New Mexico and DOE. The NAS Report determined:

> **FINDING 5-4: By virtually any measure, the proposal to dilute 48.2 metric tons of surplus plutonium and dispose at the Waste Isolation Pilot Plant (WIPP) represents a substantial technical and "social contract" change for WIPP and the State of New Mexico.**

The NAS Report recommended various measures to address that matter, including:

> **RECOMMENDATION 5-6: The Department of Energy's (DOE's) National Nuclear Security Administration, DOE's Office of Environmental Management, and DOE higher-level officials should take additional actions beyond those defined by the National Environmental Policy Act toward transparency and stakeholder engagement on the whole of the potential scope of surplus plutonium under consideration (48.2 metric tons) for disposal at the Waste Isolation Pilot Plant. Such actions include completing and publicizing the outcome of relevant safety analyses and cost estimates.**

[10] https://hwbdocuments.env nm.gov/Waste%20Isolation%20Pilot%20Plant/200800/200800%20WIPP%20Permit%20PDF/Attachment%20G%2008-2020.pdf at G-6.

64-4 Please refer to the response to comment 64-3.

Commenter No. 64 (cont'd): Don Hancock, Southwest Research and Information Center

Thus, NE and other DOE officials should engage now with New Mexico officials and the public to discuss whether the social contract and legal requirements and agreements can be changed, and if so, what waste would be accepted at WIPP under what requirements. States with legacy TRU waste should also be engaged so that they are aware of conclusions and agreements and the impacts on waste storage in their states. In its NEPA documents, NE must discuss the social contract and the outcomes of such engagements.

The WIPP LWA, C&C Agreement, and social contract all presumed that additional repositories would be required because not all defense TRU waste for all time would go to WIPP. However, DOE has no program to identify other potential sites. Such a program should be immediately implemented. The requirement for other repositories must be incorporated into NE NEPA documents as a reasonable alternative (and necessity). **64-4 cont'd**

SRIC is well aware that DOE and NE assume that less than the actual amount of TRU waste is emplaced at WIPP because of the VOR, which was approved as a permit modification by the New Mexico Environment Department (NMED) in December 2018.[11] SRIC and Nuclear Watch New Mexico have a pending appeal of that decision in the New Mexico Court of Appeals.[12] In addition, the VOR will be challenged in the WIPP Permit renewal process, which could occur in 2021. Further, even if there is a VOR, NMED may order closure of WIPP before 6.2 million cubic feet of waste is emplaced, using either the historic container volume limits or the VOR. Once again, in its NEPA documents, NE must recognize those facts.

WIPP's insufficient capacity for dilute and disposal also has been reported by the Government Accountability Office (GAO).[13] In its 2017 report, GAO found: "DOE does not have sufficient disposal space available in WIPP for the TRU waste planned for disposal identified in its 2016 annual TRU waste inventory report, and DOE will need to expand the repository to accommodate this waste." at 32. In response to GAO's recommendations, DOE stated that it would develop a long-term plan by no later than December 31, 2018. at 69. More than two years later, such a plan has not been presented to the public or regulators, but such a plan might not include consideration of waste from the VTR. **64-3 cont'd**

4. The preferred alternative should be no action.
SRIC does not agree that any VTR is needed. The United States does not need another fast neutron reactor, which was demonstrated by the shutting down of the Fast Flux Test Facility almost 30 years ago. Most other nations have also concluded that fast neutron reactors are unneeded and too expensive. **64-5** Further, the environmental and health consequences of the VTR, its fuel fabrication, and waste storage and disposal would be severe, and are not adequately analyzed in the DEIS. **64-6** Additionally, the DEIS presumes that the VTR could operate until after 2090. at 5-49. The DEIS does not explain why that timeframe is reasonable, why the VTR is needed for that time period, and how any "need" for a fast neutron reactor thereafter would be met. **64-5 cont'd**

[11] https://www.env.nm.gov/wp-content/uploads/sites/12/2016/05/HWB-18-19-P-Secretarys-Order-Approving-Draft-Permit.pdf
[12] No. A-1-CA-37894. Nuclear Waste Partnership, LLC and United States on behalf of United States Department Of Energy, Applicants-Appellees, v. Nuclear Watch New Mexico, and Southwest Research And Information Center.
[13] https://www.gao.gov/products/GAO-17-390

5

64-5 DOE acknowledges the commenters preference for the No Action Alternative. Refer to Section 2.1, "Support and Opposition," of this CRD for more information on this topic. DOE recognizes that construction of the VTR is a large investment and wants to get the most out of the testing and research capabilities it provides. Therefore, DOE has assumed that the VTR would be operated to provide testing capabilities for 60 years. This is a long time horizon, but is considered reasonable with respect to design life. DOE would evaluate the need and make appropriate plans for fast-neutron testing capabilities as the VTR approaches the end of its life; addressing that future need is beyond the scope of this EIS. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost. DOE's decision pursuant to the analysis in this VTR EIS will be announced in a Record of Decision(s) that will be issued no sooner than 30 days after the EPA Notice of Availability of this Final EIS is published in the *Federal Register*.

64-6 This VTR EIS presents the analysis and potential environmental and health impacts of constructing and/or operating the VTR, support facilities, and reactor fuel production capabilities in Chapter 4. The analysis addresses the storage of spent nuclear fuel pending offsite shipment and the transportation of low-level and TRU waste to offsite disposal facilities. The potential health consequences are explicitly addressed in Section 4.10 (for normal operations), Section 4.11 (for facility accidents), and Section 4.12 (for transportation). The results of the analysis do not show severe consequences for normal operations and credible accidents as presented in Chapter 4 and summarized in the Chapter 2, Section 2.9, and the Summary. The only severe impacts presented would be for a hypothetical, beyond-design-basis accident for which a credible initiating event has not been identified or from an intentional destructive act that would be protected against through the safeguards and security program. The potential environmental impacts at offsite disposal facilities have been addressed in the licensing, permitting, and/or environmental documents prepared specifically for the operation of those sites. The VTR project's responsibility with respect to those sites is to comply with their waste acceptance criteria.

Commenter No. 64 (cont'd): Don Hancock, Southwest Research and Information Center

In summary, NE should not proceed with the planned FEIS. Instead, NE should stop pursuing the VTR, or issue a FEIS in which no action is the preferred alternative. DOE, including NE, NNSA, and EM should proceed with a comprehensive PEIS that discusses the alternatives for storage and disposition for all surplus plutonium. DOE, including NNSA, NE, and EM should also begin discussing with New Mexico state officials and the public the roles it is considering for WIPP and whether any of them are consistent with federal laws, agreements with the State, and the social contract. DOE should also immediately begin a process to investigate potential repository sites in states other than New Mexico for defense TRU waste, surplus plutonium, and perhaps for other wastes that require geologic disposal. *64-7* *64-1 cont'd* *64-4 cont'd* *64-3 cont'd*

Thank you very much for your careful consideration of, and your response to, these comments.

Sincerely,

Don Hancock

64-7 DOE acknowledges your support for the No Action Alternative and opposition to the VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

Commenter No. 64 (cont'd): Don Hancock, Southwest Research and Information Center

WIPP PERMITTED VS. ACTUAL CAPACITY

(in cubic meters) - As of February 20, 2021

Chart 1

	CH-Permitted	Actual	% Used	RH-Permitted	Actual	% Used
Panel 1	18,000	10,497	58.32%	0		
Panel 2	18,000	17,998	99.99%	0		
Panel 3	18,750	17,092	91.16%	0		
Panel 4	18,750	14,258	76.04%	356	176	49.44%
Panel 5	18,750	15,927	84.94%	445	235	52.81%
Panel 6	18,750	14,467	77.16%	534	214	40.07%
Panels 1-6	**111,000**	**90,239**	**81.30%**	**1,335**	**625**	**46.82%**
Shortfall		**20,761**			**710**	
Panel 7	18,750	8,169 **1,500**		650	26	
Panel 8	18,750	**18,750**		650	**650**	
Panels 1-8	**148,500**	**118,658**		**2,635**	**1,301**	
Panel 10		**5,000**				
Legal Capacity	168,485	123,658 ~ 73%		7,079	1,301 ~19%	
VOR		84,250 ~50%			700 ~10%	

Notes:
"CH" is Contact-Handled waste; "RH" is Remote-Handled
"Permitted" refers to the capacity limits in the New Mexico WIPP permit
Volume is by outer container volume
Green amounts are estimates
"VOR" is Volume of Record that calculates by inner container volume

Compiled by: Don Hancock, Southwest Research and Information Center
[redacted]

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Commenter No. 65: George Buehler

From: George Buehler
Sent: Tuesday, March 2, 2021 7:08:29 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] DOE/EIS-0542: Versatile Test Reactor

Mr Lovejoy,

As a longtime resident of Southern Idaho I am concerned about the proposed Versatile Test Reactor which the INL lobby is trying to introduce to our state. As always, this project is portrayed as nothing short of miraculous, a source of limitless energy, employment for the masses, Progress!!! Best of all, this is CLEAN energy, well sort of, except for that annoying nuclear WASTE. All these years and all the brainpower of all the Phd Engineers and we still don't know what to do with the stuff. *65-1* *65-2*

I will leave it to more patient and loquacious commenters to argue the finer points of this proposal. I will simply state that I oppose it for various reasons. Please put me in the NO NUKES camp~ *65-1 cont'd*

Sincerely,
George Buehler
Pocatello, 83204

65-1 DOE acknowledges your opposition to the Idaho National Laboratory (INL) VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

65-2 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR spent nuclear fuel (SNF) would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository.

Commenter No. 66: Martin B. Sattison, Chair, Idaho Section, American Nuclear Society

From: Marty Sattison
Sent: Tuesday, March 2, 2021 9:31:50 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: IANS Comments on the Virtual Test Reactor Environmental Impact Statement

Dear Mr. Lovejoy,

Attached are comments from the Idaho Section of the American Nuclear Society on the Virtual Test Reactor Environmental Impact Statement.

Best regards,

Martin B. Sattison

Chair,

Idaho Section

American Nuclear Society

Response side of this page intentionally left blank.

Commenter No. 66 (cont'd): Martin B. Sattison, Chair, Idaho Section, American Nuclear Society

Mr. James Lovejoy
US Department of Energy
Idaho Operations Office
1955 Fremont Ave.
MS 1235
Idaho Falls, ID 83415

March 2, 2021

SUBJ: Comments on Virtual Test Reactor Environmental Impact Statement

The Idaho Section of the American Nuclear Society (IANS) endorses the US Department of Energy's (DOE) decision to move forward with the proposed Versatile Test Reactor (VTR) at the preferred location of Idaho National Laboratory (INL). **66-1**

IANS appreciates the opportunity to comment on the draft Environmental Impact Statement (EIS) for the proposed VTR. IANS agrees with the DOE decision to proceed with the construction and operation of a new fast-neutron spectrum test reactor user facility to provide a much-needed domestic research and testing capability in support of advancing the state-of-the art of nuclear energy. **66-1 cont'd**

The draft VTR EIS documents a thorough assessment of the potential environmental impacts from the proposed project. The report discusses a number of key technical decisions and the options considered, including: **66-2**

- The reactor type and technology for the VTR. To reduce overall project risk and establish a relatively short design and construction schedule, DOE wisely evaluated options that took advantage of mature technologies and a history of operating experience. IANS supports this approach and the resulting decision to proceed with a sodium-cooled, pool-type reactor design, leveraging the experience within DOE with the Experimental Breeder Reactor II and the Fast Flux Test Facility.
- Options for siting the VTR. Based, in part, on the desire to minimize the amount of new infrastructure development needed (and the associated risks), DOE quickly focused on siting the VTR at INL or Oak Ridge National Laboratory (ORNL). While both locations provide significant existing resources, infrastructure and capabilities directly applicable to VTR, INL's infrastructure would require substantially fewer upgrades and less overall funding to become fully functional and supporting of sodium-cooled reactor fuel handling and experiment post-irradiation examinations. After weighing all the evidence, DOE designated INL as the preferred alternative. IANS strongly supports this position. INL has the most modern support infrastructure, post-irradiation testing and examination capabilities, the most experience within the DOE Complex with the selected reactor technology, and a scientific, engineering and technical support workforce second to none. **66-1 cont'd**

The VTR EIS uses sound science and engineering analysis to ascertain the potential environmental impacts from the entire lifecycle of the proposed test reactor. **66-2 cont'd** By using existing infrastructure and facilities, environmental effects from construction and operation are minimized and have been assessed to be well within all regulatory limits and guidelines.

IANS, comprised of hundreds of leading experts in all fields related to nuclear energy, is confident that the VTR can be safely constructed, operated, and when the time comes, decommissioned, while simultaneously protecting the environment. **66-1 cont'd** Indeed, an operational VTR would greatly benefit the environment on a global scale by promoting and enhancing clean, carbon-free nuclear energy. **66-3**

IANS fully supports and encourages DOE to aggressively pursue the VTR Project at the INL. **66-1 cont'd**

On behalf of the Idaho Section of the American Nuclear Society,
Martin B. Sattison, Chair

66-1 DOE acknowledges your preference for the Idaho National Laboratory (INL) VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

66-2 Thank you for your comment.

66-3 Chapter 1, Section 1.3, of this VTR EIS, describes the purpose and need for the VTR, and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). The global impacts of promoting and enhancing carbon-free nuclear energy are outside the scope of this VTR EIS.

Commenter No. 67: Chuck Broscious, Environmental Defense Institute

Environmental Defense Institute
Troy, ID 83871-0220
[redacted]
http://environmental-defense-institute.org

RE: Public Comment Submittal on the U.S. Department of Energy's Versatile Test Reactor Draft Environmental Impact Statement (VTR EIS) (DOE/EIS-0542)

Sent by Chuck Broscious on or before March 1, 2021 by email to VTR.EIS@Nuclear.Energy.gov

EDI comments submittal on the Department of Energy Scope of an Environmental Impact Statement for a Versatile Test Reactor, ID: DOE-HQ-2019-0029-0001 is included herein by reference. [1]

In the interest of avoiding repetition for the public seeking independent information, EDI references critical contributors to the VTR EIS Scoping discussion by David McCoy. [2] Tami Thatcher offers essential comments on VTR's impact at INL.[3] [4] [5] [6] [7] Also, Ed Lyman, Union of Concerned Scientists, Acting Director, Nuclear Safety Project submits crucial review of the VTR. [8] EDI encourages the

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[1] Chuck Broscious, *Comments on scoping warfighter mobile nuclear reactor power generation environmental impact statement,* March 31, 2020, filed on behalf of Environmental Defense Institute. http://environmental-defense-institute.org/publications/EDIMicroreactor.pdf

[2] Dave McCoy, J.D., *Citizen Action New Mexico's EIS Scoping Comments for Plutonium Down-blending Dilution and Disposal at WIPP, Department of Energy/NNSA*, February 1, 2021, Dave McCoy, J.D., Executive Director Citizen Action New Mexico, [redacted] http://environmental-defense-institute.org/publications/CommentNRCdEISHoltecM.pdf

[3] Tami Thatcher, *Public Comment Submittal on the U.S. Department of Energy's Versatile Test Reactor Draft Environmental Impact Statement (VTR EIS)* (DOE/EIS-0542); Comment submittal by Tami Thatcher, February 5, 2021. Comments Due: February 16, 2021. Sent by email to VTR.EIS@Nuclear.Energy.gov http://environmental-defense-institute.org/publications/CommentVTRdEIS.pdf http://environmental-defense-institute.org/publications/CommentVTRdEIS2.pdf

[4] Tami Thatcher, Public Comment Submittal on the Department of Energy Scope of an Environmental Impact Statement for a Versatile Test Reactor, ID: DOE-HQ-2019-0029-0001 http://environmental-defense-institute.org/publications/ScopeEISVTR.pdf

[5] Tami Thatcher, Public Comment Submittal on the U.S. Department of Energy Draft Environmental Assessment for Microreactor Applications Research, Validation and Evaluation (MARVEL) Project at Idaho National Laboratory(DOE/EA-2146) http://environmental-defense-institute.org/publications/CommentDOEMARVELdea.pdf

[6] Tami Thatcher, Public Comment Regarding Application to the U.S. Nuclear Regulatory Commission on the "Holtec International HI-STORE Consolidated Interim Storage Facility Project," Docket NRC-2018-0052regarding NRC's draft environmental impact statement. http://environmental-defense-institute.org/publications/CommentNRCdEISHoltecT.pdf

[7] Tami Thatcher, Public Comment Submittal on the Department of Defense "Prototype Microreactor EIS Comments" on the scope of an Environmental Impact Statement for Construction and Demonstration of a Prototype Advanced Mobile Nuclear Microreactor, Docket Number DOD-2020-OS-0002 http://environmental-defense-institute.org/publications/PublicCommentMicroRx.pdf

[8] Ed Lyman, *There are Faster, Cheaper, Safer and More Reliable Alternatives to the Energy Department's Proposed Multibillion Dollar Test Reactor*, April 5, 2019, Union of Concerned Scientists (UCS) questions the need for a dedicated fast neutron test reactor and, more generally, has serious concerns about fast reactor safety and security, detailed in a critique it released last year. https://allthingsnuclear.org/

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

interested public to access these resource links that cover most of the salient issues related to the VTR project and related issues in preparing their own comments.

EDI's comments will primarily cover the prolifery of new reactors and waste projects planned for the US, the Idaho National Laboratory (INL) and/or in the first stages of deployment by DOD, DOE, National Nuclear Security Administration, National Academies and NASA and the applicability for the need for the NEPA's Programmatic provisions. The common issues requirement of a PEIS are:

1. Cumulative environmental emissions impact of all new reactors in the nation;
2. Cumulative nuclear waste disposal impact of all new reactors;
3. Cumulative financial drain away from renewable energy development;
4. As the NEPA regulations cited below demonstrate, a Programmatic Environmental Impact Statement (PEIS) is required for the segmented and expansive program of these agencies. *Definition: Programmatic NEPA* document means a broad-scope EIS or EA that identifies and assesses the environmental impacts of a DOE program; it may also refer to an associated NEPA document, such as an NOI, ROD, or FONSI.

67-1

Nuclear Waste Generated by All Reactors Must be Included in a VTR PEIS

67-2

"By taking these positions on promoting nuclear reactors, the Nuclear Regulatory Commission (NRC) is ignoring some of the most important issues in the public mind as to whether New Mexico becomes an unwilling recipient for a permanent repository for existing wastes, more future generated nuclear reactor wastes and the adequacy of storage prior to transport for wastes from other sites. NRC thus limits any discussion of the elephant in the room." [9]

"[WASHINGTON, DC – February 10, 2021] -- The non-profit organization Beyond Nuclear filed suit in federal court today to prevent the U.S. Nuclear Regulatory Commission (NRC) from licensing a massive "consolidated interim storage facility" (CISF) for highly radioactive waste in Andrews County, west Texas.

"In its Petition for Review filed in the U.S. Court of Appeals for the District of Columbia Circuit, Beyond Nuclear asked the Court to dismiss the NRC licensing proceeding for a permit to build and operate a CISF proposed by Interim Storage Partners (ISP), a business consortium. It plans to use the facility to store 40,000 metric tons of highly radioactive irradiated fuel generated by nuclear reactors across the U.S. (also euphemistically known as "used" or "spent" fuel), amounting to nearly half of the nation's current inventory.

"The irradiated fuel would be housed on the surface of the land, on the site of an existing facility for storage and disposal of so-called "low-level radioactive waste" (LLRW). The LLRW facility is owned and operated by Waste Control Specialists (WCS). WCS and Orano (formerly Areva) comprise ISP. ISP's CISF is located about 0.37 miles from the New Mexico border, and very near the Ogallala Aquifer, an essential source of irrigation and drinking water across eight High Plains states.

"The Beyond Nuclear petition charges that orders issued by the NRC in 2018 and 2020 violate federal law by contemplating that the U.S. government will become the owner of the irradiated fuel during transportation to and storage at the ISP facility. Under the Nuclear Waste Policy Act, the government is precluded from taking title to irradiated fuel unless and until a repository is licensed and

[9] Ibid. Foot Note #2

67-1 Chapter 1, Section 1.3, of this VTR EIS, describes the purpose and need for the VTR, and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). Other government agency programs (including NASA and NRC programs), are outside the scope of this VTR EIS. The impacts of past global nuclear activities contributes to the background dose described in Chapter 3, Sections 3.1.10.1, 3.2.10.1, and 3.3.10.1, and is considered in the impacts analyses in Chapter 4 and cumulative impacts in Chapter 5. At the time it was prepared in 2002, the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250), evaluated the impacts of storage and disposal of all SNF generated and projected to be generated. Work on the Yucca Mountain repository was later cancelled. Updated National Environmental Policy Act (NEPA) documentation would be needed for a future geologic repository. For more information on spent fuel storage and disposal, please see Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

67-2 The environmental impacts of nuclear waste generated by reactors other than VTR is outside the scope of this EIS. SNF would be generated under the VTR alternatives and managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and agreements. The SNF assemblies would be stored within the VTR reactor vessel until decay heat generation is reduced to a level that would allow fuel transfer and storage of the fuel assemblies with passive cooling. After allowing time for additional radioactive decay, the SNF would be transferred to a fuel treatment facility. As discussed in the VTR EIS, Chapter 2, Section 2.2.3, following treatment and removal of sodium within the spent fuel, the SNF would be melted, diluted, placed in canisters ready for future disposal, which would then be placed in dry storage casks, and stored on a storage pad on site in compliance with all regulatory requirements and agreements. This VTR SNF would be managed along with other SNF at the site until it is transported off site to an interim storage facility or a permanent repository. The SNF is expected to be compatible with the acceptance criteria for any interim storage facility or permanent repository. The program for a geologic repository for SNF at Yucca Mountain, Nevada, has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE

Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

operating. No such repository has been licensed in the U.S. The U.S. Department of Energy's (DOE) most recent estimate for the opening of a geologic repository is the year 2048 at the earliest.

"In its 2020 decision, in which the NRC rejected challenges to the license application, the NRC Commissioners admitted that the Nuclear Waste Policy Act would indeed be violated if title to irradiated fuel were transferred to the federal government so it could be stored at the ISP facility. But they refused to remove the proposed license provision which contemplates federal ownership of the irradiated fuel. "Instead, they ruled that approving ISP's application would not directly involve NRC in a violation of federal law – according to the NRC, that violation would occur only if DOE acted on the approved license – and therefore they could approve it, despite the fact the provision is illegal. The NRC Commissioners also noted with approval that "ISP acknowledges that it hopes Congress will change the law to allow DOE to enter storage contracts prior to the availability of a repository" (December 17, 2020 order, page 5).

"But the petition contends that the NRC may not approve license provisions that violate federal law in the hope the law will change. "This NRC decision flagrantly violates the federal Administrative Procedure Act (APA), which prohibits an agency from acting contrary to the law as issued by Congress and signed by the President," said Mindy Goldstein, an attorney for Beyond Nuclear. "The Commission lacks a legal or logical basis for its rationale that it may issue a license with an illegal provision, in the hopes that ISP or the Department of Energy won't complete the illegal activity it authorized. The buck must stop with the NRC." Co-counsel Diane Curran stated, "Our claim is simple. The NRC is not above the law, nor does it stand apart from it."

"In a separate case, filed in June 2020, Beyond Nuclear challenged a similar application, by Holtec International, to store up to 173,600 metric tons of irradiated fuel on another CISF site in southeastern New Mexico. The Holtec site lies just over 40 miles west from the ISP facility in Texas. Like ISP's license application, Holtec's application illegally assumes that the federal government will take title to the irradiated fuel during transportation and storage.

"*Background on the Nuclear Waste Policy Act.* According to a 1996 D.C. Circuit Court ruling, the NWPA is Congress' "comprehensive scheme for the interim storage and permanent disposal of high-level radioactive waste generated by civilian nuclear power plants" [*Ind. Mich. Power Co. v. DOE*, 88 F.3d 1272, 1273 (D.C. Cir. 1996)]. The law establishes distinct roles for the federal government, versus the owners of facilities that generate irradiated fuel, with respect to storage and disposal of the highly radioactive wastes. The "Federal Government has the responsibility to provide for the permanent disposal of…spent nuclear fuel" but "the generators and owners of…spent nuclear fuel have the primary responsibility to provide for, and the responsibility to pay the costs of, the interim storage of…spent fuel until such…spent fuel is accepted by the Secretary of Energy" [42 U.S.C. § 10131]. Section 111 of the NWPA specifically provides that the federal government will not take title to spent fuel until it has opened a permanent geologic repository [42 U.S.C. § 10131(a)(5)].

"'Congress acted wisely when it passed the Nuclear Waste Policy Act and refused to allow nuclear reactor licensees to transfer ownership of their irradiated reactor fuel to the DOE until a permanent repository was up and running,' said Kevin Kamps, radioactive waste specialist for Beyond Nuclear. "It understood that irradiated fuel remains hazardous forevermore, and that the only safe long-term strategy for safeguarding irradiated reactor fuel is to place it in a permanent repository for deep geologic isolation from the living environment." Certain radioactive isotopes in irradiated fuel remain dangerous for more than a million years, Kamps pointed out.

"'Today, the NWPA remains the public's best protection against a so-called consolidated 'interim' storage facility becoming a de facto permanent, national, surface 'parking lot dump' for radioactive waste,' Kamps said. "But if we ignore it or jettison the law, communities like west Texas and

remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. High-level waste would not be generated under any VTR alternative or reactor fuel production options. Please refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

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southeastern New Mexico can be railroaded by the nuclear industry and its friends in government, and forced to accept mountains of forever deadly high-level radioactive waste other states are eager to offload."

"In addition to impacting Texas and New Mexico, shipping the waste to the ISP facility would also endanger 43 other states plus the District of Columbia, because it would entail hauling several thousands of high-risk, high-level radioactive waste shipments on their roads, rails, and/or waterways, posing risks of release of hazardous radioactivity all along the way.

"'The communities near the nuclear plants that generated this dangerous high-level radioactive waste do not want it, and neither do we,' said Rose Gardner of Eunice, New Mexico, whose home and business are just several miles from the ISP CISF site. She is a co-founder of the grassroots environmental justice organization Alliance for Environmental Strategies, and a member of Beyond Nuclear. "Every single one of the thousands of high-risk shipments of irradiated nuclear fuel would pass through my community, which is unacceptable,' Gardner said.

"Besides threatening public health, safety, and the environment, evading federal law to license the ISP facility would also impact the public financially. Transferring title and liability for irradiated fuel from the nuclear utilities that generated it to DOE would mean that federal taxpayers would have to pay many billions of dollars for so-called "interim" storage of the waste. That's on top of the many tens of billions of dollars that ratepayers and taxpayers have already paid to fund a permanent geologic repository that hasn't yet materialized.

"While emphasizing the essential role of a repository to isolate irradiated fuel from the environment over the long term, Kamps said that the government should cancel the Yucca Mountain Project once and for all. 'A deep geologic repository for permanent disposal should meet a long list of stringent criteria: scientific suitability, legality, environmental justice, consent-based siting, mitigation of transport risks, regional equity, intergenerational equity, and safeguards against nuclear weapons proliferation, including a ban on irradiated fuel reprocessing,' Kamps said. "But the proposed Yucca Mountain dump, sited on land owned by the Western Shoshone in Nevada without their consent, fails to meet any of those standards. That's why a coalition of more than a thousand environmental, environmental justice, and public interest organizations, representing all 50 states, has opposed it for 34 years." [10]

Waste Isolation Pilot Plant

"Citizen Action New Mexico comments are submitted in opposition to the Department of Energy/ National Nuclear Security Administration plans to "dilute and dispose" and bring up to 42 metric tons of downblended Plutonium waste to the Waste Isolation Pilot Plant (WIPP) in southern New Mexico.

"WIPP may not be suitable for expanded disposal of downblended Plutonium for technical and regulatory reasons including prior accidents and that the waste planned for disposal at WIPP that is identified in DOE's 2016 inventory report exceeds the facility's disposal space. Even if the method

[10] Keven Kamps, *Beyond Nuclear Files Federal Lawsuit Challenging High-Level Radioactive Waste Dump Targeted at Texas/New Mexico Border, and* Stephen Kent, [redacted] February 10, 2021.
Petition charges the Nuclear Regulatory Commission knowingly violated the U.S. Nuclear Waste Policy Act and up-ended settled law which prohibits transfer of ownership of commercial irradiated fuel to the federal government unless and until a permanent geologic repository is ready to receive it.

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were changed for counting the amount of waste in storage, unidentified future waste and that proposed for disposition, WIPP" [11]

New Reactors Planned at the Idaho National Laboratory
Prototype Advanced Mobile Nuclear Microreactors

Project Pele – encompasses multiple prototype mobile nuclear reactors (2-10 MWe range). The Department of Defense funded mobile reactors can be fairly large. On Pele (2-10 MWe range) mobile reactor. [12]

"The U.S. Department of Defense (DOD), acting through the Strategic Capabilities Office (SCO) and in close collaboration with the U.S. Department of Energy, Nuclear Regulatory Commission, U.S. Army Corps of Engineers, as well as industry partners, is exploring modern design concepts and cutting-edge technology developed by industry to meet warfighter mobile power-generation needs. The DOD is considering the development of a prototype advanced mobile nuclear microreactor to support DOD domestic energy demands, DOD operational and mission energy demands, and Defense Support to Civil Authorities mission capabilities. SCO invites public comment on the scope of the Environmental Impact Statement (EIS) during a 30-day comment period from March 2, 2020 to April 1, 2020. The Notice of Intent is available for viewing online at https://www.federalregister.gov/ and https://www.cto.mil/pele_eis/.

"SCO will host a virtual presentation to provide information about the proposed project and the National Environmental Policy Act (NEPA) process, and to invite public comments on the scope of the EIS. Comments on the scope of the EIS may be submitted by email or in written form. Comments will be accepted via email to: PELE_NEPA@sco.mil

"Mailed comments regarding the proposed plan must be postmarked by April 1, 2020, and sent to: OSD Strategic Capabilities Office, ATTN: Prototype Microreactor EIS Comments, 675 N. Randolph Street, Arlington, VA 22203-2114. https://www.cto.mil/pele_eis/." [13]

Announcement of the Pentagon Contract Awards on M**obile, Small Nuclear Reactors**

WASHINGTON — The Pentagon on Monday issued three contracts to start design work on **mobile, small nuclear reactors**, as part of a two-step plan towards achieving nuclear power for American forces at home and abroad. *Updated 3/9/20*

https://www.csis.org/events/online-event-project-convergence-and-army-modernization-conversation-general-john-m-murray

"The department awarded contracts to BWX Technologies, Inc. of Virginia, for $13.5 million; Westinghouse Government Services of Washington, D.C. for $11.9 million; and X-energy, LLC of Maryland, for $14.3 million, to begin a two-year engineering design competition for a small nuclear microreactor designed to potentially be forward deployed with forces outside the continental United

[11] IBID., Footnote #2. Also see https://fas.org/sgp/othergov/doe/lanl/pubs/00818031.pdf
[12] Article from https://www.defensenews.com/smr/nuclear-arsenal/2020/03/09/pentagon-to-award-mobile-nuclear-reactor-contracts-this-week/
[13] Comments will be accepted via email to: PELE_NEPA@sco mil
Mailed comments regarding the proposed plan must be postmarked by April 1, 2020, and sent to: OSD Strategic Capabilities Office, ATTN: Prototype Microreactor EIS Comments, 675 N. Randolph Street, Arlington, VA 22203-2114

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States.

"The combined $39.7 million in contracts are from "Project Pele," a project run through the Strategic Capabilities Office (SCO), located within the department's research and engineering side. The prototype is looking at a 1-5 megawatt (MWe) power range. The Department of Energy has been supporting the project at its Idaho National Laboratory

TerraPower; DOE has awarded money to TerraPower and GE Hitachi for their sodium-cooled fast reactor research based on EBR-II (in the family are Hanford's Fast Flux Test Reactor, now dismantled and other fast reactors)

Xenergy; DOE has awarded money to Xenergy for their high-temperature gas-cooled (helium) reactors with TRISO fuel (something akin to Peach Bottom HTGR and Fort St. Vrain)

MARVEL; Microreactor Applications Research Validation and Evaluation Project (MARVEL) power level of less than 100 kilowatts of electricity using High-Assay, Low-Enriched Uranium (HALEU). DOE/ID announced comment opportunities January 11, 2021 on a draft environmental assessment for a proposal to construct the Microreactor Applications Research Validation & EvaLuation (MARVEL) project microreactor inside Idaho National Laboratory's (INL's) Transient Reactor Test Facility. The MARVEL design is a sodium-potassium-cooled, thermal microreactor with a power level of less than 100 kilowatts of electricity using High-Assay, Low-Enriched Uranium (HALEU). [14]

NuScale; NRC licensing is proceeding for NuScale (a so-called small modular reactor) slated for construction on INL site as a commercial nuclear power station. [15]

Versatile Test Reactor Draft Environmental Impact Statement (VTR DEIS)

S.8 VTR DEIS Preferred Alternative

"DOE's Preferred Alternative is the INL VTR Alternative. DOE would build and operate the VTR at the INL Site adjacent to the existing MFC. Existing facilities within the MFC would be modified and used for post-irradiation examination of test assemblies. Post-irradiation examination would be performed in HFEF, IMCL, and other MFC facilities. Spent VTR driver fuel would be treated to remove the sodium-bonded material at FCF. Modifications to FCF may be required to carry out this process. The intent of this treatment is to condition and transform the spent nuclear fuel into a form that would meet the acceptance criteria for a future permanent repository. This treated fuel would be temporarily stored at a new VTR spent fuel pad at MFC. DOE has no preferred options at this time for where it would perform reactor fuel production (feedstock preparation or driver fuel fabrication)for the VTR. This EIS evaluates options for both processes at the INL Site and at SRS. DOE could choose to use either site or a combination of both sites to implement either option. DOE will state its preferred options for feedstock

[14] DOE/ID, Press Release, Media Contacts: Tim Jackson, [redacted], January 11, 2021

[15] Tami Thatcher, *U.S. Nuclear Regulatory Commission cautions that its recent NuScale approval does not mean NRC will approve a NuScale construction permitter an operating license*, http://www.environmental-defense-institute.org/publications/News.20.Nov.pdf

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preparation and fuel fabrication in the Final VTR EIS, if preferred options are identified before issuance." [Draft Versatile Test Reactor Environmental Impact Statement Pg.S-20]

S.9 Summary of Environmental Consequences
S.9.1Comparison of Alternatives and Options

"Table S–1summarizes and allows side-by-side comparison of the potential environmental impacts of the INL VTR Alternative and the ORNL VTR Alternative. Impacts are presented for the construction of the VTR at the INL Site and the VTR and a hot cell facility at ORNL. The impacts, as presented, include the operation of the VTR, post-irradiation examination activities, and spent driver fuel management. Table S–2summarizes and allows comparison of the impacts from establishing the capabilities for and performing feedstock preparation and fuel fabrication at the INL Site or SRS. Under the No Action Alternative, DOE would make use of the limited capabilities available at existing facilities, both domestic and foreign, for testing in the fast-neutron-flux spectrum. DOE would not construct or modify any facilities or effect any substantial change in the level of operations for post-irradiation examination. There would be no need for new VTR driver fuel production and no VTR spent nuclear fuel would be generated. Whereas the impacts presented in Tables S–1 and S–2 represent potential incremental increases, under the No Action Alternative there would be no increase in environmental impacts at the INL Site, ORNL, and SRS above those described in Chapter 3, Affected Environment." [Page S.9 Summary]

S.9.2 Summary of Combined Idaho National Laboratory Impacts

"Potential Affected Environment environmental impacts were evaluated for three possible actions at the INL Site: 1) construction and operation of the VTR along with modification and operation of associated facilities needed for post-irradiation examination of test articles and management of spent fuel; 2) facility modifications and operation to prepare fuel feedstock material for use in VTR driver fuel; and 3) facility modifications and operation for fabrication of VTR driver fuel. Impacts were evaluated separately for each of these actions. Table S–3 summarizes the potential environmental consequences that could occur if DOE were to decide to perform all three actions at the INL Site" [Page DEIS S.9.2]

DOE fails to adequately analyze in the VTR DEIS in the following areas:
* Analysis of waste disposal for used spent nuclear fuel when none currently exists for high-level waste that VTR will generate; **67-2 cont'd**
* Analysis of storing/reprocessing sodium cooled nuclear fuel as opposed to water cooled reactors and difficulty of disposal of sodium fuel and coolant post closure; **67-3**
* Does this relatively small (300 MW) VTR represent what the proponents call only the first step in expanding the modular design into a larger facility? **67-4**
* Analysis of VTR emissions contribution to DOE/INL total emissions factoring in expansion of waste treatment operations at INTEC/IWTU, AMWTP, ATRC, NRC and MFC;
* Analysis of VTR emissions reliance on HEPA filters proven inadequacy;
* Analysis of VTR emissions radioactive gas emissions and tritium; **67-5**
* Analysis of VTR defenses against cyber-attacks; **67-6**
* Analysis of VTR emissions impact on health effects including cancers, autoimmune diseases, birth defects pulmonary diseases, cardiovascular diseases; **67-7**
* Analysis of VTR construction emissions in contaminated soils resulting from 60+ years of INL operations deposition on the stie. **67-8**

67-3 Please refer to the response to comment 67-2.

67-4 The VTR is not a modular design and there are no plans to expand the VTR into a larger facility; the VTR would be a one-of-a-kind test facility. The VTR would provide test capabilities that could enable advanced reactor designs, including modular and larger designs.

67-5 Please refer to the discussions in Section 2.11, "High-Efficiency Particulate Air (HEPA) Filter Performance," and Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD. VTR operations are not expected to have an impact on waste treatment operations at the Idaho National Laboratory (INL) Site. As stated in Chapter 4, Section 4.9.1, the low-level radioactive waste (LLW) generation rate for the VTR project would be about 6 percent of the site generation rate. This small increase would not materially change the radiological air emissions from waste handling operations. Based on emission information in the INL Site Annual Environmental Reports (ASERs) and the emissions estimated for the VTR project, these would be a very small part of the total emissions from the VTR project and would not impact the results of the analysis.

67-6 DOE takes intentional destructive acts quite seriously. Please see Section 2.8, "Intentional Destructive Acts," of this CRD for a discussion of cyberattacks. Security forces are constantly training to thwart intentional destructive acts. Furthermore, the form of materials associated with the VTR serves to inhibit consequences from an intentional act of destruction. The VTR fuel and the VTR radioactive waste by their very nature are not susceptible to an intentional act of destruction. The consequences and risks of cyberattacks are bounded by the analysis in the VTR EIS. Some details of the intentional destructive acts analysis are not available to the public for security reasons.

67-7 This EIS uses the incidence of LCF as the measure for the impact to the population of exposure to radiological air emissions from the VTR alternatives and fuel production options. This is a standard approach in EISs that include actions that could have a radiological impact. Both the U.S. Environmental Protection Agency (EPA) and Centers for Disease Control and Prevention (CDC) identify cancer as the primary long-term health affect associated with radiation exposure. The CDC does not identify any non-cancer health effects from doses of less than 10 rad to the embryo or fetus (CDC 2019). The estimated annual exposure to any individual from any of the VTR operations would be much less than 10 rad.

Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

So if the VTR reactor is built at the Idaho National Laboratory producing 34 MT of plutonium, the waste might not be considered military and therefore ineligible for WIPP. DOE is really screwed up about what to do with all the Pu these reactors will produce. New Mexico doesn't want it. 67-9

Nuclear Regulatory Commission Promotion of New Reactors

Flexible Licensing Processes for Advanced Reactors

"The NRC's review and licensing processes are flexible and allow interactions related to a wide variation in design development and deployment strategies. Based on interactions with stakeholders, the NRC determined that guidance would be beneficial to assist non-LWR developers in planning regulatory interactions. To address this need, the NRC developed guidance for its flexible regulatory review processes within the bounds of existing regulations, including the use of conceptual design reviews and staged-review processes in the document, "A Regulatory Review Roadmap for Non-Light Water Reactors." The "roadmap" is also intended to help designers prepare technology- or design-specific regulatory engagement plans. Regulatory engagement plans define desired outcomes from various interactions between the designer and the NRC, considering factors such as the resources available to the designer and the NRC and the coordination of regulatory issues with other aspects of the overall program for developing and deploying non-LWR designs. Regulatory engagement plans also define the timing and scope of regulatory interactions in order to align with stakeholders activities related to plant design, research and development, finance, public policy, and the fuel cycle. The NRC released a draft roadmap document in October of 2016 to support discussions with stakeholders during several public meetings. The staff incorporated stakeholder feedback, and guidance related to standard design approvals and prototype reactors into the final roadmap, which was issued on December 26, 2017."

NRC Industry-Led Licensing Modernization Project

"The NRC engaged with the Licensing Modernization Project (LMP) led by Southern Company, coordinated by the NEI, and cost-shared by DOE. The interactions between the NRC staff and LMP resulted in the submittal of NEI–18–04, Revision 1, "Risk-Informed Performance-Based Guidance for Non-Light Water Reactor Licensing Basis Development," on August 26, 2019. The guidance focuses on identifying licensing basis events; categorizing and establishing performance criteria for structures, systems, and components; and evaluating defense in depth for advanced reactor designs. The staff issued SECY-19-0117, "Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors," on December 2, 2019. In this notation vote paper, the staff discussed potential policy issues associated with the LMP methodology and recommended that the Commission find that the use of the methodology described in NEI 18-04 is a reasonable approach for establishing key parts of the licensing basis for non-LWRs. The Commission's Staff Requirements Memorandum dated May 26, 2020, found that using the methodology is a reasonable approach to support the licensing of non-light water reactors. The NRC published Regulatory Guide 1.233, "Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light Water Reactors," in the Federal Register on June 9, 2020.

67-8 All construction work would be performed in areas that are not radiologically controlled. Construction activities would not pose radiological risks to workers nor would they result in any risk to public health. To limit nonradiological emissions from construction, DOE would implement a dust control program. Construction activities would be monitored to ensure a safe working environment is maintained.

67-9 The VTR Alternative does not generate plutonium. Plutonium is used to produce the reactor driver fuel. If the plutonium used is defined as defense related the transuranic waste generated during the production of nuclear fuel would be disposed at the WIPP facility. If non-DOE defense plutonium were used to produce VTR driver fuel, the waste generated as part of the reactor fuel production options would not meet the criterion of being defense related and would be managed as greater-than-Class-C (GTCC)-like waste. GTCC-like wastes would be stored on site and be managed along with other GTCC-like wastes at the site until they are transported to an available offsite interim storage facility or for permanent disposal. Please refer to the Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, which discusses the sites' current radioactive waste and SNF management programs. Section 2.5 also refers to the VTR EIS sections that provide detailed discussions of estimated waste inventories, along with their management and/or disposal options.

"The following table provides reports related to the LMP demonstration and pilot activities that have been submitted to date.

Date	Design
September 2019	Fluoride-Cooled High Temperature Reactor Licensing Modernization Project Demonstration
September 2019	Molten Salt Reactor Experiment (MSRE) Case Study Using Risk-Informed, Performance-Based Technical Guidance to Inform Future Licensing for Advanced Non-Light Water Reactors
August 2019	Westinghouse eVinci Micro Reactor Licensing Modernization Project Demonstration
December 2018	PRISM Sodium Fast Reactor Licensing Modernization Project Demonstration
September 2018	OKLO's DG-1353 Pilot
August 2018	High Temperature, Gas-Cooled Pebble Bed Reactor licensing Modernization Project Demonstration

NRC Advanced Reactor Content of Application Project

"The purpose of the advanced reactor content of application project (ARCAP) is to develop technology-inclusive, risk-informed and performance-based application guidance. The ARCAP is broader and encompasses the industry-led technology-inclusive content of application project (TI-CAP). These projects build on the outcome of the Licensing Modernization Project.

"The ARCAP guidance is intended to be used for an advanced reactor application for a combined license, construction permit, operating license, design certification, standard design approval, or manufacturing license. The industry-led TI-CAP's purpose is to develop the content for specific portions of the safety analysis report (SAR) that would be used to support an advanced reactor application. The TI-CAP portion of the SAR will be informed by the guidance found in in NEI 18-04, Revision 1, "Risk-Informed Performance-Based Technology-Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development.

"ARCAP is a longer-term effort that will support the 10 CFR Part 53 rulemaking effort. NRC staff has developed the "Non-Light Water Reactor Review Strategy Staff White Paper," dated September 2019, to provide internal guidance for the review of non-LWR applications in the near-term."

NRC Advanced Nuclear Reactor Generic Environmental Impact Statement (GEIS)

"The NRC intends to develop a GEIS for advanced nuclear reactors with a small generating output and correspondingly small environmental footprint in order to streamline the environmental review process for future small-scale advanced nuclear reactor (ANR) environmental reviews. The purpose of an ANR GEIS is to determine which environmental impacts could result in essentially the same (generic) impact for different ANR designs that fit within the parameters set in the GEIS, and which environmental

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impacts could result in different levels of impacts requiring a plant-specific analysis. Environmental reviews for small-scale advanced nuclear reactor license applications could incorporate the ANR GEIS by reference and provide site-specific information and analyses in a Supplemental Environmental Impact Statement (SEIS), thereby streamlining the environmental review process.

"In SECY-20-0020, the staff informed the Commission that it plans to use a technology-neutral plant parameter envelope (or PPE) approach to bound small-scale ANR projects. For the purposes of the ANR GEIS, the staff considers a "small-scale" ANR as having the potential to generate up to approximately 30 megawatts thermal per reactor with a correspondingly small environmental footprint. The actual bounding thermal power level of the ANR and the environmental footprint used in the ANR GEIS are topics to be determined during the scoping process for the GEIS.

"Because small-scale advanced reactors are not specific to only one reactor design and could be sited anywhere in the United States that meets NRC siting requirements, the NRC decided to pursue a technology neutral approach using a PPE. The PPE will consist of a table of bounding values or parameters for different reactor designs located on a site. In addition, a table of values representing the site parameter envelope (e.g., size of site, quantity of water used, demographics) will be developed to describe the affected environment. The ANR GEIS will evaluate the impacts of a reactor that fits within the bounds of the PPE on a site that fits within the bounds of the site parameter envelope to determine the environmental impact.

"A future application that references the ANR GEIS will need to demonstrate that its project is bounded by the analysis in the ANR GEIS and that there is no significant new information affecting the evaluation. If the project is bounded by the ANR GEIS and there is no significant new information, the NRC will incorporate by reference the ANR GEIS and no further analysis would be needed. The application will also need to analyze the site-specific resources not resolved generically in the ANR GEIS. If impacts to a resource have not been resolved generically by the ANR GEIS, the site-specific SEIS will evaluate the impacts to the resource."

NRC-DOE Joint Initiative - Non-LWR Design Criteria

"In July 2013, the US Department of Energy (DOE) and the NRC established a joint initiative to address a key portion of the licensing framework essential to advanced reactor technologies. The initiative addresses the "General Design Criteria for Nuclear Power Plants," Appendix A to 10 Code of Federal Regulations (CFR) 50, which were developed primarily for LWRs, by adapting them to the needs of advanced reactor design and licensing. The initiative is being accomplished in two phases. Phase 1, completed by DOE, consisted of reviews, analyses and evaluations resulting in a report issued by the DOE in December 2014 titled, "Guidance for Developing Principal Design Criteria for Advanced (Non-Light Water) Reactors." Phase 2 of the initiative, managed by the NRC, involved review of the Phase 1 DOE work products issuance of regulatory guidance resulting from the review.

"On April 7, 2016, the NRC issued the, "Draft - Advanced Non-LWR Design Criteria - April 2016," for informal public comment. The informal public comment period closed on June 8, 2016. After consideration of stakeholder input, the NRC issued draft regulatory guide DG-1330, "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors" for formal public comment. DG-1330 was published in the *Federal Register* on February 3, 2017, for a 60 day public comment period.

"The issuance of this new NRC regulatory guidance is expected to provide the following benefits:

- reduced regulatory uncertainty for advanced reactor developers,
- improved guidance for NRC staff reviewing advanced reactor license applications, and
- improved timeliness and efficiency of licensing activities for both applicants and NRC staff."

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

NRC Advanced Reactor Training Materials

"The NRC contracted with the Oak Ridge National Laboratory (ORNL) to develop a 12-module training course on molten-salt reactors (MSRs). The course provides background on various MSR concepts presently under development, including a history of earlier MSR projects, descriptions of conceptual designs, and expected technical and regulatory challenges. The NRC also contracted with Argonne National Laboratory and Idaho National Laboratory to develop training courses for fast reactors and high-temperature gas-cooled reactors. The training materials for molten salt reactors, fast reactors, and high-temperature gas-cooled reactors are publicly available.

"The NRC contracted with Brookhaven National Laboratory (BNL) to prepare a Regulatory History of Non-Light Water Reactors. This report describes the history of licensing non-LWRs with a focus on regulatory policy and licensing beginning with the Atomic Energy Commission and transitioning to the NRC's past and current activities. This background information is a valuable knowledge management tool for NRC staff and member of the public."

NRC Testing Needs and Prototype Plants

"On June 16, 2017, the NRC issued a preliminary draft document, "Nuclear Power Reactor Testing Needs and Prototype Plants for Advanced Reactor Designs." This document described the relevant regulations governing the testing requirements for advanced reactors, described the process for determining testing needs to meet the NRC's regulatory requirements, clarified when a prototype plant might be needed and how it might differ from the proposed standard plant design, and described licensing strategies and options that include the use of a prototype plant to meet the NRC's testing requirements. The document was discussed during periodic public meetings on advanced reactor topics. The staff considered stakeholder feedback and issued the final paper as part of the regulatory review roadmap in December 2017."

NRC Advanced Reactor Workshops

"In 2015, the NRC and the U.S. Department of Energy (DOE) began co-hosting a series of Advanced Reactor Workshops. The first workshop was held on September 1-2, 2015, 2015 and included presentations and discussions on roles and responsibilities of the NRC and DOE, previous experience licensing non-LWR designs, critical gaps and needs in research and development that need to be addressed, and suggestions for improvements in the licensing of non-LWR designs. The second workshop was held on June 7-8, 2016 and focused on exchanging information from NRC, DOE, industry and included presentations and discussions on strategies for advanced reactor development and deployment, recent initiatives; and advanced reactor fuel development, qualification, and challenges. The Third workshop in this series was held on April 25 and 26, 2017. The NRC has now transitioned from this workshop format to more frequent periodic stakeholder meetings to focus on specific topics of interest as discussed below."

Given that at least seven government nuclear labs are involved, a Programmatic EIS is clearly *67-1 cont'd*

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

indicated to show the cumulative emission impacts on the nation.

67-1 cont'd

NRC Advanced Reactor Reference Materials

Date Issued	Topic	Author Affiliation
07/01/20	Molten Salt Reactor Fuel Salt Qualification Methodology	Oak Ridge National Laboratory
06/30/20	Technology-Inclusive Determination of Mechanistic Source Terms for Offsite Dose-Related Assessments for Advanced Nuclear Reactor Facilities	Idaho National Laboratory
06/30/20	Human Factors Considerations for Automating Microreactors	Sandia National Laboratories
05/31/20	Technical Letter Report on The Assessment of Tritium Detection and Control in Molten Salt Reactors: Final Report	Argonne National Laboratory
04/01/20	Technical and Licensing Considerations for Micro-Reactors	Sandia National Laboratories
03/31/20	Model Materials Controls and Accounting Plan for Pebble Bed Reactors	Oak Ridge National Laboratory
02/05/20	Regulatory Review of Micro-Reactors – Initial Considerations	Brookhaven National Laboratory
01/30/20	Simplified Approach for Scoping Assessment of Non-LWR Source Terms	Sandia National Laboratories
08/09/19	Hazards Associated with Molten Salt Reactor Fuel Processing Operations Presentation	Oak Ridge National Laboratory
08/07/19	Metal Fuel Fabrication Safety and Hazards Presentation	Pacific Northwest National Laboratory
06/30/19	Review of Hazards for Molten Salt Reactor Fuel Processing Operations	Oak Ridge National Laboratory
06/28/19	Metal Fuel Fabrication Safety and Hazards Final Report	Pacific Northwest National Laboratory
06/19/19	Advanced Reactor Siting Policy Considerations	Oak Ridge National Laboratory
06/10/19	NRC Regulatory History of Non-Light Water Reactors (1950-2019)	Brookhaven National Laboratory
03/31/19	Advanced Non-Light-Water Reactors Materials and Operational Experience	NUMARK Associates

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

03/31/19	Technical Gap Assessment for Materials and Component Integrity Issues for Molten Salt Reactors	Oak Ridge National Laboratory
11/30/18	Molten Salt Reactor Fuel Qualification Considerations and Challenges	Oak Ridge National Laboratory
08/21/18	Phenomena Important in Liquid Metal Reactor Simulations	Brookhaven National Laboratory
05/09/18	Phenomena Important in Modeling and Simulation of Molten Salt Reactors	Brookhaven National Laboratory

NRC Non-LWR Analytical Code Development

"In support of IAP Strategy 2, the staff prepared a three-volume report to describe computer code needs, current capabilities, and gaps relevant to non-LWR confirmatory and future (beyond initial licensing) safety analysis. The reports identify candidate computer codes, the decision criteria and technical rationale applied to the selection process, and specific development activities needed to address known gaps. On May 1, 2019 and September 17, 2019, the staff briefed the Advisory Committee on Reactor Safeguards (ACRS) Future Plant Design Subcommittee on its plans for development of codes for non-LWR analysis. On October 3, 2019, the staff briefed the ACRS full committee on the role of computer codes in regulatory activities and needs for advanced reactor reviews and codes the staff intends to develop. On November 4, 2019, the ACRS transmitted a letter containing its conclusions, recommendations and constructive feedback on the staff's code development strategies. On January 30, 2020 the NRC published the final version of these reports taking into account ACRS and stakeholder feedback."

The cumulative impact of NRC's testing/waste disposal of nuclear operation on radiation emissions must be considered in a comprehensive Programmatic EIS.

Space Council Stressing Cross-government Approach

Space Reactors must be considered in a comprehensive PEIS

Nuclear rockets to Mars are dangerous and unnecessary

https://independentaustralia net/environment/environment-display/nuclear-rockets-to-mars-are-dangerous-and-unnecessary,14812

67-1 cont'd

"Nuclear-powered space technology risks causing further damage to our planet and is an unnecessary expense when we have higher priorities, writes Karl Grossman.

"A REPORT ADVOCATING rocket propulsion by nuclear power for U.S. missions to Mars, written by a committee packed with individuals deeply involved in nuclear power, was issued last week by the National Academies of Sciences, Engineering and Medicine (NAS).

"The 104-page report also lays out "synergies" in space nuclear activities between the National Aeronautics and Space Administration (NASA) and the U.S. military, something not advanced explicitly since the founding of NASA as supposedly a civilian agency in 1958.

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

The report states: "'*Space nuclear propulsion and power systems have the potential to provide the United States with military advantages... NASA could benefit programmatically by working with a DoD* [Department of Defense] *program having national security objectives.'*

"The report was produced "by contract" with NASA, it states.

"NAS describe themselves as having been *'created to advise the nation'* with *'independent, objective advice to inform policy'*. [16]

HELEN CALDICOTT: Time to learn lessons of the past on nuclear

The threat of nuclear warfare is ever-present despite the horrors of the past, writes Dr Helen Caldicott.

Space Nuclear Technology

Kilopower project

"US Ramps Up Planning for Space Nuclear Technology: NASA and the Department of Energy are expanding their collaboration as part of a broader White House push to develop nuclear power systems for space applications. The initiative comes as NASA faces key decisions on what fuel sources and technology development paths to pursue.

"Among the Department of Energy officials to attend the Perseverance Rover launch were Office of Science Director Chris Fall, center, National Nuclear Security Administration head Lisa Gordon-Hagerty, far right, and Office of Nuclear Energy head Rita Baranwal, second from right.

"As NASA launched its Perseverance rover to Mars yesterday, senior officials from the Department of Energy were at Cape Canaveral to see it off. Perseverance is the first mission to launch since the Curiosity rover in 2011 that is powered by the radioactive isotope plutonium-238, which is manufactured in DOE facilities.

"Now, NASA, DOE, and the White House want nuclear power to play a much larger role in space exploration as plans take shape for a sustained human presence on the Moon and subsequent crewed journeys to Mars. During their trip, the DOE officials met with representatives from NASA at Kennedy Space Center to launch a new working group that aims to facilitate R&D on new space technologies, including ones powered by nuclear fission rather than radioactive decay.

"NASA is currently debating tradeoffs between different surface power and propulsion methods and is looking for commonalities with reactor designs under development by DOE and the Department of Defense. NASA must also decide whether it will use highly enriched uranium (HEU) or a less-enriched variant as a fuel. Although HEU has certain advantages, such as its high-power density, non-proliferation advocates argue its use would undermine longstanding U.S. efforts to limit applications of the material, which can be adapted for use in nuclear weapons." [17]

"The White House National Space Council released a strategy for deep space exploration on July 23 that identifies DOE as "critical" to the development of nuclear power and propulsion technologies. It notes that NASA plans on developing a power reactor that could provide electricity for a surface Moon base and is exploring nuclear propulsion methods that would significantly cut down travel time to deep-

[16] https://independentaustralia.net/environment/environment-display/nuclear-rockets-to-mars-are-dangerous-and-unnecessary,14812

[17] On Space reactors, see https://www.aip.org/fyi/2020/us-ramps-planning-space-nuclear-technology
Also see: DOE-officials-at-Cape-Canaveral-740x450.jpg

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

space destinations.

"The director of civil space policy at the National Space Council, Ryan Whitley, elaborated on the administration's work to promote nuclear technology development across agencies at a symposium convened this month by the American Astronautical Society.

"Whitley said NASA's "immediate need" is for a surface fission reactor that enables long-duration lunar exploration, since current systems based on radioisotope decay cannot provide enough power for larger missions that must operate through the lunar night or within shadowed craters. He added that nuclear propulsion is a longer-term priority, given its ability to enable eventual missions to Mars and beyond.

"NASA and the National Nuclear Security Administration have already tested a surface reactor through their joint Kilopower project, which is developing a system to provide up to ten kilowatts of electric power for crewed planetary bases. For propulsion technologies, NASA initiated a Mars Transportation Assessment Study in October through which it is evaluating the merits of nuclear thermal propulsion (NTP) versus nuclear electric propulsion (NEP). Both use a nuclear reactor to generate heat, which NTP systems use to expel gas, while NEP systems convert the heat into electricity then thrust.

"Whitley said one of the administration's near-term goals is to establish a capacity for producing high-assay low-enriched uranium (HALEU) that could be used as fuel for a range of agency missions. HALEU is enriched to contain between 5% and 20% of the isotope uranium-235 by weight, and last year DOE announced plans to establish a domestic supply line for the fuel, citing demand from designers of next-generation commercial power reactors. NASA is now exploring HALEU as an alternative to HEU, which it used in the Kilopower test.

"Whitley said the administration is likewise looking to leverage commonalities between reactor designs under consideration by NASA and the Department of Defense. The council's report highlights Project Pele, which is designing mobile reactors to power military bases, and DARPA's DRACO program, which aims to develop spacecraft that can maneuver quickly in the region between the Earth and the Moon.

"While DARPA is pursuing an NTP design through the DRACO program, NASA has not settled on a particular propulsion technology. Asked at the symposium about the choice between NTP and NEP, Whitley declined to weigh in directly given NASA's ongoing deliberations on the subject.

"There's pluses and minuses to both, and so it's not easy necessarily to make a clean decision there," he said.

Congress pushing thermal nuclear propulsion

NTP-rocket-design-740x450.jpg

SpaceX launches 60 Starlink satellites but booster landing fails

https://www.yahoo.com/news/spacex-launches-60-starlink-satellites-062316233.html

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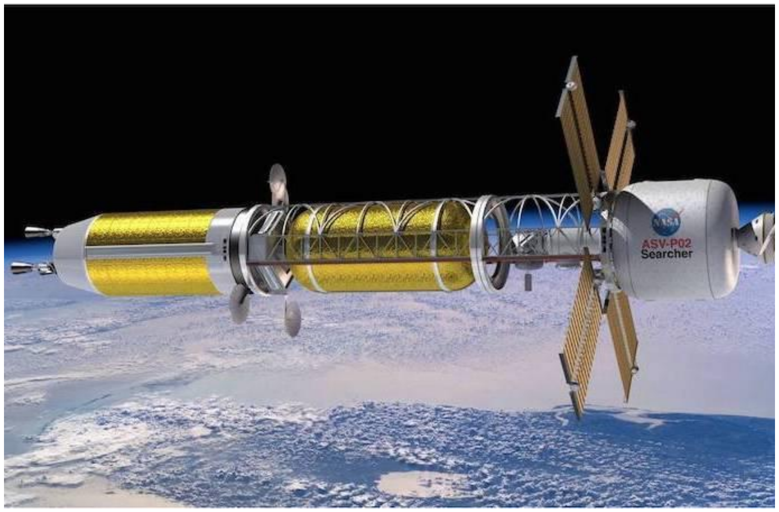
Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute



A design concept for a spacecraft using nuclear thermal propulsion.

NTP-rocket-design-740x450.jpg

"To aid its decision-making, NASA has commissioned a National Academies study committee to assess the tradeoffs associated with NEP and NTP, as well as considerations arising from the use of HEU versus HALEU. Jim Reuter, head of NASA's Space Technology Mission Directorate, told the committee at its kickoff meeting in June that the study is not meant to focus on policy matters, except when it comes to considerations associated with the fuel choice.

"In recent years, Congress has prioritized NTP development, which is led by Marshal Space Flight Center in Alabama. In fiscal year 2020, it provided $110 million specifically for NTP, of which at least $80 million was to prepare for performing a flight demonstration by 2024.

"Reuter said NASA has requested that in future appropriations Congress instead target a demonstration in the late 2020s and not specify that all the funding must go toward NTP. He explained that recent studies are leading the agency to consider "looking much more strongly" at NEP and that it wishes to focus on surface power in the near term.

"Reuter noted that NASA's budget request for fiscal year 2021 includes $100 million for the space nuclear technology portfolio within a new line item, of which $62 million is for surface power and the remainder is for propulsion, not limited to NTP. The agency projects its request for the portfolio will grow to $250 million in fiscal year 2025.

"However, the House has proposed that NASA instead press ahead with NTP, again including $110

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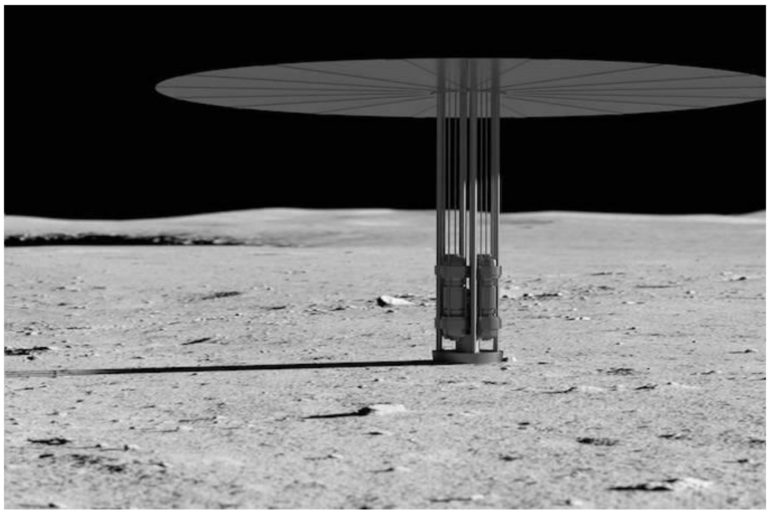
million for its continued development in pending appropriations legislation for fiscal year 2021. In their report accompanying the legislation, House appropriators note they have not yet received a plan they mandated from NASA on a path toward performing an NTP flight demonstration by 2024. The Senate has not yet released its NASA spending legislation for the year.

HEU debate heating up

kilopower-moon-740x450.jpg



An artist's rendering of a Kilopower fission reactor on the Moon.

"As NASA has moved forward with its propulsion and Kilopower projects, non-proliferation advocates have taken issue with NASA's continued interest in using HEU.

"The American Nuclear Society hosted a debate on the topic at its annual meeting in June. While the society has generally supported the use of space nuclear power and propulsion in the past, it has decided to develop a position statement by spring 2021 on whether to favor the use of LEU.

"Among the participants was Rep. Bill Foster (D-IL), a former Fermilab physicist, who argued that proceeding with HEU would set a dangerous precedent. "If all of the spacefaring nations start using HEU reactors in space, then this would involve utilization of a significant amount of weapons grade material," he remarked. Conversely, he continued, if the U.S. develops an LEU-based design, it could

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

become a "de facto standard." Foster also suggested the high costs of security measures associated with handling HEU could outweigh the advantages of using the material.

"Alan Kuperman, a policy scholar affiliated with the Nuclear Proliferation Prevention Project, pointed to U.S. efforts since the 1970s to minimize the use of HEU in civilian applications, arguing they are "based on the logic of no exceptions."

"If we say, 'well, we're going to have exceptions,' then other countries are going to say, 'well, we want exceptions too,' and then the whole thing falls apart," he remarked.

"Among those advocating in favor of HEU, Kilopower chief reactor designer David Poston said that in his experience regulators were most concerned with a criticality accident resulting in a high-yield event, which he said HEU systems tend to mitigate. Len Dudzinski, NASA's program executive for radioisotope power systems, also said that LEU reactors are not powerful enough for certain potential missions, such as burrowing through thick ice sheets on the moons of Europa or Enceladus.

"Bhavya Lal, another panelist at the event and a member of the National Academies study committee, contended that choosing between HEU and LEU is ultimately a political decision rather than a technical one, and noted other countries may pursue HEU systems regardless of how the U.S. proceeds. She advocated for not adopting a blanket ban on the material.

"In my view, it would be prudent that we retain flexibility and allow the use of HEU in space systems only where the mission is not possible without HEU or where HEU is a significant enabler of mission scope or objective," she said [18]

The US military is getting serious about nuclear thermal propulsion

"Activity in cislunar space is expected to increase considerably in the coming years."

Eric Berger - 6/15/2020, 5:18 AM

"There are many ways to get around space, but most of them are pretty slow. This is why, even when launching at an optimal time, a spacecraft leaving Earth requires about six months to reach orbit around Mars.

"For decades, many rocket scientists have looked to a propulsion system powered by a nuclear reactor as the fastest practical means of getting to Mars and other places in the Solar System more quickly.

"Wernher von Braun, the German engineer who defected to the United States after World War II, recognized the potential of nuclear thermal propulsion even before his Saturn V rocket landed humans on the Moon with chemical propulsion. Eventually, this led to a project called NERVA, which stood for Nuclear Engine for Rocket Vehicle Application. It was eventually canceled to help pay for the space shuttle.

"NASA has supported efforts to develop a nuclear thermal engine in fits and starts since. The basic idea is pretty simple—a nuclear reactor heats a propellant such as liquid hydrogen, and it expands through a rocket nozzle and provides thrust. No such rocket engine has ever flown, however, and at

[18] Hale Stolberg, American Institute of Physics, [redacted]

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present, NASA is more interested in developing nuclear energy for surface power on other worlds than working on propulsion."

Enter DARPA

"But now, the US Department of Defense is getting interested in space-based propulsion. Last month, through a presolicitation, the US Defense Advanced Research Projects Agency announced its intent to have a flyable nuclear thermal propulsion system ready for a demonstration in 2025.

"Through this Demonstration Rocket for Agile Cislunar Operations, or DRACO program, the defense agency seeks technology that will allow for more responsive control of spacecraft in Earth orbit, lunar orbit, and everywhere in between, giving the military greater operational freedom in these domains.

""Activity in cislunar space is expected to increase considerably in the coming years," Maj Nathan Greiner, manager of the DRACO Program, told Ars. "An agile nuclear thermal propulsion vehicle enables the DOD to maintain Space Domain Awareness of the burgeoning activity within this vast volume."

Further Reading

Astra came close to achieving what DARPA has sought for two decades

"In 'Phase 1' of its solicitation, DARPA has asked industry for the designs of both a nuclear thermal reactor and an operational spacecraft upon which to demonstrate it. This initial phase of the program will last 18 months. Subsequent phases will lead to detailed design, fabrication, ground tests, and an in-space demonstration. No contracts have yet been awarded, and award values will be determined by industry submissions.

"With the DRACO program, the US Defense Department could potentially move large satellites quickly around cislunar space. For example, moving a 4-ton satellite from point A to point B might take about six months with solar electric propulsion, whereas it could be done in a few hours with nuclear thermal propulsion.

"To use this technology for Mars missions, NASA would probably want a system with higher thrust. But having DARPA show the way in terms of developing this technology, proving out a lot of overlapping technologies, and demonstrating operation of a nuclear engine in space, would have benefits for NASA down the road. So while the defense department is interested in cislunar space, a successful DRACO test would be good news for human exploration as well.

Converging technologies

"DARPA's decision to push forward with development of nuclear thermal propulsion comes as critical enabling technologies are maturing, said Jonathan Cirtain, president of advanced programs at BWX Technologies. Cirtain's company, which makes most of the nuclear reactors found on US Navy submarines and aircraft carriers, is working with NASA on the design of a reactor to enable Mars missions.

"One advancement has come in the ability to manufacture refractory metals, which are extraordinarily resistant to heating. To operate efficiently, Cirtain said, an engine must be able to withstand huge temperature and pressure changes across just two meters in length. Hydrogen fuel is stored at just 19 Kelvin and heated to 2,500 Kelvin or higher.

"At the same time, engineers designing nuclear reactor cores have access to computational power that allows them to iterate new designs—calculating such variables as neutron flux and fluid dynamics—quickly. "Now, with supercomputers on your desk, you can go from years' worth of calculation time to

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days, and iterate to a design solution much faster than you could previously," he said.
"DARPA has decided that now is the time to capitalize on these maturing technologies."

NASA's plasma rocket making progress toward a 100-hour firing

https://arstechnica.com/science/2017/08/nasas-plasma-rocket-making-progress-toward-a-100-hour-firing/?itm_source=parsely-api

Now, the company is firing VASIMR for about five minutes at a time.

Eric Berger - 8/10/2017, 6:56 AM

"Almost everyone recognizes that if humans are truly to go deeper into the Solar System, we need faster and more efficient propulsion systems than conventional chemical rockets. Rocket engines powered by chemical propellants are great for breaking the chains of Earth's gravity, but they consume way too much fuel when used in space and don't offer optimal control of a spacecraft's thrust.

"NASA recognizes this, too. So in 2015, the space agency awarded three different contracts for development of advanced propulsion systems. Of these, perhaps the most intriguing is a plasma-based rocket—which runs on Argon fuel, generates a plasma, excites it, and then pushes it out a nozzle at high speed. This solution has the potential to shorten the travel time between Earth and Mars to weeks, rather than months."

Further Reading

NASA's longshot bet on a revolutionary rocket may be about to pay off

"But to realize that potential, Houston-based Ad Astra Rocket Company must first demonstrate that its plasma rocket, VASIMR, can fire continuously for a long period of time. The three-year, $9 million contract from NASA required the company to fire its plasma rocket for 100 hours at a power level of 100 kilowatts by 2018.

"This week, Ad Astra reported that it remains on target toward that goal. The company completed a successful performance review with NASA after its second year of the contract, and it has now fired the engine for a total of 10 hours while making significant modifications to its large vacuum chamber to handle the thermal load produced by the rocket engine.

"As the company continues to test the new hardware, it is gradually building up to longer and longer pulses, with inspections in between. Ad Astra remains on target to perform the 100-hour test in late summer or early fall of 2018, Chang-Diaz said.

"Initially, the company foresees the plasma rocket as a means for pushing cargo between Earth and the Moon—or on to Mars. With solar powered panels, the rocket would have a relatively low thrust and therefore would move loads slowly but efficiently. But with more power, such as from a space-based nuclear reactor, it could one day reach much higher velocities that would allow humans to travel rapidly through the Solar System."

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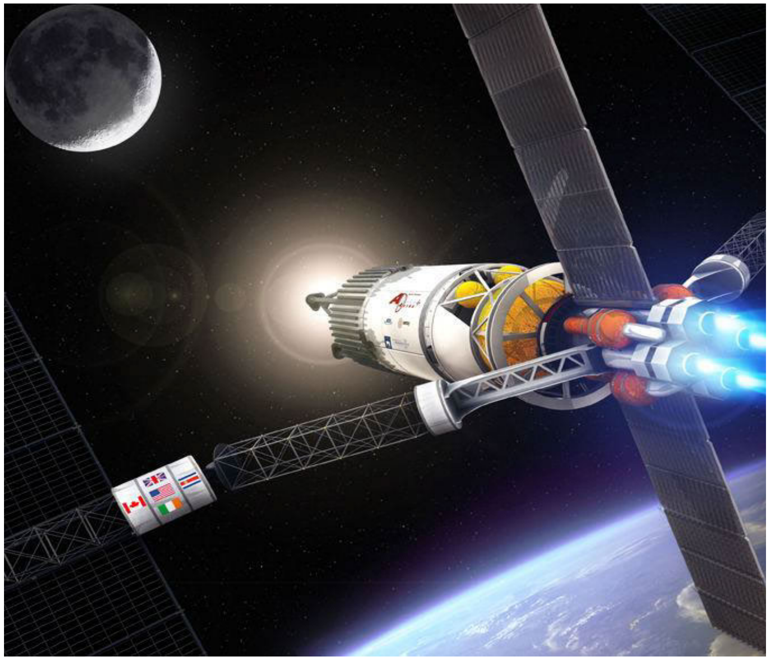

NASA's plasma rocket making progress toward a 100-hour firing

Now, the company is firing VASIMR for about five minutes at a time.

Eric Berger - 8/10/2017, 6:56 AM

"With 200 kW of solar power, the VASIMR engine could be used as a lunar tug.

"Almost everyone recognizes that if humans are truly to go deeper into the Solar System, we need faster and more efficient propulsion systems than conventional chemical rockets. Rocket engines

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

powered by chemical propellants are great for breaking the chains of Earth's gravity, but they consume way too much fuel when used in space and don't offer optimal control of a spacecraft's thrust.

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"When Ars visited Ad Astra early in 2017, it was pulsing its rocket for about 30 seconds at a time. Now, the company is firing VASIMR for about five minutes at a time, founder Franklin Chang-Diaz told Ars. "The limitation right now is moisture outgassing from all the new hardware in both the rocket and the vacuum chamber," he said. "This overwhelms the pumps, so there is a lot of conditioning that has to be done little by little."

"As the company continues to test the new hardware, it is gradually building up to longer and longer pulses, with inspections in between. Ad Astra remains on target to perform the 100-hour test in late summer or early fall of 2018, Chang-Diaz said.

"Initially, the company foresees the plasma rocket as a means for pushing cargo between Earth and the Moon—or on to Mars. With solar powered panels, the rocket would have a relatively low thrust and therefore would move loads slowly but efficiently. But with more power, such as from a space-based nuclear reactor, it could one day reach much higher velocities that would allow humans to travel rapidly through the Solar System."

NASA wants to cut travel time to Mars "in half" with new propulsion tech

Ion thrusters, nuclear rockets, and other in-space propulsion tech being looked at.

Sebastian Anthony - 6/4/2015, 11:13 AM

NASA/JPL

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

"Speaking at an Aerojet Rocketdyne plant, NASA administrator Charles Bolden said the program is looking into advanced propulsion technologies that can cut the current eight-month journey to Mars "in half." Technologies such as solar-electric propulsion are definitely in the cards, but NASA may look towards more unconventional solutions such as nuclear rockets as well.

"Over the past few years, there's been a lot of attention on getting astronauts to Mars, mostly fuelled by crazy projects like Mars One, the success of the Curiosity rover, and heavyweights like Elon Musk saying he wants to colonise the planet.

"The main problem with getting humans to Mars is that, with our current liquid-fuelled rocket engines, it takes a very long time to get there; about eight months or so. If we can cut the journey in half, we significantly reduce the amount of food and water needed—which in turn cuts down the weight of the spacecraft, which in turn reduces the amount of fuel needed, which in turn feeds a very positive feedback loop. Less time in outer space means astronauts will be bombarded by less radiation too."

Further Reading

Round trip to Mars would push radiation safety limits

"Finding a propulsion technology that's better than liquid fuel, though, has proven difficult. NASA has been looking at a variety of different technologies for *decades*. An In-Space Propulsion roadmap (PDF) from 2010 lists no less than 41 different propulsion methods. One of the most promising propulsion techniques, at least in the short term, is solar-electric propulsion—gathering solar energy with photovoltaic cells, which then powers some kind of electric engine like a Hall effect ion thruster.

"Aerojet Rocketdyne recently won a NASA contract to develop Hall effect ion thrusters. The main benefit of solar-electric propulsion (SEP) technologies such as ion thrusters is that the energy source (the Sun) lasts for a very long time, while liquid-fuelled rockets have a very finite duration. SEPs aren't quite ready to send humans to Mars, though. "The limiting power of this type of propulsion has been the power to drive it," Bolden said, according to Space.com's account of Bolden's visit to the Aerojet facility. "Aerojet Rocketdyne has partnered with different entities around the country in looking [at] how to get more energy density onto a solar cell. The more power we can get, the larger we can make the engine and its capability."

"According to Space.com, Bolden also mentioned the possibility of using thermal nuclear rockets: rockets that use a nuclear reactor to heat gas, which then expands through the nozzle to create thrust. NASA did a lot of work on nuclear rockets with the NERVA program in the '50s and '60s, but it was eventually cancelled in 1972.

"Bolden wants NASA to put more money into in-space propulsion technologies, noting that they could be "game changers." Bolden also stressed that he doesn't want NASA's rocket partners to fixate on moving *cargo* more quickly through space. "I want industry to focus on getting people to move really fast. I think we can do far better than we are doing today, but we've got to show our commitment by putting some money into it."

Space X deployment of 5G system

80 to 100 thousand low-orbit satellites will require thousands of launches to deploy these 5G satellites thus resulting in significant emissions and o-zone depletion that must be included in a comprehensive PEIS. The debris when these satellites eventually fall back to earth must also be included in the PEIS. **67-1 cont'd**

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

Media hype over Mars rover ignores deadly truth

*"Media coverage of the Perseverance rover mission fails to report that NASA projected fair odds of lethal plutonium being released by accident, writes Professor **Karl Grossman**.* [19]

"WITH ALL the media hoopla last week about the Perseverance rover, frequently unreported was that its energy source is plutonium – considered the most lethal of all radioactive substances – and nowhere in media that National Aeronautics and Space Administration (NASA) projected one-in-960 odds of the plutonium being released in an accident on the mission.

"*'A "one-in-960 chance" of a deadly plutonium release is a real concern — gamblers in Las Vegas would be* Further, NASA's Supplementary Environmental Impact Statement (SEIS) for the U.S.$3.7 billion (AU$4.8 billion) mission acknowledges that an "alternative" power source for Perseverance could have been solar energy. Solar energy using photovoltaic panels has been the power source for a succession of Mars rovers.

"For an accident releasing plutonium on the Perseverance launch – and one in 100 rockets undergo major malfunctions upon launch, mostly by blowing up – NASA, in its SEIS, described these impacts for the area around Cape Canaveral under a heading *'Impacts of Radiological Releases on the Environment'*. NASA states:

"*In addition to the potential human health consequences of launch accidents that could result in a release of plutonium dioxide, environmental impacts could also include contamination of natural vegetation, wetlands, agricultural land, cultural, archaeological and historic sites, urban areas, inland water, and the ocean, as well as impacts on wildlife'.*

"In addition to the potential direct costs of radiological surveys, monitoring, and potential cleanup following an accident, there are potential secondary societal costs associated with the decontamination and mitigation activities due to launch area accidents. Those costs may include: temporary or longer-term relocation of residents; temporary or longer-term loss of employment; destruction or quarantine of agricultural products, including citrus crops; land-use restrictions; restrictions or bans on commercial fishing; and public health effects and medical care.

"NASA was compelled to make disclosures about the odds of an accident releasing plutonium, alternatives to using nuclear power on the Perseverance and consequences of a plutonium release, under the National Environmental Policy Act (NEPA).

"Meanwhile, the U.S. is now producing large amounts of plutonium-238, the plutonium isotope used for space missions. The U.S. stopped producing plutonium-238 in 1988 and began obtaining it from Russia, however that is no longer happening. A series of NASA space shots using plutonium-238 are planned for coming years.

"Plutonium-238 is 280 times more radioactive than plutonium-239, the plutonium isotope used in atomic bombs and as a "trigger" in hydrogen bombs.

"There are 10.6 pounds (4.8 kilograms) of plutonium-238 on Perseverance.

"We might have dodged a plutonium bullet on the Perseverance mission. The Atlas V rocket carrying it was launched without blowing up. And the rocket didn't fall back from orbit with Perseverance and its plutonium-238 disintegrating on re-entry into the Earth's atmosphere and plutonium dispersed.

[19] By Karl Grossman | 28 February 2021, 12:00pm

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"But with NASA planning more space missions involving nuclear power, including developing nuclear-powered rockets for trips to Mars and launching rockets carrying nuclear reactors for placement on the Moon and Mars, space-based nuclear Russian roulette is at hand."

Dangers of launching nukes into space [20]

"The US began launching space probes with nuclear power in the early 1960's. One of these military satellites powered with a nuclear reactor fell back to Earth in April of 1964.

"It was called SNAP 9-A and was launched aboard a Department of Defense weather satellite that failed to reach orbit. The nuclear reactor, as designed, released radioactive debris in our upper atmosphere during reentry and then burned up. Remnants struck the Indian Ocean. A total of 2.1 pounds of plutonium-238 vaporized in the atmosphere and spread worldwide.

"Over the years there have been a host of space nuclear accidents by the US and former Soviet Union/Russia. See more **here**

"Dr. John Goffman studied the SNAP 9-A accident and concluded that the dispersed deadly plutonium-238 was a leading cause of the increase in cancers around the world today. During our 1997 Florida Coalition for Peace & Justice and Global Network campaign to stop the launch of the Cassini space probe, with 72 pounds of plutonium-238 onboard, Goffman was a huge help to us doing frequent media interviews where he warned of the dangers of global contamination if there was to be a launch accident.

"(Goffman's earliest research was in nuclear physics and chemistry, in close connection to the Manhattan Project. He co-discovered several radioisotopes, notably uranium-233; he was the third person ever to work with plutonium. Later in life, Gofman took on a role as an advocate warning of dangers involved with nuclear power.)

"The nuclear industry currently views space as a new (and wide open) market for their toxic product that has run its dirty course on Mother Earth.

"During our campaigns in 1989, 1990, and 1997 to stop NASA's Galileo, Ulysses and Cassini plutonium launches, we learned that the nuclear industry positioned their agents inside NASA committees that made the decisions on what kinds of power sources would be placed on those deep space missions. Similarly, it now appears that the nuclear industry has also infiltrated the National Academies of Sciences, Engineering, and Medicine that has been studying missions to Mars. The recommendation, not any surprise, is that nuclear reactors are the best way to power a Mars mission.

"But nukes are not the best for us Earthlings because the Department of Energy (DoE) has a bad track record of human and environmental contamination as they fabricate space nuclear devices. An accident at launch could have catastrophic consequences.

"In 1996, just prior to the launch of Cassini, it was reported that while fabricating the plutonium generators for the Cassini space probe, 244 cases of worker contamination occurred at DoE's Los Alamos lab in New Mexico. So it is not just a launch pad explosion that we worry about.

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[20] Bruce K. Gagnon, **http://space4peace.blogspot.com/2021/02/our-opposition-remains-dangers-of.html** February 15, 2021

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

"We fought the DoE and NASA on those previous nuclear launches and are entering the struggle again. The nuclear industry has its sights set on nuclear-powered mining colonies on an assortment of planetary bodies - all necessitating legions of nuclear devices being produced at DoE and then launched on rockets that blow up from time to time. They are also now promoting a nuclear rocket to Mars - with reactors for engines. The Pentagon has long claimed that they need nuclear reactors to power space-based weapons.

"We urge the public to help us pressure Congress, NASA and DoE to 'say no' to nukes in space. We've got to protect life here on this planet. The best way you can help is to share this information with others so that we can build an international base of awareness and action around this issue.

"We are in the middle of a pandemic and people have lost jobs, homes, health care and even food on their table. Trips to Mars (without nuclear devices) can wait."

The cumulative impact of space projects and NASA's testing/launch/waste disposal of nuclear space propulsion on radiation emissions must be considered in this VTR comprehensive Programmatic EIS. 67-1 cont'd

Programmatic NEPA Applicability to Reactors and Reactor Waste Planned or Ready in Initial Operations Throughout the US by DOD, DOE, NASA and NRC.

Title 10: Energy
PART 1021—NATIONAL ENVIRONMENTAL POLICY ACT IMPLEMENTING PROCEDURES
Subpart C—Implementing Procedures

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10 §1021.330 Programmatic (including site-wide) NEPA documents.

"(a) When required to support a DOE programmatic decision (40 CFR 1508.18(b)(3)), DOE shall prepare a programmatic EIS or EA (40 CFR 1502.4). DOE may also prepare a programmatic EIS or EA at any time to further the purposes of NEPA.

(b) A DOE programmatic NEPA document shall be prepared, issued, and circulated in accordance with the requirements for any other NEPA document, as established by the CEQ Regulations and this part.

(c) As a matter of policy when not otherwise required, DOE shall prepare site-wide EISs for certain large, multiple-facility DOE sites; DOE may prepare EISs or EAs for other sites to assess the impacts of all or selected functions at those sites.

(d) DOE shall evaluate site wide NEPA documents prepared under §1021.330(c) at least every five years. DOE shall evaluate site-wide EISs by means of a Supplement Analysis, as provided in §1021.314. Based on the Supplement Analysis, DOE shall determine whether the existing EIS remains adequate or

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whether to prepare a new site-wide EIS or supplement the existing EIS, as appropriate. The determination and supporting analysis shall be made available in the appropriate DOE public reading room(s) or in other appropriate location(s) for a reasonable time.

(e) DOE shall evaluate site-wide EAs by means of an analysis similar to the Supplement Analysis to determine whether the existing site-wide EA remains adequate, whether to prepare a new site-wide EA, revise the FONSI, or prepare a site wide EIS, as appropriate. The determination and supporting analysis shall be made available in the appropriate DOE public reading room(s) or in other appropriate location(s) for a reasonable time."

§1021.341 Coordination with other environmental review requirements.

"(a) In accordance with 40 CFR 1500.4(k) and (o), 1502.25, and 1506.4, DOE shall integrate the NEPA process and coordinate NEPA compliance with other environmental review requirements to the fullest extent possible.

(b) To the extent possible, DOE shall determine the applicability of other environmental requirements early in the planning process, in consultation with other agencies when necessary or appropriate, to ensure compliance and to avoid delays, and shall incorporate any relevant requirements as early in the NEPA review process as possible."

§1021.102 Applicability.

(a) This part applies to all organizational elements of DOE except the Federal Energy Regulatory Commission.

(b) This part applies to any DOE action affecting the quality of the environment of the United States, its territories or possessions. DOE actions having environmental effects outside the United States, its territories or possessions are subject to the provisions of Executive Order 12114, "Environmental Effects Abroad of Major Federal Actions" (3 CFR, 1979 Comp., p. 356; 44 FR 1957, January 4, 1979), DOE guidelines implementing that Executive Order (46 FR 1007, January 5, 1981), and the Department of State's "Unified Procedures Applicable to Major Federal Actions Relating to Nuclear Activities Subject to Executive Order 12114" (44 FR 65560, November 13, 1979).

§1021.103 Adoption of CEQ NEPA regulations.

DOE adopts the regulations for implementing NEPA published by CEQ at 40 CFR parts 1500 through 1508.

Definition: Programmatic NEPA document means a broad-scope EIS or EA that identifies and assesses the environmental impacts of a DOE program; it may also refer to an associated NEPA document, such as an NOI, ROD, or FONSI.

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

§1021.341 Coordination with other environmental review requirements.

(a) In accordance with 40 CFR 1500.4(k) and (o), 1502.25, and 1506.4, DOE shall integrate the NEPA process and coordinate NEPA compliance with other environmental review requirements to the fullest extent possible.

(b) To the extent possible, DOE shall determine the applicability of other environmental requirements early in the planning process, in consultation with other agencies when necessary or appropriate, to ensure compliance and to avoid delays, and shall incorporate any relevant requirements as early in the NEPA review process as possible.

§1021.342 Interagency cooperation.

For DOE programs that involve another Federal agency or agencies in related decisions subject to NEPA, DOE will comply with the requirements of 40 CFR 1501.5 and 1501.6. As part of this process, DOE shall cooperate with the other agencies in developing environmental information and in determining whether a proposal requires preparation of an EIS or EA, or can be categorically excluded from preparation of either. Further, where appropriate and acceptable to the other agencies, DOE shall develop or cooperate in the development of interagency agreements to facilitate coordination and to reduce delay and duplication.

Title 40: Protection of Environment
PART 1502—ENVIRONMENTAL IMPACT STATEMENT

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40 §1502.4 Major Federal actions requiring the preparation of environmental impact statements.

"(a) Agencies shall define the proposal that is the subject of an environmental impact statement based on the statutory authorities for the proposed action. Agencies shall use the criteria for scope (§1501.9(e) of this chapter) to determine which proposal(s) shall be the subject of a particular statement. Agencies shall evaluate in a single environmental impact statement proposals or parts of proposals that are related to each other closely enough to be, in effect, a single course of action.

(b) Environmental impact statements may be prepared for programmatic Federal actions, such as the adoption of new agency programs. When agencies prepare such statements, they should be relevant to the program decision and timed to coincide with meaningful points in agency planning and decision making.

(1) When preparing statements on programmatic actions (including proposals by more than one agency), agencies may find it useful to evaluate the proposal(s) in one of the following ways:

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

(I) Geographically, including actions occurring in the same general location, such as body of water, region, or metropolitan area.

(ii) Generically, including actions that have relevant similarities, such as common timing, impacts, alternatives, methods of implementation, media, or subject matter.

(iii) By stage of technological development including Federal or federally assisted research, development or demonstration programs for new technologies that, if applied, could significantly affect the quality of the human environment. Statements on such programs should be available before the program has reached a stage of investment or commitment to implementation likely to determine subsequent development or restrict later alternatives.

(2) Agencies shall as appropriate employ scoping (§1501.9 of this chapter), tiering (§1501.11 of this chapter), and other methods listed in §§1500.4 and 1500.5 of this chapter to relate programmatic and narrow actions and to avoid duplication and delay. Agencies may tier their environmental analyses to defer detailed analysis of environmental impacts of specific program elements until such program elements are ripe for final agency action."

EXAMPLE OF Applicability of PEIS

"The Final Programmatic EIS incorporates by reference the Draft Programmatic EIS published in June 2003. After considering all the comments received on the Draft PEIS and developing responses, the agencies determined that changes required to the Draft Programmatic EIS were minor. Therefore, the agencies implemented the provision of the Council on Environmental Quality regulations for implementing the National Environmental Policy Act at Section 1503.4(c), which reads:

(c) If changes in response to comments are minor and are confined to the responses described in paragraphs (a)(4) and (5) of this section, agencies may write them on errata sheets and attach them to the statement instead of rewriting the draft statement. In such cases only the comments, the responses, and the changes and not the final statement need be circulated (Sec. 1502.19). The entire document with a new cover sheet shall be filed as the final statement (Sec. 1506.9).

"In accordance with this provision, the agencies placed a Final Programmatic EIS cover sheet on the Draft Programmatic EIS and, along with the errata sheet and comments/responses, filed it as the Final Programmatic EIS on mountaintop coal mining and associated valley fills in Appalachia.

"DEPARTMENT OF DEFENSE Department of the Army, Corps of Engineers ENVIRONMENTAL PROTECTION AGENCY DEPARTMENT OF THE INTERIOR Office of Surface Mining Fish and Wildlife Service Final Programmatic Environmental Impact Statement for Mountaintop Mining and Valley Fills

"SUMMARY: The above agencies announce the availability of the FPEIS that considers developing policies, guidance, and coordinated agency decision- making processes to minimize, to the maximum extent practicable, the adverse environmental effects to waters of the United States and to fish and wildlife resources affected by mountaintop mining operations, and to environmental resources that could be affected by the size and location of excess spoil-disposal sites in valley fills within the Appalachian

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

study area in West Virginia, Kentucky, Virginia, and Tennessee. This FPEIS was prepared as part of a settlement agreement that resolved the Federal claims brought in Bragg v. Robertson, Civ. No. 2:98–0636 (S.D.W.Va.). This FPEIS was prepared consistent with the provision set forth in 40 CFR 1503.4(c) of the Council on Environmental Quality regulations implementing NEPA, which allow the agencies to attach an errata sheet to the statement instead of rewriting the draft statement and to circulate the errata, comments, responses, and the changes, rather than the entire document. The agencies are filing the entire statement with a new cover sheet as the FPEIS. The FPEIS is being made available by mail and can be viewed on the Internet at http://www.epa.gov/region3/mtntop/ index.htm. The FPEIS can also be viewed at local offices of the above agencies and at selected local libraries. Copies of the FPEIS may be obtained by writing to the address listed below."

10 CFR 1021.315,

"Amended Record of Decision for the Department of Energy's Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility, DOE/EIS–0310AGENCY: Department of Energy. ACTION: Amended record of decision. SUMMARY: The Department of Energy (DOE), pursuant to 10 CFR 1021.315, its implementing regulations under the National Environmental Policy Act (NEPA), is amending its Record of Decision (ROD) (66 FR 7877, January 26, 2001) for its Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility (Nuclear Infrastructure (NI) PEIS)."

EDI's VTR Comment Summary

In EDI's view, the prolifery of reactors, the nuclear fuel and radioactive waste generated by these reactors discussed above is clearly problematic deserving a full Programmatic Environmental Impact Statement (PEIS) to fully evaluate the cumulative impact. As the regulations cited above demonstrate, a Programmatic Environmental Impact Statement (PEIS) is required for the segmented and expansive program of these agencies (DOD, DOE, NRC, National Nuclear Security Administration, National Academies and NASA). In addition, the multiple US agencies involved, these reactors and their related nuclear wase operations are spread around multiple states. As the statute below outlines:

40 §1502.4 Major Federal actions requiring the preparation of environmental impact statements.

67-1 cont'd

"(b) Environmental impact statements may be prepared for programmatic Federal actions, such as the adoption of new agency programs. When agencies prepare such statements, they should be relevant to the program decision and timed to coincide with meaningful points in agency planning and decision making.
(1) When preparing statements on programmatic actions (including proposals by more than one agency), agencies may find it useful to evaluate the proposal(s) in one of the following ways:
(i) Geographically, including actions occurring in the same general location, such as body of water, region, or metropolitan area.
(ii) Generically, including actions that have relevant similarities, such as common timing, impacts,

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Commenter No. 67 (cont'd): Chuck Broscious, Environmental Defense Institute

alternatives, methods of implementation, media, or subject matter.

(iii) By stage of technological development including Federal or federally assisted research, development or demonstration programs for new technologies that, if applied, could significantly affect the quality of the human environment. Statements on such programs should be available before the program has reached a stage of investment or commitment to implementation likely to determine subsequent development or restrict later alternatives.

(2) Agencies shall as appropriate employ scoping (§1501.9 of this chapter), tiering (§1501.11 of this chapter), and other methods listed in §§1500.4 and 1500.5 of this chapter to relate programmatic and narrow actions and to avoid duplication and delay. Agencies may tier their environmental analyses to defer detailed analysis of environmental impacts of specific program elements until such program elements are ripe for final agency action." 67-1 cont'd

In EDI's view, the prolifery of reactors proposed by so many US agencies, the nuclear fuel produced at numerous DOE sites and radioactive waste generated by all these reactors discussed above is clearly problematic deserving a full Programmatic Environmental Impact Statement (PEIS) to fully evaluate the cumulative impact. It's imperative to show the American public the collective impact/scope of these projects via a PEIS.

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Commenter No. 68: Christine D. Andres, Chief, Bureau of Federal Facilities, Nevada Division of Environmental Protection

NEVADA DIVISION OF
ENVIRONMENTAL PROTECTION

STATE OF NEVADA
Department of Conservation & Natural Resources
Steve Sisolak, Governor
Bradley Crowell, Director
Greg Lovato, Administrator

March 2, 2021

Mr. James Lovejoy
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83402-1510

RE: Draft Versatile Test Reactor Environmental Impact Statement

Dear Mr. Lovejoy:

The Nevada Division of Environmental Protection (NDEP) provides herein comments on the U.S. Department of Energy's (DOE) Draft *Versatile Test Reactor Environmental Impact Statement* (VTR DEIS), December 2020.

1. A significant conflict exists between the timeframes covered by the VTR DEIS and the *Final Site-Wide Environmental Impact Statement for the Continued Operation for the Department of Energy/National Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada, February 2013 (DOE/EIS-0426)* (NNSS SWEIS).

   The NNSS SWEIS does not account for the proposed VTR waste stream as the NNSS SWEIS analyzes potential environmental impacts until 2023. The proposed VTR waste streams will not be generated until 2026, at the earliest.

   10 Code of Federal Regulations [CFR] §1021.330(d) requires the DOE to evaluate site-wide NEPA documents prepared under §1021.330(c) at least every five years. 10 CFR §1021.330(d) also states, "DOE shall evaluate site-wide EISs by means of a Supplement Analysis, as provided in §1021.314. Based on the Supplement Analysis, DOE shall determine whether the existing EIS remains adequate or whether to prepare a new site-wide EIS or supplement the existing EIS, as appropriate." **68-1**

   The State of Nevada recommends that the process for reanalysis of the NNSS SWEIS as required by 10 CFR §1021.330(d) begin as soon as possible as the DOE will need to conduct further NEPA analysis of any continued use of the NNSS for disposal of waste from the VTR DEIS past the timeframes covered by the 2013 NNSS SWEIS. Additionally, as the baseline for EM Nevada's presence at the NNSS is anticipated to end between 2028 and 2030, coinciding, for the most part, with the start of waste generation from the VTR operation and fuel production, the fact that the NNSS Radioactive Waste Management Complex may not be operational/accepting waste past 2028-2030 should be taken into consideration in the VTR DEIS. **68-2**

375 East Warm Springs Rd, Suite 200 • Las Vegas, NV 89119 • p: 702.668.3900 • f: 702.486.2863 • ndep.nv.gov
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68-1 The continued operation of the DOE/NNSA Nevada National Security Site (NNSS) is not within the scope of this VTR EIS. Continued operation of the NNSS is monitored and the associated documentation, including National Environmental Policy Act (NEPA) documents, are evaluated for any necessary revisions and updates. While the VTR EIS does discuss past and current disposal of low-level and mixed low-level wastes at NNSS, it does not specify that the VTR alternatives or reactor fuel production options low-level or mixed low-level wastes would be disposed at NNSS. NNSS disposal is one option included in the VTR EIS analysis and its use would be contingent on the status and availability of the disposal facility, as well as other disposal options, at the time disposal would be required. Commercial disposal options were also identified and evaluated in this VTR EIS. Adequate capacity for VTR waste is anticipated regardless of the disposal facility selected.

The National Nuclear Security Administration Nevada Field Office (NNSA/NFO) reviews the NNSS Site-wide Environmental Impact Statement (SWEIS) continually as activities/projects are proposed or changed. Currently, projected future missions are within the bounds of the NNSS SWEIS; however, NNSA/NFO will continue to assess all projects as part of the formal NEPA process. The waste from the VTR project, should it come to the NNSS, would be within the bounds of the NNSS SWEIS analysis. NNSA will continue to pursue the necessary resources to execute the appropriate NEPA processes as required.

68-2 Please refer to response to comment 68-1.

Commenter No. 68 (cont'd): Christine D. Andres, Chief, Bureau of Federal Facilities, Nevada Division of Environmental Protection

Mr. James Lovejoy
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2. Chapter 5, Page 21 of the VTR DEIS states "There are existing offsite DOE and commercial waste management facilities with sufficient capacities for the treatment and disposal needs of the relatively small volumes of LLW and MLLW generated by the Proposed Action. Consequently, substantial cumulative impacts on offsite LLW and MLLW treatment and disposal facilities would not be expected."

   401 CFR §1502.15 Affected environment states, "The environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration, including the reasonably foreseeable environmental trends and planned actions in the area(s). … Data and analyses in a statement shall be commensurate with the importance of the impact, with less important material summarized, consolidated, or simply referenced…"

   The State of Nevada recognizes that the VTR DEIS states there will be relatively small volumes of LLW and MLLW generated by the Proposed Action. However, as the NNSS is identified in the VTR DEIS as a potential waste disposal site, the State of Nevada requests that the DOE provide the documentation used in the analysis under 40 CFR §1502.15 that all past, present, and future actions that contribute to any and all cumulative effects for waste disposal capacity at the NNSS have been evaluated. *68-3*

3. *DOE Manual 435.1-1 Chg. 2 Radioactive Waste Management*, Chapter I.2.F (4) states, "DOE radioactive waste shall be treated, stored, and in the case of low-level waste, disposed of at the site where the waste is generated, if practical; or at another DOE facility."

   The NNSS currently receives an average of 66,327 ft^3 (1,878 m^3) of Low-Level Waste (LLW) per year from Idaho National Lab Generators. The projected generation of 31,077 ft^3 (880 m^3) of LLW waste generated per year from the operation of the Versatile Test Reactor, Feedstock Preparation, and Fuel Fabrication is a 59% increase in waste received from Idaho National Lab at the NNSS and would then represent 23% of the total waste generated annually by INEL. The Idaho National Laboratory currently has two active low level waste disposal facilities onsite (RWMC LLW Disposal Facility and Remote-Handled LLW Facility). *68-4*

   The VTR DEIS does not analyze the current onsite disposal using these existing disposal facilities or analysis on future additional onsite LLW disposal cells.

   The State of Nevada requests as required by 40 CFR §1502.14(a), which requires the evaluation of <u>reasonable alternatives</u> to the proposed action, and, for alternatives that the agency eliminated from detailed study, briefly discuss the reasons for their elimination, that the DOE evaluate the feasibility of onsite disposal and include the findings and analysis in the VTR EIS.

4. The VTR EIS cites the *1997 Final Waste Management Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (WM PEIS) as a NEPA document related to the scope of the VTR project. The WM PEIS identifies Hanford and the NNSS as regional disposal sites. In addition, the WM PEIS also asserts that, *68-5*

68-3 Please refer to response to comment 68-1.

68-4 DOE notes that the "alternatives" evaluated in this EIS are alternatives for the construction and operation of the VTR; waste disposal is not the proposed action that is being evaluated in this EIS. Whereas onsite disposal has occurred in the past, the Radioactive Waste Management Complex (RWMC) at the Idaho National Laboratory (INL) Site stopped receiving low-level waste in April 2021. All activities at RWMC will focus on Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) closure activities beginning in January 2022. The RWMC will be closed in accordance with the Record of Decision for Radioactive Waste Management Complex Operable Unit 7-13/14 (DOE-ID/EPA/IDEQ 2008).

68-5 The DOE evaluation of sending low-level and mixed low-level waste generated off site to Hanford is still pending. Also, please refer to the response to comment 68-1.

Commenter No. 68 (cont'd): Christine D. Andres, Chief, Bureau of Federal Facilities, Nevada Division of Environmental Protection

Mr. James Lovejoy
Page 3 of 4
March 2, 2021

consistent with current practice, LLW disposal operations at LANL, ORR, INEL and SRS would continue, to the extent practicable. LANL and ORR would continue disposal of LLW generated on-site and INEL and SRS would continue to dispose of LLW generated on-site or by the Naval Nuclear Propulsion Program. For the management of MLLW analyzed in the WM PEIS, it is stated that the Department prefers regional disposal at Hanford and NNSS, which was subsequently codified in the *Identification of Preferred Alternatives for the Department of Energy's Waste Management Program: Low-Level Waste and Mixed Low-Level Waste Disposal Sites (64 FR 69241)*, published December 10, 1999.

On December 18, 2009, the Department of Energy published the *Notice of Modifications to the Preferred Alternatives for Tank Waste Treatment and Disposal of Off-Site Waste in the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA* (74 FR 67189), which states in part that "... DOE would not send LLW and MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions) at least until the WTP is operational, consistent with DOE's proposed settlement agreement with the State of Washington. Off-site waste would be addressed after the WTP is operational subject to appropriate NEPA review..."

Nevada recognizes the limitations set forth in 74 FR 68179. However, the 2013 NNSS SWEIS states "DOE has established a moratorium on the receipt of offsite waste at the Hanford Site until 2022 or until the Waste Treatment Plant at the Hanford Site is operational. This facility is currently under construction and is designed to treat radioactive waste from the Hanford Site's underground storage tanks." This statement aligns with 74 FR 68179 and expands it with the inclusion of a deadline. **68-5 cont'd**

Additionally, the VTR EIS Section 5.1 States that "Two other DOE sites, the Hanford Site, and the Nevada National Security Site (NNSS), allow for disposal of both onsite and offsite generated LLW and MLLW, as long as the waste meets each sites' waste acceptance criteria."

The VTR EIS does not analyze the option of sending this waste to the Hanford Site even though it is designated as a "Regional" disposal site by WM PEIS and authorized to take offsite generated LLW and mixed low-level waste. As the waste from the VTR EIS is not projected to be generated until at least 2026 and the WTP will be operational by 2023, the conditions set forth in 74 FR 68179 for disposal of offsite waste to resume as the Hanford Site would be met.

The State of Nevada requests as required by 40 CFR §1502.14(a), which requires the evaluation of reasonable alternatives to the proposed action, and, for alternatives that the agency eliminated from detailed study, briefly discuss the reasons for their elimination, that the DOE evaluate the use of the Hanford Site as an alternative disposal option for the waste generated by the VTR operation and fuel production.

5. **The VTR EIS should include a list of radionuclides anticipated to be generated through the Versatile Test Reactor, Feedstock Preparation, and Fuel Fabrication processes.** **68-6**

68-6 Isotopes that could be released to the environment from VTR and fuel production operations under normal operational conditions and accidents are identified in this VTR EIS, see Appendices C and D. While not specifically identified, the contents of radioactive waste packages would be within the limits required by their ultimate disposal site. The radionuclides anticipated to be generated by VTR and fuel production operations are expected to be similar to the radionuclides currently present at INL. Operating facilities at the Materials and Fuels Complex (post-irradiation examination facilities and fuel treatment facilities) and the Advanced Test Reactor handle fuel and material similar to those envisioned for VTR.

Commenter No. 68 (cont'd): Christine D. Andres, Chief, Bureau of Federal Facilities, Nevada Division of Environmental Protection

Mr. James Lovejoy
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March 2, 2021

6. **The VTR DEIS does not address how dose rates from the Versatile Test Reactor, Feedstock Preparation, and Fuel Fabrication processes affect the cumulative dose rates for the onsite disposal facility workers at the NNSS near Las Vegas, Nevada; EnergySolutions near Clive, Utah; or Waste Control Specialists, near Andrews, Texas. This information should be evaluated and included in the VTR EIS.** *68-7*

Should you have any questions, or if you wish to discuss Nevada's comments further, please do not hesitate to contact Justin Costa Rica at [redacted] or me at [redacted]. Thank you for your consideration of these comments on the Draft VTR EIS.

Sincerely,

Chris Andres

Christine D. Andres
Chief
Bureau of Federal Facilities

CDA/JCR

ec: Greg Lovato, Administrator, NDEP
Brad Crowell, Director, Nevada DCNR
Fred Dilger, Executive Director, Nevada ANP
VTR.EIS@nuclear.energy.gov

68-7 The capacity of disposal facilities to accept waste generated by activities evaluated in this VTR EIS is discussed in Chapter 4, Section 4.9. Treatment and disposal of these relatively small quantities of wastes are well within the current capacities of existing offsite facilities. As described in Chapter 5, Section 5.0, the impacts of waste disposal (including worker doses) were already evaluated in the licensing or permitting processes for these facilities. Because the disposal of the VTR wastes would be within the evaluated disposal capacity of the facilities, there would be no additional impacts above those already evaluated.

Commenter No. 69: Rebecca A. Chu, Chief, Policy and Environmental Review Branch, U.S. Environmental Protection Agency

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 155
Seattle, WA 98101-3188

REGIONAL ADMINISTRATOR'S DIVISION

March 2, 2021

James Lovejoy, Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415

Dear Mr. Lovejoy:

The U.S. Environmental Protection Agency has reviewed the Department of Energy's Draft Versatile Test Reactor Environmental Impact Statement (CEQ Number 20200263; EPA Region 10 Project Number 19-0047-DOE) pursuant to our responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act.

The DEIS evaluates the potential environmental impacts associated with alternatives for the construction and operation of a versatile reactor-based fast-neutron source facility (Versatile Test Reactor facility or VTR) and associated facilities at a suitable DOE site. As proposed, the VTR will be approximately 300-megawatt thermal, sodium-cooled, pool-type, and uranium-plutonium-zirconium metal-fueled reactor that will help to modernize the U.S. nuclear energy industry and ensure its competitiveness in the global nuclear energy sector. For the VTR facility, DOE will use existing facilities and infrastructure as much as possible to minimize impacts. The DEIS considers reactor construction site alternatives at DOE's Idaho National Laboratory (INL) near Idaho Falls, Idaho; the Oak Ridge National Laboratory (ORNL) near Oak Ridge, Tennessee; and a no action alternative. The DEIS identifies INL as DOE's preferred alternative. DOE is also considering INL Site and Savannah River Site in South Carolina for the proposed reactor fuel production but has no preferred option for where it will perform the feedstock preparation or driver fuel fabrication.

Our review of the DEIS finds that overall, most impacts associated with the proposed action will be due to construction and operation activities, which will generate temporary and permanent impacts related to the project footprint, long-term operation and maintenance of facilities, as well as their decommissioning. Thus, EPA recommends that DOE continue to coordinate with other federal and state agencies, affected tribes, and other impacted entities to ensure that the proposed action is implemented in a manner protective of human health and the environment. We also encourage DOE to include in the Final VTR EIS additional clarifying or missing information on topics in our attached detailed comments. **69-1**

Thank you for providing this opportunity to comment. If you have questions about our review, please

69-1 As the project evolves, DOE would continue to coordinate with Federal and State agencies, affected tribes, and others at an appropriate level, commensurate with the stage of the project. DOE appreciates the comments the U.S. Environmental Protection Agency (EPA) provided and, as discussed below, we have evaluated and responded to the comments and made changes in this Final VTR EIS, as appropriate. In resolving the EPA comments, DOE used a sliding-scale approach to suggestions that additional material be added to the EIS with an eye on including important information in the EIS while keeping the size of the entire EIS (including appendices) reasonable. As noted in individual responses, supporting references are now available on the internet and some of the detailed information is included in the references and the Administrative Record.

Commenter No. 69 (cont'd): Rebecca A. Chu, Chief, Policy and Environmental Review Branch, U.S. Environmental Protection Agency

contact Theo Mbabaliye of my staff at [redacted] or at [redacted], or you may contact me at [redacted] or by email at [redacted].

Sincerely,

Rebecca A. Chu, Chief
Policy and Environmental Review Branch

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Commenter No. 69 (cont'd): Rebecca A. Chu, Chief, Policy and Environmental Review Branch, U.S. Environmental Protection Agency

U.S. Environmental Protection Agency Detailed comments on the Draft Versatile Test Reactor EIS

General comments

- This DEIS has been prepared to evaluate the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles and managing spent nuclear fuel. EPA notes that DOE also examined other technologies and reported findings in its *Analysis of Alternatives, Versatile Test Reactor Project* report.[1] As the public may not be familiar with this report, EPA recommends that DOE summarize those other technologies in the Final VTR EIS and provide easy access to the report in the form of a web site link or an appendix to this EIS.
- This DEIS also summarizes the radiological impacts associated with the VTR in various chapters under the 'Human Health' headings. Information in this section relies heavily on key radiological assessment reports for INL and are included in the DEIS as references. EPA recommends that the Final VTR EIS either include a summary of the reports or provide easy access to the reports in the form of web site links or appendices to this EIS. **69-1 cont'd**
- The Summary footnote 6 states that other entities could also fabricate test items for placement in the reactor. EPA therefore recommends that the Final VTR EIS include information describing procedures for the acceptance of test items for use in the VTR.[2] **69-2**
- The DEIS states that "If the U.S. sources cannot be made available for the VTR project or to supplement the domestic supply, DOE has identified potential sources of plutonium in Europe." Accepting and using plutonium feedstock where the composition and purity cannot be confirmed introduces an additional variant into the feedstock process. Even if this 'stray' plutonium is converted to oxide and back to metal in an attempt to purify the metal, there will inevitably be impurities in the form of waste gases, waste liquids, or solid wastes that are generated in this treatment process. EPA recommends that the Final VTR EIS briefly describe measures that will be taken to make plutonium obtained from foreign sources suitable for the VTR project. **69-3**
- The statement that "DOE does not intend to separate, purify, or recover fissile material from VTR driver fuel" appears in several locations in the DEIS. EPA recommends that the Final VTR EIS disclose plans for further analyses if the decision is made to separate, purify, or recover fissile material. **69-4**

Potential impacts on water resources
The DEIS indicates that water quality may be adversely affected if the project construction activities such as surface grading, excavation, surface pavement, and building roofs alter the hydrology of springs **69-5**

[1] U.S. Department of Energy, 2019d, *Analysis of Alternatives, Versatile Test Reactor Project*, Office of Nuclear Energy, November 15.
[2] Draft EIS, p. S-5

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69-2 DOE acknowledges that there would be a process for accepting test items to be placed in the VTR, whether those items come from DOE or external researchers. At this stage of the project, it is premature to describe in any detail the procedures that would be implemented for acceptance of test item. Chapter 2 of the Final VTR EIS was revised to reflect that acceptance criteria and procedures for accepting test items would be developed as part of the VTR project.

Safe operation of the VTR and support facilities is paramount. DOE would require safety analysis of configurations, tests, and experiments associated with the VTR to show that the VTR would continue to operate safely under the new conditions and in compliance with the documented safety analysis. Test items would not be placed in the VTR until after an appropriate safety review. DOE is committed to maintaining the safety basis for the VTR and all fuel production and support facilities in compliance with 10 CFR Part 830.

69-3 Both domestic and foreign sources of plutonium were assessed in the EIS. The feedstock preparation processes described in Chapter 2, Section 2.6, and Appendix B, Section B.5, are applicable to both domestic- and foreign-sourced plutonium. Three potential feedstock preparation processes are under consideration for VTR feedstock preparation: an aqueous capability, a pyrochemical capability, and a combination of the two. In the estimation of releases and wastes generated, plutonium from both domestic and foreign sources was considered so that impacts were conservatively estimated and would be bounding regardless of the source of plutonium.

69-4 Any change in the VTR project that could potentially impact the environmental analysis and its conclusions would be subject to additional National Environmental Policy Act (NEPA) analysis. That stated, the VTR and the fuel production facilities are being designed with the intent that the reactor would be a test reactor and not a breeder reactor. The commitment not to separate, purify, or recover fissile material from the VTR driver fuel is not subject to change.

69-5 Idaho National Laboratory (INL) holds a National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Construction Sites. INL contractors obtain coverage under the general permit and develop stormwater pollution prevention plans for individual construction projects if it is determined there is reasonable potential to discharge pollutants to regulated surface waters. As described in Chapter 3, Section 3.1.3.1.3, of this VTR EIS, the Industrial Waste Pond receives stormwater runoff at the Materials and Fuels Complex. As such, no

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and surface runoff such that erosion carries sediment to surface waters and pollutants to local drainages and the underlying aquifers. Additionally, groundwater extraction in the analysis area and vicinity, land disturbance, material storage, waste and wastewater disposal, inadvertent chemical or hazardous liquid spills, and compaction produced by vehicular traffic can all affect recharge to the local aquifer and groundwater quality.

Because of the project, for example, there will be an increase in water discharges, which will increase erosion and sedimentation in receiving facilities and surface waters, and result in an increased amount of water seeping into the perched water zone at the outfall of the discharge facilities and in local aquifers. Water use during construction of the project will also increase over baselines and may exacerbate the seepage and facilitate migration of contaminants (e.g. salts in process wastewater discharges) to local aquifers. Aquifers that could be impacted during the construction of the project include the Snake River Plain Aquifer at INL Site. This aquifer is an EPA designated sole source aquifer vulnerable to contamination from surface activities.

In addition, the DEIS indicates that the proposed project will disturb up to 150 acres and therefore require authorization under the Construction Storm Water Discharge NPDES Permit for construction and industrial activities.[3] EPA appreciates the plan to modify the existing permits at INL and ORR-ORNL to address these issues. Please note that after June 30, 2021, DOE will need to discuss directly with the Idaho Department of Environmental Quality about whether coverage under a construction stormwater general permit will be needed for the project at INL.

Recommendations
For protection of water resources at proposed VTR sites, EPA recommends that the Final VTR EIS include information on:

- Anticipated modifications of the existing General Construction Stormwater; measures to be taken to protect water quality; and any required Storm Water Pollution Prevention Plans, reporting, and monitoring.

69-5 cont'd

- How the proposed project will be consistent with the EPA Technical Guidance on Implementing the Storm Water Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act of 2007.[4] Please also include the EISA among other Federal laws and regulations applicable to activities associated with the proposed action.

69-6

- How the project will address the application of green construction and management practices, consistent with the federal "green" requirements and opportunities that may apply to design, operation, and maintenance of project-related facilities and equipment.[5]
- Considerations for zero or low impact development techniques in project design due to their potential to reduce storm water volumes, and mimic natural conditions. For example, consider:
  - Minimizing creation of new impervious surface.
  - Using pervious pavement and avoid building over groundwater recharge areas.
  - De-paving areas as mitigation for any new impervious surfaces needed for the project, to achieve no net increase in pollution generating impervious surface.
- Best management practices, erosion and sediment control, and other mitigation measures to minimize impacts.

69-5 cont'd

[3] https://www.epa.gov/npdes/npdes-stormwater-program
[4] http://www.epa.gov/polluted-runoff-nonpoint-source-pollution/stormwater-management-federal-facilities-under-section-438
[5] https://www.epa.gov/green-infrastructure/what-green-infrastructure

2

stormwater discharge would enter a regulated surface water, and the proposed VTR project would not require coverage under the existing NPDES permit nor any new or modified Stormwater Pollution Prevention Plan (SWPPP).

As described in Chapter 4, Section 4.3.1.2, of this VTR EIS, a project-specific NPDES Stormwater Construction permit and associated SWPPP would be required for construction of the proposed ORNL VTR Alternative. While specific stormwater drainage plans for construction would be finalized in later stages of design, this section does summarize low impact development techniques that would be used to prevent groundwater pollution and keep stormwater runoff on the construction site. Established BMPs would continue to be used to minimize sediment and chemical constituents in stormwater runoff. The TDEC's Erosion and Sediment Control Handbook provides guidance regarding erosion prevention and sediment control BMPs and for the development and implementation of SWPPPs.

DOE's goal is to achieve Leadership in Energy and Environmental Design (LEED) for all new buildings. The VTR would aim to achieve this certification as well, which requires buildings to satisfy prerequisites and earn points to achieve different levels of certification. Several recent INL buildings have achieved Certified, Gold, and Platinum recognition. In addition, the FY 2020 Idaho National Laboratory Site Sustainability Plan and the ORNL FY 2020 Site Sustainability Plan outline strategies and activities that will lead to energy, water, and waste reductions that move each facility toward meeting DOE sustainability goals and requirements. The listed considerations for zero or low impact development techniques in project design are noted.

As stated above, Chapter 4, Section 4.3.1.2, summarizes low impact development techniques incorporated into the design of the ORNL VTR Alternative. ORNL's Stormwater Pollution Prevention Plan and Best Management Practices of the Water Quality Protection Plan (prepared in accordance with the site-wide NPDES permit) summarize ORNL's efforts toward BMPs, erosion and sediment control, and other mitigation measures implemented across the site. As mentioned above, a project-specific SWPPP would be prepared prior to construction of the ORNL VTR Alternative, which would outline project-specific measures to be implemented.

Prior to initiating any project construction, a checklist would be completed in order to identify potential impacts, including to water resources. If the proposed activity would impact water resources, plans to control erosion and stabilize soil such as reseeding and revegetation would be established. Chapter 4, Section 4.3, of this VTR EIS was revised to reflect the above information.

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Coordination strategies with each State Department of Environmental Quality (Idaho, Tennessee, and South Carolina) and tribes that may be affected by the project to ensure that state and tribal water resources are protected and used wisely. 69-7

Impacts on wetlands and ecological resources
The DEIS discusses the proposed project's impacts to ecological resources and indicates that vegetation removal, habitat fragmentation, and ground disturbance will affect plant communities, migratory birds, and other wildlife species of concern. Most proposed project impacts to these resources will occur during new facility construction. Specifically, there will be habitat alteration for sage grouse (candidate species for listing under the Endangered Species Act) and pygmy rabbits, loss of native grasslands and sagebrush steppe habitats, and potential impacts to nesting migratory birds. Some of the impacts will be indirect, while others will be direct, cumulative, and unavoidable.

EPA appreciates the avoidance measures of limiting the project footprint and using previously disturbed areas. EPA notes that clearing and grading during construction will result in complete removal of vegetation on up to 100 acres at INL and 150 acres at ORNL. Of these acres, less than half will remain permanently developed for facilities and infrastructure. Approximately 25 acres will be converted permanently for industrial use at the INL Site, while 50 acres of vegetated area at ORNL will be cleared and converted permanently for industrial use. In addition, EPA notes that the ORNL VTR Alternative will permanently affect nearly 2 acres of palustrine, forested wetlands associated with tributaries to Bearden Creek and Melton Branch which exist within the operational footprint. The proposed ORNL VTR alternative will impact about 10.5 acres of wetlands, 15,637 feet of streams, conveyances and/or channels associate with creeks (e.g., Melton Branch and Bearden Creek) that flow into major rivers, and 30 seeps and springs. In addition, the temporary construction area includes about 5 acres of wetlands associated with intermittent tributaries to Bearden Creek and Melton Branch. Such habitat loss and fragmentation will have direct impacts on wildlife (loss of cover and food, displacement, increased noise, etc.), tribal resources (ethnobotanical plants, wildlife), soil (exposure, erosion, sedimentation, noxious weeds), and potentially mortality of small mammals, lizards, and raptors that occur in construction locations. 69-8

Recommendations
Given the wildlife (e.g., sage grouse) use and occurrence of vegetation of concern (e.g., sagebrush steppe) and aquatic resources in the planning areas, EPA recommends that the Final VTR EIS include:

- Measures to be taken to avoid, minimize, and mitigate impacts on ecological resources of concern.
- An expanded analysis of aquatic resources and impacts associated with the ORNL VTR alternative to include a description of the quality (e.g., functions and values) of the waters that will be impacted, quantification of surface waters and wetlands subject to regulation of Section 404 of the Clean Water Act, and proposed avoidance, minimization, and compensatory mitigation measures to reduce impacts to waters of the U.S..
- Information on work with the U. S. Fish and Wildlife Service and each state (Idaho, Tennessee, and South Carolina) department of fish and wildlife to determine the level of risk to vegetation and wildlife species and identify effective measures to reduce the risks and protect species and biota. We also encourage DOE to include in the Final VTR EIS any new information on the outcomes of the work with the Service and coordination with the other agencies.

3

69-6 The *Technical Guidance on Implementing the Storm Water Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act* is incorporated into processes and procedures at DOE sites. The intent of the Section 438 is to maintain or restore the pre-development site hydrology during the development process. In an effort to meet these requirements, the design of the proposed VTR facility at INL would include contouring the land to minimize the potential impact on existing surface waters and avoid pooling water during the spring thaw. At ORNL, the clayey soils severely limit the infiltration of stormwater, and the introduction of additional groundwater to the underlying karst geology could accelerate the formation of sink holes. Instead of using subsurface infiltration to meet the requirements of Section 438 of the EISA, DOE would likely pursue mitigation of streams and associated buffer zone and the installation of devices and systems to improve water quality and allow for additional evapotranspiration. This approach is applied on an area basis at ORNL rather than a project-by-project basis. DOE uses this approach to show environmental stewardship rather than claiming the "technical infeasibility" allowed under EISA due to the existing soils and underlying geologic conditions. EISA was added to the list of Federal laws and regulations discussed in Chapter 7.

69-7 Chapter 7, Section 7.3, of this VTR EIS describes the efforts undertaken by DOE to consult with Federal, State, and local agencies and federally recognized American Indian Tribal governments. These efforts include ecological resources, cultural resources, and American Indian consultations.

Chapter 4, Section 4.3, of this VTR EIS describes the potential effects to surface and ground water resulting from construction and operation of the proposed VTR and associated facilities. This analysis determined that there would no changes to surface water use at the INL Site during construction, and that the volume of water discharged during operation would represent approximately 12 percent of the permitted discharge allowed under the State of Idaho Industrial Wastewater Reuse Permit for the MFC Industrial Waste Pond. Similarly, groundwater quality is not expected to change during construction at the INL Site, and the water volume that would be withdrawn from the Snake River Plain Aquifer during operation of the proposed VTR would represent less than 1 percent of the INL's Federal Reserved Water Right. As such, anticipated impacts on water resources at the INL Site from construction and operation of the VTR and associated facilities, would be minor and extensive consultations are not anticipated. Table 7-3 notes that additional consultations related to surface water and aquatic resources may be required if

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Potential impacts on contaminated sites
According to the DEIS, the INL VTR alternative will be constructed in the proximity of Waste Area Group 9 and adjacent to the Materials Fuel Complex. Remediation is ongoing within the MFC and new sites have been identified as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. The EIS does not discuss any requirements to coordinate with the clean-up division or that CERCLA activities will not be affected by construction of the VTR.

Recommendation
EPA recommends that the EIS clarify that DOE will coordinate across the agency's NEPA and clean-up programs if the disturbance occurs within a designated CERCLA area and if any waste is encountered during implementation of this project. DOE's activities under the proposed program will need to be consistent with EPA cleanup goals and activities.

Waste generation and management
Information in the DEIS indicates that because of the proposed project, there will be generation of a variety of waste including low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, and hazardous and Toxic Substance Control Act wastes over the life of the program. The DEIS also states that the project will send those wastes to one of DOE's facilities under evaluation and that spent nuclear fuel debris will be securely stored with DOE's spent fuel and spent fuel debris inventory awaiting a future disposal facility.

Recommendations
Because this project may generate impacts from waste generation and management activities, EPA recommends the Final VTR EIS disclose:

- The waste receiving facilities and location(s).
- The capacity of interim onsite VTR spent fuel storage and other waste.
- The duration VTR spent fuel and other waste can be safely stored onsite temporarily, and the expected timeline a suitable offsite location will become available.
- How the possible delay of a suitable and available offsite storage location will affect the VTR proposal and interim management of VTR spent fuel and other waste.
- The regulatory requirements for shipping such wastes to receiving locations.
- Information on impacts related to handling, transportation of the wastes to disposal sites, and long-term storage of the wastes at receiving sites.

69-9

Potential impacts to air quality
The DEIS describes current air quality conditions in the planning areas and EPA appreciates data provided, especially on baseline emissions. EPA notes that while the EPA has designated all counties in the areas as attainment for all National Ambient Air Quality Standards, adjacent counties remain in nonattainment and maintenance for particulate matter or PM_{10}. It is therefore possible that the project activities may exacerbate air quality conditions in the areas due to construction-related emissions, even if the impacts will be temporary and short-term (5 years). Air quality may also be impacted due to cumulative impacts from surrounding activities such as road construction and site operations, traffic on unpaved roads, local traffic emissions, use of woodstoves, agriculture, fire, and civilian air traffic.

69-10

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the ORNL VTR Alternative is selected. Additional efforts could include wetland delineations, stream evaluations, and hydrologic determinations of currently unclassified surface water channels and wet weather conveyances.

69-8 As stated in the VTR EIS Section 4.5, for each of the proposed alternatives there would be a number of operational and administrative control measures implemented prior to any construction or land-clearing activity. Measures include, but are not limited to, the following:

- Conducting additional species-specific surveys to adequately determine the extent and severity of effects to plants and wildlife;
- Conducting nesting bird surveys; employing time of year restrictions for land-clearing activities to protect migratory birds (as well as owls, hawks, eagles and bats); and
- Following existing conservations agreements and management plans (e.g., Candidate Conservation Agreement, Invasive Plant Management Plan, Wildlife Management Plan for the Oak Ridge Reservation).
- In-kind mitigation (i.e., protection or enhancement of ecologically similar resources) could be required due to impacts on wildlife habitat and sensitive species. Species-specific survey protocols could be required as directed through consultations with the USFWS, U.S. Army Corps of Engineers (USACE) and applicable State agencies prior to work.

As stated in the VTR EIS Section 4.5.2, direct and indirect impacts on surface water and aquatic resources would potentially occur at ORNL due to construction and land-clearing activities associated with the proposed action. If the ORNL VTR Alternative were selected, additional assessment will be required. Minimally, this would include wetland delineations (USACE 1987), stream evaluations (TDEC 2019), and hydrologic determinations of currently unclassified surface water channels and wet weather conveyances (TDEC 2020). Any potential impacts on Exceptional Tennessee Waters (ETW) will require additional assessment using the Tennessee Rapid Assessment Method, as required by the TDEC. Evaluation of aquatic resources at proposed mitigation sites might also be required to assess adequate mitigation actions (TDEC 2019). A Section 404 wetland permit must be obtained from USACE prior to any construction work within jurisdictional features, and compensatory mitigation would be required for any unavoidable impacts. Mitigation ratios are broadly defined as 2:1 for restoration, 4:1 for creation/

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The DEIS also indicates the INL maybe a major source of hazardous air pollutants or Hazardous Air Pollutants or HAPs due to use of fuel oil-fired boilers to generate steam for heating facilities and diesel engines for emergency electrical power. Other sources of criteria, toxic, and HAPs in the analysis area include miscellaneous small gasoline, diesel, and propane combustion sources, and miscellaneous chemical usage. It also includes information that, for example, during new facility construction, daily traffic to and from the VTR facility will be expected to increase by up to 17 percent and employees, some of whom may be sensitive to air quality conditions, are expected to increase as well.

The DEIS further indicates this project will be associated with hazardous materials and air pollutants which may include potentially toxic pollutants and wastes that may be released during construction, operations, and decommissioning or as the result of an accident.

Recommendations
Regarding air quality impacts, EPA recommends the Final VTR EIS include information on:

- Modeling output data to show that the proposed project will not result in any significant increase in criteria, toxic and Prevention of Significant Deterioration air pollutant emissions. The use of EPA's Motor Vehicle Emission Simulator or MOVES model was referenced in Section 4.4.1.1. but no output data were included in the DEIS.
- Plans to monitor air quality conditions on site and taking corrective actions to prevent local air quality deterioration. Monitoring strategies tailored to local conditions will ensure that localized air quality impacts do not exceed standards when area-wide and/or long-term monitoring data may show compliance with air quality regulatory requirements. This is especially important for the INL Site due to its proximity to nonattainment and maintenance areas for PM_{10} and the Craters of the Moon National Monument and Preserve – a Prevention of Significant Deterioration Class I area.
- Commitments to maximize implementation of mitigation measures described in the DEIS to reduce emissions associated with the proposed project activities.
- The Clean Air Act §112(r), and, as applicable, the Emergency Planning and Community Right to Know Act, EPCRA § 303, 311, & 312, and related state and county regulatory programs.[6,7] Please also note that Local Emergency Planning Committees can require a facility to produce an emergency response plan whether or not it is required under other regulations.
- Continued coordination with other entities in the analysis area (states, affected tribes, and air quality boards, etc.) to ensure emissions due to the proposed action are reduced over the proposed project lifespan.

69-10 cont'd

Impacts of Climate Change
The DEIS indicates that because of the proposed action, greenhouse gas emissions (GHGs) may increase due to worker commuting, purchased electricity, operation of construction equipment, and use of diesel generators and fuel oil-fired boilers for heating. In addition, continued climate change may impact the proposed project, posing threats to infrastructure and higher risks to worker health and safety through increased frequency and severity of wildfires, as well as persistent drought leading to power disruptions and increased cooling demands in summer months.

69-11

[6]http://www.epa.gov/oem/docs/chem/caa112_rmp_factsheet.pdf
[7]http://www2.epa.gov/epcra/what-epcra

enhancement, and 10:1 for preservation. When mitigating impacts on ETW, TDEC prefers that habitat of equivalent quality within the same watershed be placed into permanent conservatorship (preservation) and at rates higher than non-ETW (ORNL 2020). Additional effort would be required to assess the full scale of impacts and to determine appropriate mitigation strategies given the number, complexity, and quality of aquatic resources (i.e., wetlands, streams, and conveyances). The ORNL Natural Resources Program is equipped for such assessment should the project proceed (ORNL 2020). DOE has identified correspondence between the USFWS and each State's (i.e., Idaho, Tennessee, and South Carolina) department of fish and wildlife agency in Chapter 7 of this Final VTR EIS.

It should also be noted that the approach taken to assess impacts from VTR construction in this EIS (e.g., clearing 150 acres) is a conservative. If the ORNL VTR Alternative were selected, more detailed constructions plans put in place by the construction firm in coordination with DOE and ORNL and in consultation with relevant organizations (e.g., TDEC and/or EPA) might choose to leave some of the wooded and/or wetland portions of the 150 acres alone. It is possible that the use of some nearby disturbed or even developed areas for laydown could alleviate clearing and/or use of some of the more sensitive portions of the 150 acres at ORNL. The 150 acres was a conservative and estimate of what land could be disturbed and cleared; detailed construction plans likely would not utilize the same area.

69-9 Activities related to construction and operation of the VTR and associated facilities are not expected to impact ongoing cleanup activities at the INL Site. Please refer to Section 2.10, "Ongoing INL Site Cleanup," of this CRD, for more information.

Current radioactive waste and SNF management for the INL, ORNL, and SRS sites are described in Chapter 3, Sections 3.1.9, 3.2.9, and 3.3.9, of this VTR EIS, respectively. The potential environmental consequences associated with waste and SNF management under the alternatives for construction and operation of the VTR and associated facilities are described in Chapter 4, Section 4.9. Please refer to Sections 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, for more information on these topics.

69-10 The commenter states that project construction-related emissions may exacerbate air quality conditions in nonattainment and maintenance areas for PM10 in adjacent counties. As stated in Final EIS Section 3.1.4.2.1, the nearest PM10 nonattainment or maintenance area to the INL Site is the Fort Hall Indian

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Recommendations

Because the proposed project has the potential to contribute to impacts of climate change, EPA recommends the Final VTR EIS:

- Include most current greenhouse gas emissions or GHGs inventories and updated analyses of climate change impacts. As an example, the INL has the potential to emit greater than 100,000 Metric Tons carbon dioxide or CO_2 emissions per year and is, therefore, subject to the mandatory reporting requirements.[8]
- Implement practicable mitigation opportunities for reducing GHGs during the proposed project period, consistent with federal, state, and local requirements to limit GHG emissions.

69-11 cont'd

Monitoring of the projects and adaptive management
The proposed action has the potential to impact a variety of resources for an extended period – up to 60 years and beyond. In addition, as the VTR project is not the first that DOE has undertaken (e.g., Transient Testing of Nuclear Fuels and Materials in operation at INL Site since 1959), it will be beneficial to discuss environmental monitoring results from other similar actions, and discuss implications for the proposed program. EPA expects that lessons learned from past practices and adaptive management efforts, combined with the need to account for new challenges, such as the impacts of climate change, will influence management of the proposed VTR program. For example, EPA is interested in knowing whether existing monitoring systems will meet the American National Standards Institute/Health Physics Society N13.1-1999 requirements or if modifications will be necessary.[9]

Recommendation
EPA recommends the Final VTR EIS include an environmental inspection and mitigation-monitoring program to ensure compliance with all mitigation measures and assess their effectiveness. The Final VTR EIS should describe the monitoring program and how it will be used as an effective feedback mechanism so needed program adjustments are made to meet environmental objectives throughout the life of the program.

69-12

[8] Draft EIS for the Recapitalization of Infrastructure Supporting Naval SNF Handling (DOE/EIS-0453-F), p. 3-100.
[9] Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stack and Ducts of Nuclear Facilities

6

Reservation PM10 nonattainment area, which is in northeastern Power County and northwestern Bannock. This area is about 40 miles south of the project site. Due to this extensive distance, the transport of PM10 emissions from project construction would result in substantially diluted and therefore negligible PM10 impacts in this area. Chapter 4, Section 4.4.1.1, of this Final EIS was revised to include this analysis and determination.

The comment also states that the VTR EIS indicates that INL may be a major source of hazardous air pollutants (HAPs) due to use of fuel oil-fired boilers to generate steam for heating facilities and diesel engines for emergency electrical power. As shown in Final EIS Section 3.1.4.3, INL emitted 1.49 tons of total HAPs in 2018, which is substantially lower than the major source threshold of 25 tons per year of combined HAPs. In addition, as stated in Final EIS, Section 4.4.1.2, operation of the diesel-powered backup generators proposed for the VTR Facility at INL would produce only 0.005 tons per year of combined HAPs emissions.

Regarding the recommendation to include emissions modeling output data in this Final EIS, the minor amounts of air emissions and resulting air quality impacts do not warrant including air emission calculations in an appendix. However, these data are included in the project Administrative Record.

Regarding the recommendation to include in this Final EIS, plans to monitor air quality conditions on site and to take corrective actions to prevent local air quality deterioration. Federal and state laws, regulations, and orders require INL to establish a robust and comprehensive Environmental Management System. The system has achieved ISO-14001 certification. This system includes an extensive air monitoring system that includes 36 air samplers at 26 locations on the INL Site, off the INL Site near the boundary, and at locations distant from the INL Site. The results from the air monitoring system indicate that INL Site airborne effluents were not measurable in environmental air samples. These results are published in the INL Site Annual Site Environmental Report available at http://idahoeser.com/Publications.html.

The air quality analysis in the VTR EIS determined that construction and operation of the VTR project at INL would produce emissions that would remain below levels of concern and that the transport of these emissions to offsite locations at least 3 miles away would result in inconsequential concentrations. DOE would implement control measures during construction and operation of the VTR project that would minimize air emissions (see Final EIS Section 4.4.5). For example, as

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part of a fugitive dust control plan, DOE would designate personnel to monitor the dust control programs and to increase control measures, as necessary, to minimize the generation of dust. Therefore, it would be unnecessary to monitor criteria air pollutants in proximity to the project site. Because of the low levels of air emissions, the VTR EIS does not propose any mitigation measures for air quality. However, in this Final EIS, Section 4.4.5 identifies minimization measures DOE would use to limit air emissions from proposed project activities.

The INL Site complies with applicable Federal, State, and local requirements that pertain to potential chemical emergency responses and the proposed VTR activities would comply with these requirements. For example, INL complies with the Emergency Planning and Community Right-to-Know Act for purposes of helping local emergency response agencies prepare for potential chemical emergencies and informing the public of the presence of toxic chemicals in their communities. The INL Site has a well-established process that encourages information exchange and public involvement in discussions and decision-making regarding its activities. Active participants include the public; Native American tribes; local, State, and Federal government agencies; and advisory boards. These programs would continue for purposes of educating the public and agencies about air pollutants emitted from the proposed VTR activities.

69-11 The VTR Final EIS presents the most current inventories of U.S. and global GHG emissions (year 2019) and analyses of potential GHG emissions generated by the project alternatives and their resulting climate change impacts. At stated in this VTR EIS, Section 3.1.4.2.2 and Section 3.2.4.3.1, the INL Site and ORNL each emit less than 25,000 metric tons of CO2e per year and therefore are not subject to the mandatory reporting requirements. Proposed sources would comply with all applicable Federal, State, and local requirements that pertain to GHG emissions reductions. GHG emissions and approaches to reduce them are described in the FY 2020 Idaho National Laboratory Site Sustainability Plan (DOE-ID 2019) and the ORNL FY 2020 Site Sustainability Plan (ORNL 2019). GHG sources associated with the VTR project would be consistent with the Site Sustainability Plans to reduce emissions.

Note that the *Draft EIS for the Recapitalization of Infrastructure Supporting Naval SNF Handling* (DOE/EIS-0453-D) stated, "The INL (including NRF) emits greater than 25,000 MT CO2e emissions per year and is therefore subject to the mandatory reporting requirements;" it did not indicate that the site emitted greater than 100,000 MT. In the Final Recapitalization EIS, the same paragraph was revised to state, "From 2011 through 2015, INL emitted less than 25,000 MT CO2e emissions and is no longer subject to the mandatory reporting requirements" (p 3-100).

69-12 The INL Site Environmental Monitoring Plan (DOE-ID 2014) describes routine environmental compliance and surveillance monitoring of airborne and liquid effluents, and ecological and meteorological conditions in and around the vicinity of the INL Site. Environmental surveillance programs collect and analyze samples or direct measurements of air, water, soil, biota, and agricultural products from the INL Site and offsite locations in accordance with DOE Order 458.1, "Radiation Protection of the Public and the Environment"; DOE-HDBK-1216-2015, "Environmental Radiological Effluent Monitoring and Environmental Surveillance"; and DOE-STD-1196-2011, "Derived Concentration Technical Standard." The existing stack monitoring systems meet current applicable requirements. Stack monitoring for the proposed VTR would be conducted, as appropriate, in consultation with the applicable regulatory agency and would meet all applicable requirements. Annual reporting is performed as required and evaluated annually under the quality assurance program to ensure validity of results and compliance with applicable requirements. Quality assurance is an integral part of every aspect of an environmental monitoring program, from the reliability of sample collection through sample transport, storage, processing, and measurement, to calculating results and formulating the report. INL has an established Environmental Management System that provides an environmental inspection and monitoring program. Details about the guidance and a description of the site-wide monitoring systems are available via the following website: http://idahoeser.com/. The website provides quarterly and annual surveillance reports. The most recent report indicates that none of the radionuclides detected in samples collected during the first quarter of 2020 could be directly linked with INL Site activities.

Commenter No. 70: Edwin S. Lyman, PhD, Director of Nuclear Power Safety, Union of Concerned Scientists

Comments of the Union of Concerned Scientists on the Department of Energy's Draft Versatile Test Reactor Environmental Impact Statement

Edwin S. Lyman, PhD
Director of Nuclear Power Safety
Union of Concerned Scientists
Washington, DC
March 2, 2021

The Union of Concerned Scientists (UCS) reiterates its strong opposition to the Versatile Test Reactor (VTR) project and therefore endorses the No Action Alternative described in the Draft Versatile Test Reactor Environmental Impact Statement (VTR DEIS). The Department of Energy (DOE) has again failed to provide any credible justification for this project. The DOE did not adequately address the comments UCS submitted on the Notice of Intent (NOI) to prepare this EIS and therefore UCS maintains that the VTR DEIS fails to adequately analyze the significant and highly damaging public health, occupational safety, environmental, nuclear proliferation, and nuclear terrorism impacts of this badly misguided project. The VTR DEIS also fails to make decisions on critical aspects of the VTR program that have a major bearing on the range of impacts, and thus fails to adequately assess the impacts of the entire program. UCS restates some of the points raised in its comments on the NOI, since they have been sidestepped in the VTR DEIS.

70-1

70-2

70-3

70-4

Specific comments on the VTR DEIS

1. *The VTR DEIS does not contain a nuclear proliferation and nuclear terrorism impacts assessment, a major omission given the well-known security risks of the fast reactor fuel cycle and the proposed use of plutonium in the VTR.*

As the DOE did for surplus plutonium disposition, sodium-bonded and aluminum spent nuclear fuel treatment, and the Global Nuclear Energy Partnership (GNEP), it should conduct a nonproliferation and security impacts assessment for the VTR program. (See http://www.wmsym.org/archives/2000/pdf/65/65-1.pdf). The VTR program signals to the rest of the world the false notion that plutonium-fueled fast reactor technology is necessary and desirable for the future of nuclear power, and may stimulate other countries' interest in fast reactors and reprocessing, even as other countries such as France and Russia significantly scale back their own fast reactor programs. These indirect impacts must be fully evaluated.

The assessment should address both the VTR and its entire fuel cycle, including all required plutonium transportation, storage, and processing supporting fuel fabrication, spent fuel treatment, scrap and waste management). The effectiveness of material accountancy and control measures at all associated fuel cycle facilities should be realistically analyzed with regard to the potential for theft and diversion of weapon-usable materials. The need for such an assessment is underscored by the estimate in the VTR DEIS that 27 percent of the plutonium feedstock into the

70-5

70-1 DOE acknowledges your support for the No Action Alternative and opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

70-2 Information about lack of a domestic fast-neutron testing capability and the purpose and need for a VTR is discussed in Chapter 1 of this VTR EIS. DOE is pursuing the VTR to provide a test capability that supports the fulfillment of its mission of advancing the energy, environmental, and nuclear security of the United States and promoting scientific and technological innovation in support of that mission. Refer to Section 2.2 of this CRD for additional discussion of the purpose and need for the VTR.

70-3 DOE acknowledges the commenter's objection to the proposed VTR project and notes that the comments received during scoping were considered in developing this VTR EIS. This VTR EIS adequately analyzes the potential environmental and human health consequences of the proposed VTR and reactor fuel production activities in Chapter 4. The potential consequences, summarized in Chapter 2, Section 2.9, indicate there are no major or highly damaging impacts from normal operations and credible accidents of the proposed facilities and activities. The EIS also evaluates a hypothetical beyond-extremely-unlikely accident for which no credible initiating event is recognized. Such an event would bound the impacts of an intentional destructive act. A rigorous set of physical and administrative safeguards and security controls would be implemented to prevent the likelihood and severity of an intentional destructive act.

70-4 The commenter does not identify the critical decisions being referred to. With regards to the ultimate disposition of spent nuclear fuel, DOE has committed to meeting its obligations to manage and ultimately, dispose of spent nuclear fuel and high-level waste. However, how DOE will meet this commitment is beyond the scope of the VTR EIS. The VTR SNF would be processed to remove sodium and stored on site until a consolidated storage facility or repository becomes available. The disposal of VTR SNF would be analyzed in the supplementary National Environmental Policy Act (NEPA) documentation prepared for the repository. With regards to the selection of the source of plutonium for the VTR; a decision to source the material from domestic, DOE excess and surplus inventories or from foreign sources has not been made. However, the EIS does consider both sources in the evaluation of impacts from transportation of the source material and production of the VTR driver fuel. For example, results of the transportation fuel fabrication process is lost to waste. This high process loss to waste will make accurate material accountancy very difficult to achieve.

The VTR DEIS states that conducting such an assessment is "outside the scope" of the EIS. UCS strongly disagrees and urges the DOE to reconsider this position. 70-5 cont'd

2. *The VTR DEIS does not adequately consider the full range of severe accident and sabotage scenarios for the VTR that could result in large radiological releases to the environment, including core disassembly accidents (CDAs).*

Liquid-metal cooled, plutonium-fueled fast reactors the size of the VTR are prone to rapid reactivity excursions that cannot be mitigated by conventional control-rod-based protection systems. https://www.epj-n.org/articles/epjn/full_html/2019/01/epjn170049/epjn170049.html. As such, they are inherently less stable than light-water-cooled thermal reactors. This is both due to the positive sodium void effect and to Bethe-Tait-type events in which core compaction results in explosive energy release (core disassembly accidents). The VTR DEIS does not fully evaluate the safety and environmental impacts of these events. Because there is relatively little operating experience with fast reactors, probabilistic risk assessments are not well-validated and have high uncertainties. Thus, they cannot be used to justify screening out such accidents based on probability considerations. Moreover, a full range of reasonably foreseeable sabotage attacks that could result in significant core damage must be evaluated.

The VTR DEIS defends the design choice not to include a containment dome by falsely asserting that "even under post-accident conditions, reactor and containment pressures are near atmospheric." This obviously does not include CDAs or other unmitigated reactivity excursion events. 70-6

The severe accident analysis for VTR operations in the VTR DEIS is wholly inadequate, and is based on an obviously technically incorrect statement that "for the VTR at INL, results of the VTR probabilistic risk analysis and other safety analyses indicate that all operational accidents would be controlled and not result in fuel melting. This includes the typical reactor accidents associated with light water reactors, including loss of offsite power, transient overpower events, experiment malfunctions, and seismic events. The passive heat removal systems are sufficiently robust that all of the conventional reactor accidents are either prevented or mitigated and no radioactive releases would be expected. No fuel would melt and the releases from the gaseous cooling systems have very small radiological consequences."

There is a vast amount of literature documenting that there are credible accidents for VTR-type fast reactors that could result in fuel melting and significant off-site consequences, including unprotected loss-of-flow accidents with coastdown failure. For example, simply consider the accident analyses in the following document for metal-fueled fast reactors similar to the VTR: https://www.osti.gov/servlets/purl/1365801. Also see the accident probabilities specified here: https://reader.elsevier.com/reader/sd/pii/S1738573316303199?token=02813699E6B33A37DEE4C7F409FE1FFD7A9709848B2EC6D3C7DB03B657ED4142DE6BE9D06051C065C841E11CDAE196E7.

The VTR DEIS fails to satisfy its obligations under NEPA to evaluate the impacts of such accidents.

analysis presented in Chapter 4, Section 4.12, are presented for the shipment of foreign fuel to a DOE site (i.e., transatlantic shipment of the fuel is addressed in Appendix F) and for shipments of domestically sourced material. For the fuel production process, DOE has not selected the process for feedstock preparation. This selection would depend upon factors including the source of the plutonium as the best process for impurity removal depends upon the impurities in the feedstock material. Fuel production impacts were developed based on the range of impurities found in both domestic and foreign inventories of plutonium. The analysis within an EIS is based on the best available information. There are aspects of the VTR program that are in the process of being decided and in evaluating the impacts of the alternatives, this EIS used the best information available and performed analyses that, based on that information, provided a realistic assessment of the impacts for the alternatives. These impacts should represent the impacts from the options available to the VTR project. Should options other than those analyzed be considered, additional NEPA analysis would be performed, as necessary.

70-5 In coordination with the DOE National Nuclear Security Administration, the Office of Nuclear Energy intends to prepare a Nuclear Proliferation Assessment Statement to identify and mitigate any proliferation policy concerns regarding the use of surplus plutonium. This is a policy and security activity and is not necessary for the preparation of this VTR EIS. The proposed VTR is a one-of-a-kind reactor where the neutron production over the desired test volume is maximized and, due to the fuel design, the size of the reactor is minimized. To achieve the desired performance, VTR proposes to use plutonium in a metal fuel alloy. Use of this fuel to provide the needed testing performance does not mean that future advanced reactors would use the same fuel. Although the VTR is to support development of advanced reactors, it is speculative to conclude what technologies would advance to the stage of deployment and what the characteristics of those technologies would be. Although future development and deployment of reactors is outside the scope of this EIS, it should be noted that the advanced reactors currently under development would use non-plutonium fuels such as high-assay, low-enriched uranium (HALEU) or thorium fuels. Refer to Section 2.3, "Nonproliferation," of this CRD, for additional discussion of this topic.

70-6 The analyses described in the papers referenced by the commenter included postulated accident sequences developed for the purpose of demonstrating analysis methodologies or the identification of potential phenomena through sensitivity analyses. They are not representative of the VTR or similar sodium-fast-reactor designs. The design utilized in the VTR core is not prone to rapid reactivity

Commenter No. 70 (cont'd): Edwin S. Lyman, PhD, Director of Nuclear Power Safety, Union of Concerned Scientists

3. The "melt-distill-package" approach for management of the VTR sodium-bonded spent fuel is preferable to electrometallurgical treatment with plutonium separation, but still raises security and environmental concerns.

The VTR DEIS discussion of the "melt-distill-package" process is insufficiently detailed for the public to assess whether the environmental impacts are adequately characterized or not. However, a sodium distillation process will also volatize cesium and possibly some americium. It is not at all clear that using historical emissions from the INL Fuel Conditioning Facility adequately represents the potential emissions from this novel process. Also, the distillation of the cesium from the plutonium-containing melt may result in a temporary increase in material attractiveness until sufficient diluent can be added. ***70-7***

excursions. The use of metallic alloy fuel enables the design of a core that can make extensive use of inherent (self-protecting) safety. Initiating events, including reactivity insertion events, are part of the safety analysis. It must be noted that inherent safety characteristics were demonstrated in tests in the EBR-II reactor. That experience has been incorporated in the VTR design.

In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. The accident analysis for the EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators, such as earthquakes, tornados, wildfires, flooding, volcanoes, and human initiators. Accident scenarios considered include core disruptive accidents and sodium leaks or fires. The EIS also analyzes the impacts of potential accidents on workers and public health and safety. A description of emergency response and post-response cleanup in the event of an accident was included.

70-7 As the commenter notes, DOE's estimate for the emissions (which do include cesium and americium) from the treatment of VTR fuel is based on the current radiological emissions from the Fuel Conditioning Facility (FCF). DOE started with the emissions for the processing of fuel from FCF (currently processing EBR-II sodium-bonded fuel) which were assumed to be of similar composition (activation and fission products) as VTR fuel. Data was adjusted to consider the difference in curies released per kilogram of fuel processed (higher for the VTR than the EBR-II fuel currently being processed), the quantity of fuel being processed annually, and the fresher nature of the VTR fuel (VTR fuel would be out of the reactor for a shorter time) compared to the EBR-II fuel. By assuming the EBR-II fuel is the oldest of the EBR-II fuel being processed and limiting the time out of the reactor for VTR fuel (4 years) the adjustment for decay of fission products and activation products is maximized; that is, the VTR fuel radionuclide inventory is maximized. Based on these considerations, DOE estimated that the annual releases from the treatment of VTR fuel would be 40 percent of the releases from the current FCF emissions from the treatment of EBR-II fuel. These emissions would be through the FCF exhaust systems, utilizing the same filtration systems currently in use. The VTR project has taken into consideration the attractiveness of the spent nuclear fuel during all phases of its storage, transport, and treatment at the Idaho National Laboratory (INL) Site. Appropriate safeguards and security measures would be developed and used to protect the plutonium in all forms while at the INL Site, including during spent fuel treatment at the FCF. Once the spent nuclear fuel is transferred to the FCF for treatment it (in any form including what the commenter describes as having increased attractiveness) does not leave the facility until the fuel has been diluted and packaged for storage.

Commenter No. 71: M. H. "Hootie" Langseth, County Commissioner, Butte County

From: Hootie Langseth
Sent: Wednesday, March 3, 2021 9:51:16 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] VTR EIS Butte County Commissioner Comment

Mr. James Lovejoy:

The Board of Butte County (Idaho) Commissioners support locating the Versatile Test Reactor (VTR) at the Idaho National Laboratory (INL). Siting the VTR and ancillary facilities at the INL Site would stimulate local economies. Butte County supports INL activities and their positive economic influence in the region and state of Idaho. **71-1** **71-2**

Approximately 86% of Butte County is federally owned with a large portion of federal ownership being controlled by the Department of Energy. A large portion of DOE's nuclear waste is stored in Butte County. The draft EIS for the VTR discusses many socioeconomic impacts that fall in the ROI, including many that could impact Butte County.

As noted in the EIS, Butte County has the highest vacant rental units in the ROI (26.6%), the highest unemployment rate in the ROI, and one of the lowest personal incomes and higher rates of poverty per capita. DOE/EA-2063 table 14 shows that the poverty rate in Butte County is 16.9%, 22.1% under the age of 18.

Section 3.1.14 of the draft EIS is directed by Executive Order 12898. Since DOE published the DEIS, the new administration has released Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad." Sections 219 and 223 of Executive Order 14008 discusses Environmental Justice and states that "agencies shall make... environmental justice part of their missions by developing programs, policies, activities to address the disproportionately high and adverse... impacts on disadvantaged communities," including the economic challenges of impacts.

Due the high proportion of land in Butte County owned by DOE and used to store nuclear waste and support the nuclear research mission, Butte County bears a disproportionately high amount of environmental impacts without much benefit. These impacts are not discussed in the DEIS. **71-3**

The Butte County Commissioners recommend that DOE revise Section 3.1.14 to meet the new administrations standards for Environmental Justice.

In addition, the DEIS states that the hospitals in the ROI are Eastern Idaho Regional Hospital, Portneuf Medical Center, and Bingham Memorial Hospital. It does not mention that Butte County also has a hospital— Lost Rivers Medical Center. Located in Arco, 8 miles from the INL border.

Table 3-19 of the draft EIS states Butte County has 3 Fire Stations and "87 firefighters (all INL)." Between the Lost River Fire Protection District and the Arco Fire Department, Butte County has 26 volunteer firefighters. **71-4**

Thank you for taking the time to review these comments.

M. H. "Hootie" Langseth Butte County Commissioner

71-1 DOE acknowledges your preference for the Idaho National Laboratory (INL) VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

71-2 Thank you for your support of the proposed project and acknowledgement of the beneficial economic impacts it is expected to have on the region and State of Idaho.

71-3 Chapter 3, Section 3.1.14 of this Final VTR EIS was revised to acknowledge the new Executive Order (EO) 14008 identified in the comment. The EIS analysis is consistent with EO 14008 and the order's direction to include considerations of disproportionately high and adverse impacts on disadvantaged communities, including economic considerations. Specifically, EO 12898 also directs Federal agencies to consider disproportionately high and adverse impacts on disadvantaged communities, including economic considerations; therefore, no changes to the Draft VTR EIS analysis were required to account for EO 14008 as the analysis was already consistent with EO 12898.

Environmental justice impacts associated with the proposed action alternatives are discussed in Chapter 4, Section 4.15, of the EIS and are commensurate with the anticipated level of negligible impact from the various proposed action alternatives. This is consistent with the sliding-scale approach in the *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements* (DOE 2004), as well as CEQ's instruction that agencies "focus on significant environmental issues and alternatives" (40 CFR 1502.1) and discuss impacts "in proportion to their significance" (40 CFR 1502.2(b)). Impacts from historic operations of the entire INL Site and other past actions in the region are captured in the baseline environmental conditions for the proposed action alternatives as described throughout Chapter 3, Affected Environment sections, and impacts from ongoing and future operations (including at the INL Site) are considered in the cumulative effects analysis, as described throughout Chapter 5.

It should be noted that the new EO 14008 includes several provisions aimed at addressing climate change and climate justice efforts through Federal actions. Specifically, the Order outlines the administration's policy "to secure environmental justice and spur economic-opportunity for disadvantaged communities that have been historically marginalized and overburdened by pollution and underinvestment in housing, transportation, water and wastewater infrastructure, and health care." The emphasis is on climate justice and building a clean energy economy. Therefore,

Commenter No. 71 (cont'd): M. H. "Hootie" Langseth, County Commissioner, Butte County

the proposed action is further consistent with EO 14008 goals, including the following:

- Investing and building a clean energy economy by helping the U.S. modernize its nuclear energy industry–a "cleaner" energy source than fossil fuels with respect to greenhouse gas emissions that cause climate change; and
- Creating well-paying jobs, along with labor income, economic output and tax revenues that would help create an ongoing stabilizing force to the local and regional economy.

The added economic benefits to the region, tax revenues, and other benefits from the sustained presence of the facility, as described in Chapter 4, Section 4.14, are anticipated to be beneficial contributors to the quality of life in the communities surrounding the facility and across the State, including minority and low-income communities.

71-4 Thank you for the additional information relating to the medical and fire department capabilities in Butte County, ID. This information has been added to Chapter 3, Section 3.1.13.3, of the Final VTR EIS.

Commenter No. 72: John E. Starkey, Director, Public Policy, American Nuclear Society

From: John Starkey
Sent: Wednesday, March 3, 2021 9:14:09 PM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: American Nuclear Society Comments on Draft VTR EIS

Good afternoon Mr. Lovejoy:

VTR sections from the attached "Nuclear R&D Imperative"

Build and maintain a foundation of capability: Provide national R&D test beds as well as demonstration test beds of cutting-edge experimental capability, computational capability, and databases, and staff those activities with people who have the expertise to keep the test beds flexible and relevant. U.S. nuclear technology test beds are distributed across multiple facilities at federal laboratories, universities, and commercial entities, and include both specialized facilities and large, capital-intensive demonstration facilities. The nation's primary neutron-generating test beds currently include the Advanced Test Reactor (ATR), the Transient Reactor Test Facility (TREAT), the High Flux Isotope Reactor (HFIR), and the MIT Reactor (MITR), and they need to remain accessible and at the highest caliber. The Versatile Test Reactor (VTR) will add a fast-spectrum neutron source to the suite of U.S. nuclear technology test beds to provide needed data for technology developers and scientists from all over the nation. The VTR will help reestablish U.S. global leadership in nuclear energy R&D, while attracting potential collaborations, investments, and personnel from international research partners. *72-1*

Construction of the VTR by 2030 to provide a versatile fast-neutron source to test and qualify advanced reactor technologies and materials, and build-out of the National Reactor Innovation Center for accelerated testing and demonstrations.

See also page 36 of the report

Thank you,

John E. Starkey | Director, Public Policy
American Nuclear Society | www.ans.org
[redacted]
ANS

72-1 DOE acknowledges your preference for the Idaho National Laboratory (INL) VTR Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information. As noted in Section 2.7.1, construction of the VTR would allow the U.S. to expand its fast flux test capability without impacting the current thermal flux capabilities at ATR and HFIR.

Commenter No. 73: Carl Holder

From: Carl Holder
Sent: Friday, March 5, 2021 1:44:01 AM (UTC+00:00) Monrovia, Reykjavik
To: VTR.EIS
Subject: [EXTERNAL] Public Comment: draft VTR EIS

Advanced nuclear reactor fuel research and development is The Critical Path.

- NI-PEIS 0310, Nuclear Infrastructure Programmatic Environmental Impact Statement, including Role of the Fast Flux Test Facility (FFTF).

  FFTF restart has National Environmental Policy Act (NEPA) analysis and authority, NEAC advice, and positive congressional testimony.

  NI-PEIS 0310 IS NOT referenced in this draft VTR-EIS.

73-1

Rejoin the community of nations with ongoing advanced reactor, nuclear fuel and nuclear fuel cycle development.

- GenIV International Forum was initiated by the USA in 2001.
- Global Nuclear Energy Partnership (GNEP) EIS was abandoned.

73-2

Requirements for production of industrial, medical and space transportation isotopes. Irradiation infrastructure in USA is limited and aged.

- Supplement required: Nuclear Infrastructure – Programmatic Environmental Impact Statement, including the Role of the Fast Flux Test Facility. (NI-PEIS - 0310)
- Fast Flux Test Facility is deactivated; cold and dark with sodium systems maintained under high purity argon gas.

73-3

Russia is the nuclear R&D leader

- Commissioned the BN-800 with MOX fuel
- Maintains robust R&D, fuel, and irradiation capabilities.

India approved the Global Centre for Nuclear Energy Partnership (GCNEP)

- From India Press: *Enrico Fermi believed that whichever country mastered liquid metal fast breeder reactor (LMFBR) technology would end up leading the world. LMFBRs have long been the promised land for nuclear energy, given their potential to greatly reduce the radioactive waste management burden besides facilitating the extraction of a much greater quantum of energy from extant uranium resources by 'breeding' more fissile material (fuel) than they consume. In the Indian scheme of things, they are also the pathway to large-scale thorium utilization in the third stage.*

73-2 cont'd

73-1 FFTF was considered in the Analysis of Alternatives for the VTR. Construction of a new facility utilizing a sodium-cooled fast reactor was rated higher than all other alternatives considered. In this analysis, the Modify and Restart FFTF Alternative rating was relatively close to that for the new facility rating. As stated in Chapter 2, Section 2.7.1, of the EIS, the VTR project decided the ratings for the two alternatives justified a closer examination of the potential use of the FFTF as the VTR. This examination included a facility walk down of FFTF conducted in October 2019 by a team composed of the VTR Program Director, DOE Richland Assistant Manager, VTR Project Manager, and industry experts. Based on the facility walk down, extensive pre and post-tour discussions and a review of a study by the Columbia Basin Consulting Group, the team had significant concerns about the viability of restarting FFTF. For the reasons identified in Section 2.7.1, the Modify and Restart FFTF Alternative was dismissed from detailed analysis. Note that DOE/EIS-0310 was referenced in Chapter 2, Section 2.7, of the EIS in the discussion of FFTF and is discussed in Chapter 1, Section 1.6.1.

73-2 DOE notes the commenter's support of the VTR program. As discussed in Section 2.2, "Purpose and Need," of this CRD, the research performed at the VTR could lead to advanced reactors that would enhance the U.S. position in advanced reactor technology. Although the results of the advanced reactor technology development are unknown at this time, DOE's intent is to support development of advanced reactors with improved fuel resource utilization and waste management.

73-3 DOE notes that the VTR is not proposed as a facility for producing industrial, medical, or space power isotopes. Refer to Chapter 1, Section 1.3, of this VTR EIS for a description of the purpose and need. DOE evaluated the Hanford Site's Fast Flux Test Facility (FFTF) as a possible facility for meeting the fast-neutron source testing needs that the VTR would is to fill. Chapter 2, Section 2.7, of this VTR EIS explains the evaluation that was performed and why FFTF was not evaluated in detail as an alternative to a new VTR in additional detail.

Commenter No. 73 (cont'd): Carl Holder

Imperative that USA initiate building the Versatile Test Reactor (VTR) at Idaho National Laboratory.

- Fuel development, certification and licensing requires irradiation facilities that do not exist.
- The Critical Path requirement is to restart the Fast Flux Test Facility.
- Building the VTR requires the FFTF. FFTF requires the VTR.

Transfer FFTF to DOE-NE

- Integrate the Hanford 400 Area assets into INL, the national nuclear laboratory.
- FFTF is currently maintained, Cold and Dark, with the sodium systems maintained under high purity argon gas. A restart analysis was performed for GNEP EIS.
- VTR is an ambitious, long term project.
- FFTF is licensed and built and can be operational by the 2025.
- In Testimony to the Holland Commission, Dr. Yoon Chang of Argonne National Laboratory pleaded for restart of FFTF, as the most important requirement for advanced nuclear reactor development.
- Dr. Chang, along with Russia and India, believe that the future is "fast."

Fast Flux Test Facility: A National Asset, Richland Operations Office:

- Brochure: circa 2002, attached.

VTR Program Director, Office of NE, letter to Carl Holder, 2/24/2020.

- "This EIS will consider alternatives, such as FFTF refurbishment and restart…"

73-4

Respectfully submitted:
Carl Holder
Richland WA
[redacted]

73-4 Please refer to the response to comment 73-1.

Commenter No. 73 (cont'd): Carl Holder

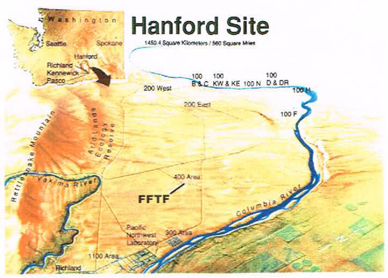
The Fast Flux Test Facility: A National Asset

HANFORD WORKS! Environmental Excellence

U.S. Department of Energy • Richland Operations Office

What is the Fast Flux Test Facility?

The Fast Flux Test Facility (FFTF) is a 400-megawatt thermal, liquid-metal (sodium) cooled nuclear test reactor owned by the U.S. Department of Energy (DOE). The facility is located in the 400 Area of the DOE's Hanford Site in southeastern Washington State, about 13 miles north of Richland, Washington. The construction of FFTF was completed in 1978 and initial operation began in 1980. From April 1982 to April 1992, the FFTF operated successfully as a national research facility to test advanced nuclear fuels, materials, components, nuclear power plant operations and maintenance protocols, and reactor safety designs. During this time, the FFTF also produced a wide variety of medical and industrial isotopes, made tritium for the U.S. fusion research program, and conducted cooperative international research work.



Map of the Hanford Site in Washington State

FFTF's Background and History

In December 1993, DOE ordered the FFTF to begin shutdown due to a lack of economically-viable missions at that time. From 1994 through 1997, fuel was removed from the reactor vessel for storage in fuel storage vessels and above-ground dry storage casks, and 23 of 100 FFTF operating systems were put into lay up. In January 1997, DOE ordered the FFTF to be maintained in a standby condition, while an evaluation was conducted of any future role it might have in DOE's tritium production strategy. In December 1998, the DOE determined that the FFTF would not play a role in tritium production and that a decision on any other future FFTF missions would be made by Spring 1999. Subsequently, DOE decided in May 1999 that it would prepare a program scoping plan for the FFTF, which was completed in August 1999.

Under the authority of the Atomic Energy Act of 1954, as amended, DOE is responsible for ensuring the availability of isotopes for medical, industrial and research applications, meeting the nuclear material needs of other Federal agencies, and undertaking research and development activities related to development of nuclear power for civilian use. DOE does this using its existing research nuclear reactors and atomic particle accelerators. The atomic particle most often used is the neutron. However, since the early 1990's, the DOE civilian nuclear research and isotope production infrastructure has declined significantly. In August 1999, DOE decided to initiate the preparation of a Nuclear Infrastructure Programmatic Environmental Impact Statement (NI-PEIS) evaluating the potential environmental impacts associated with the proposed expansion of the DOE's nuclear infrastructure capabilities for the following proposed missions: (1) isotopes for medical and industrial uses, (2) civilian nuclear energy research and development, and (3) plutonium-238 (Pu-238) production for use in advanced radioisotope power systems for future NASA space exploration. The alternatives evaluated in this NI-PEIS for irradiation services included the possible role of FFTF, the use of other existing reactor and neutron accelerator facilities, the construction of new accelerator(s), and the construction of a new research reactor. Overviews of the proposed missions as they relate to FFTF's capabilities are presented below.

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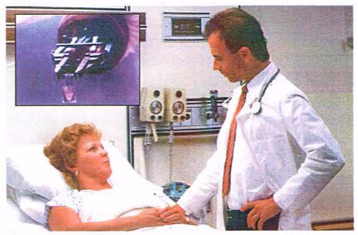
Commenter No. 73 (cont'd): Carl Holder

Isotopes for Medical and Industrial Uses

The DOE makes medical isotopes in the U.S. for use in diagnosis and therapy. Diagnostic isotopes provide improved images of internal organs. This makes earlier detection of health problems possible and provides better data for diagnosis and treatment. Therapeutic isotopes are used for treating cancer and other diseases. Ongoing research is developing improved isotope treatments that minimize adverse side effects (e.g., healthy tissue damage, nausea, and hair loss).

Isotopes are used in a variety of industrial applications. They are used in smoke detectors and in instruments to detect pollutants, explosives, drugs, ores, petroleum, and natural gases. Isotopes are also used to sterilize medical products. The use of isotopes as tracers includes studying transport and uptake of nutrients, fertilizers, herbicides and waste materials in plants, soil, and groundwater.



In 1998, an expert panel indicated that it believed medical isotope use could grow significantly over the next 20 years.

The FFTF has produced diagnostic, therapeutic, and industrial isotopes and can do so again. It has the largest target volume of any reactor within the DOE complex and can produce large quantities of isotopes that thermal reactors cannot produce. In doing so, the FFTF can provide diagnostic and therapeutic isotopes to the medical community that will not otherwise be available. The FFTF can also provide isotopes to the industrial community for food and instrument sterilization, and to the research community for biology, medicine, physics, chemistry, agriculture, and environmental science.

Civilian Nuclear Research and Development

DOE's reactor facilities have been used to test materials for commercial nuclear power plant license renewal, space power technology, and destruction of long-lived isotopes from commercial spent nuclear fuel. These reactor facilities have also been used to research fusion, an environmentally friendly source of unlimited energy that does not produce combustion products or greenhouse gases. While fusion is a nuclear process, the products of the fusion reaction (helium and a neutron) are not radioactive. DOE's reactor facilities could be used to further this research.

A major source of energy in use today is nuclear fission. Unfortunately, fuels used by the current nuclear power stations can be used to create nuclear materials needed for nuclear weapons. If a nation were to misuse its civilian nuclear power systems in this fashion it would be called proliferation. Although proliferation resistant fuel does not exist, there are ideas that deserve further evaluation. The DOE's high flux research reactor facilities are ideally suited to study, research, test, develop, and demonstrate these ideas.

Researchers from different countries have used FFTF for materials testing and fuels research.

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Commenter No. 73 (cont'd): Carl Holder

The FFTF is ideally suited to test and demonstrate technologies necessary to safely convert plutonium-based materials to forms for use in proliferation-resistant fuels. The flexibility of the FFTF allows it to tailor its neutron flux to simulate different reactors and reactor conditions. The core of the reactor is highly instrumented which will allow the tests to be closely monitored.

Plutonium-238 (Pu-238) for NASA Space Missions

Pu-238 is a heat-producing isotope that powers space generators to make electricity. Pu-238 is not suitable for use in nuclear weapons. Special, sealed capsules of Pu-238 are built into thermoelectric generators that use the heat energy to make electricity. These generators are very reliable in harsh environments like outer space and are used by NASA to power deep space probes.

In 1992, the U.S. signed a contract to purchase Pu-238 from Russia after the facilities that made the isotope at DOE's Savannah River Site were shut down. In 1997, the contract was extended to 2002. However, there is a concern that Russia may not continue to be a reliable source for Pu-238 after 2002. The U.S. is considering reestablishing its own supply.

The FFTF has irradiated test targets to make Pu-238. FFTF has the capacity to produce Pu-238, up to the maximum demand currently being forecast by DOE.

Pu-238 is used to make electricity in NASA deep space probes.

Can FFTF Do This Work Concurrently?

Yes, FFTF can do all of these missions concurrently because of its large size. The in-core assemblies would be accessible for easy target placement and removal (primarily for isotopes) while the reactor runs.

For more FFTF, background and related documents, please visit DOE's web site at:

http://www.fftf.org

and for information about DOE's Hanford Site, please visit the web site at:

http://www.hanford.gov.

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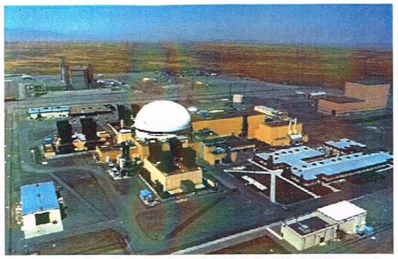
Commenter No. 73 (cont'd): Carl Holder



FFTF has demonstrated the highest level of safety and reliability.

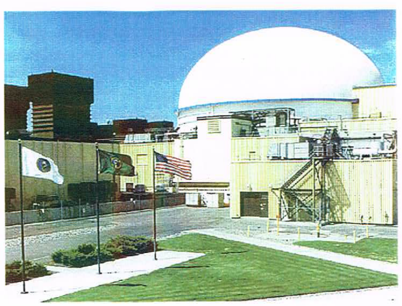
FFTF's Status

Preparation of the NI-PEIS began in September 1999. A Draft NI-PEIS was published and issued in July 2000. The Final NI-PEIS and the followup Record of Decision (ROD) were published and issued in December 2000 and January 2001, respectively. Part of this ROD called for the permanent deactivation of FFTF. However, in April 2001, DOE suspended this FFTF decision in the ROD for 90 days. This suspension was made to allow for a proper review of all available, existing data and information to date to ensure that all relevant factors affecting the decision in the January 2001 ROD to close the FFTF would be addressed. The FFTF continues being maintained in standby mode awaiting a decision on its future.

Is FFTF Safe?

Yes, the FFTF is safe. It was designed, constructed, maintained, and operated to modern commercial reactor standards. The reactor and its associated cooling system are inside a building that was designed and tested to meet stringent containment criteria. The reactor uses a safety system designed to automatically shutdown if there is an abnormal condition.

Before the FFTF began operation, the Nuclear Regulatory Commission and the Advisory Committee on Reactor Safeguards performed an extensive review of the plant design and the Final Safety Analysis Report. This is the same review process that has been applied to all commercial reactors. During initial plant startup, a comprehensive series of acceptance tests was performed to confirm the adequacy of the plant design (including cooling the core by natural circulation during an emergency). The results of these tests fully confirmed the outstanding level of safety inherent in the plant design.



Contact Information

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Commenter No. 74: Lew Pence, Chairman, Bob Muffley, Executive Director, Middle Snake Regional Water Resource Commission

Middle Snake Regional
Water Resource Commission
Lew Pence, Chairman
Bob Muffley, Executive Director
122 5th Ave West
Gooding, ID 83330
[redacted]

February 11, 2021

Mr. James Lovejoy
U. S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415

RE: Versatile Test Reactor EIS Comments

We have studied the draft Environmental Impact Statement of the Department of Energy (DOE) for the Versatile Test Reactor (VTR) for the Idaho National Laboratory (INL) and have the following draft comments:

- Page 3-50: You should discuss why thyroid cancer rates in the bordering counties of Bingham, Bonneville, Jefferson, and Madison are twice those of the average for the state of Idaho and the nation. ***74-1***

- Page 2 31: You state that the DOE has no preferred location for the VTR yet in appendix D you strongly imply that Idaho is the best location because there are fewer people to put at risk. Refer to pages D 73 to D 89. It is also the preferred site for transportation of nuclear fuels as shown on E-11. It's good to know that our lives are less important because there are so few of us. ***74-2***

- Page 3-18 to 3 21: These pages describe the Snake River Plain Aquifer (SRPA). What the readers should know is that it's also one of the largest and most productive aquifers in the nation. It's not only the major source of water for southeaster Idaho, but also south-central Idaho which is down gradient from the INL. You say the land above the aquifer is made up of "thin basalt and interbedded sediments". You should say fractured basalt. This fractured basalt is what allows snow melt and rainfall to recharge the aquifer throughout the system each year. Snow melt and rain also will pick up contaminants in the top soil which will be carried to the aquifer over time. Do the contaminants in the soil at the INL filter out prior to entering the aquifer? We know it doesn't in our region so we must assume it doesn't at the INL as well. We also know the kind of contaminants that are in our soil do you? If not, you'd better find out. We down streamers want to know. ***74-3***

74-1 As noted by the commenter, there are elevated levels of thyroid cancer in the counties surrounding the Idaho National Laboratory (INL) Site. However, the overall cancer rate for the surrounding counties is lower than that for Idaho and for the U.S. in general. This EIS provided information on the cancer rates in the area of interest around the INL Site (Chapter 3, Section 3.1.10). It is not the purpose of this EIS to establish a cause for any of these cancer rates. Cancer is caused by both external factors (e.g., tobacco, infectious organisms, chemicals, and radiation) and internal factors (inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). Risk factors for cancer include age, alcohol, cancer-causing substances, chronic inflammation, diet, hormones, immunosuppression, infectious agents, obesity, radiation, sunlight, and tobacco use. Therefore, to determine the cause of any incidence of cancer can be very difficult as there are many confounding factors.

74-2 Chapter 2, Section 2.8, of this VTR EIS identifies the INL VTR Alternative as the preferred alternative for the VTR. It is the location of the fuel production facilities for which DOE has no preferred option. The intent was not to imply that the lives of people in Idaho are less important. The societal risks associated with the VTR sited at Idaho are less than the societal risks with the VTR sited at ORNL (see the human health impact results of the normal operations and accident analyses in Chapter 4, Sections 4.10 and 4.11, and summarized in Chapter 2, Section 2.9). The difference in risk is not solely due to the population at the two sites. Other factors, for example, the greater distance from the proposed VTR site at the INL Site to the surrounding population, contributes to the lower dose to the maximally exposed individual and population at the INL Site compared to ORNL.

74-3 Chapter 3, Section 3.1.2.1, of this VTR EIS describes the geology underlying the INL, including the basalt lava flows. This section includes a statement that the upper surfaces of the basalt flows are often irregular and contain many fractures and joints. Chapter 3, Section 3.1.3.2.1, also refers to the fractured basalt which allows for the flow of groundwater. This section also discusses sources of recharge for the aquifer, including infiltration from the surface and melting of local snowpacks. The INL Site environmental surveillance programs collect and analyze samples or direct measurements of air, water, soil, biota, and agricultural products from the INL Site and offsite locations in accordance with DOE Order 458.1, "Radiation Protection of the Public and the Environment, Radiation Protection of the Public and the Environment"; DOE-HDBK-1216-2015, "Environmental Radiological Effluent Monitoring and Environmental Surveillance"; and DOE-STD-1196-2011, "Derived

Commenter No. 74 (cont'd): Lew Pence, Chairman, Bob Muffley, Executive Director, Middle Snake Regional Water Resource Commission

- Page 3-26: Your discussion about year to year radiological air emission leaves out another important aspect of air pollution. What goes up must come down. Are these radionuclides eventually falling to the ground and building up over the years or do they simply disappear? Curious minds want to know. **74-4**

- Pages 4-106 and D-12: You talk about the "almost impossibility" of a seismic event that is beyond the design of the VTR and associated structures, but don't state what their capabilities are. You instead tell us to go to DOE order 420-b or 420.-c. That's ridiculous. Just tell us what seismic events they will be built or refurbished to withstand. 6.1, 6.8, 7.2 or whatever. **74-5**

- The EIS downplays the possibility of a damaging seismic event on or near the INL facility yet last year there was a 6.5 earthquake that shook building and disrupted wells at the Snake River Canyon rim south of Jerome, Idaho which is over 100 miles away from the epicenter. There are experts that agree a big event could be due at both the Great Idaho Rift and Yellowstone. (If Yellowstone blows, however, we won't need to worry about the VTR.) **74-6**

- Volume 2, page B-55: You state that "treated fuel would be stored at the site until an off site storage option (either interim storage facility or permanent repository, when either becomes available for VTR fuel) at which time it would be shipped off site." This statement needs to be further explained to the public. You know that no such interim or permanent repository exists and you have no idea when or if such a site will become available. A storage site is, and will continue to be, a political issue for which you have no control. You should also mention in this section the 2020 change to the 1995 Idaho agreement giving you until 2035 to start to remove the waste. We have little hope for this as well. **74-7**

- Volume 2, page D-3: You state that "quantitatively assessing the frequency of events addressed is not possible," but you do it anyway "by use of models or input values that yield conservative estimates of consequences and frequency." This is greatly concerning. This is a completely experimental facility so how is the public to know if your assumptions are even close to the true risk? We must wonder if the scenarios put forth in appendix D could be based more on your need to stay relevant in today's world. **74-8**

- Volume 2, page B-24: The primary sodium purification system is yet to be designed. This seems odd for such a critical part of the VTR. This draft EIS should be shelved until a realistic design has been completed and conclusions drawn. **74-9**

- Liquid Sodium: The use of liquid sodium as a coolant is a very bad idea. It was tried in Japan and failed miserably. **74-10**

This commission and the counties we represent in south-central Idaho are opposed to this experimental facility being built at either the INL or Oak Ridge. This leaves us with the "no action alternative'. You are trying to sell this as a pathway to green energy, but it's not even close. Just because you can't see the pollution doesn't mean it isn't there. The citizens of this **74-11**

Concentration Technical Standard." The purpose of DOE Order 458.1 is to establish requirements to protect the public and the environment against undue risk from radiation associated with radiological activities conducted under the control of DOE pursuant to the Atomic Energy Act of 1954, as amended. Monitoring activities are performed to generate measurement-based estimates of the amounts or concentrations of contaminants in the environment. Measurements are performed by sampling and laboratory analysis or by "in place" measurement of contaminants in environmental media. Chapter 3, Section 3.1.3.2.2, of this VTR EIS describes the groundwater monitoring network maintained by USGS and INL contractors that exists on and adjacent to the INL Site. Samples collected from monitoring wells are analyzed for organic, inorganic, and radioactive constituents. Localized areas of radiochemical and chemical contamination are present in the Snake River Plain Aquifer beneath the INL Site. These areas, or plumes, are considered to be the result of past disposal practices. Groundwater monitoring has generally shown long-term trends of decreasing concentrations and concentrations near or below U.S. Environmental Protection Agency (EPA) maximum concentration limits (MCLs) for drinking water. The decreases in concentrations are largely attributed to discontinued disposal to the aquifer, radioactive decay, and dilution within the aquifer. Samples collected from five wells at the MFC indicated no discernable impacts on groundwater quality from site activities. Wells along the down-gradient southern INL Site boundary were sampled and analyzed for volatile organic compounds, anions, gross alpha, gross beta and tritium in 2019. None of the analytes exceeded the EPA MCLs for drinking water.

Chapter 3, Section 3.1.2.2, of this VTR EIS discusses soil sampling and radiological monitoring. This ongoing monitoring effort has shown slowly declining concentrations of short-lived manmade radionuclides, with no evidence of detectable concentrations depositing onto surface soil from ongoing INL releases. The source of any detected radionuclides is most likely derived from worldwide fallout activity. As such, construction and operation of the proposed VTR and associated facilities at the INL Site is not expected to result in contamination of the soil or groundwater.

74-4 The radionuclides do not simply disappear, they are assumed to remain in the environment for extended periods. In the assessment of the impacts from radiological emissions, the dose is calculated based on an extended exposure of individuals and the population to the radionuclides. The duration of the exposure is based on the lifetime of the individuals, rather than the half-life of the radioisotope

Commenter No. 74 (cont'd): Lew Pence, Chairman, Bob Muffley, Executive Director, Middle Snake Regional Water Resource Commission

nation would also need to deal with the SNF forever. We've seen how that's worked out. You and the politicians can't even find a storage site permanent or otherwise . If you ever do find and develop such a site we can talk again. **74-7 cont'd**

We ask that we be placed on the list to receive a copy of the final EIS when completed.

Submitted By:

Lew Pence

Lew Pence, Chairman

Bob J. Muffley

Bob Muffley, Executive Director

Cc:
Idaho Governor, Brad Little
Idaho Attorney General, Lawrence Wasden

Representing the counties of Cassia, Gooding, Jerome, Lincoln and Twin Falls

(except for the isotopes with a very short half-life). Groundshine (radiation exposure from isotopes in the soil), resuspension (exposure due to isotopes becoming airborne after initially settling on the ground), and ingestion (both from foodstuff and drinking water) are all considered as exposure pathways in addition to the initial inhalation exposure.

74-5 The EIS does not refer to seismic events in the terms stated by the commenter. Seismic events, including a beyond-design-basis seismic event, are clearly considered "possible", but based on available science, considered to have a very low annual probability. The EIS recognizes that buildings used by the VTR project may have differing capabilities to withstand severe seismic events. In order to address the potential impacts of a very low probability, but potentially high consequence seismically-initiated accident, the EIS evaluates seismic events that would be so severe that structural failures of the buildings and equipment might occur. These accidents are assumed to be initiated by seismic events much more severe than those for which the structures and equipment were designed. Please refer to the response to comment 74-6 for more information on geologic hazards at and near the INL Site.

74-6 Chapter 3, Section 3.1.2.4, of this VTR EIS describes geologic hazards at and near the INL Site. As described in this section, the historical earthquake record shows the Eastern Snake River Plain, where the INL Site is located, has a remarkably low rate of seismicity compared to the surrounding Basin and Range Province. The basalt layers interbedded with ancient stream and lakebed sediments under the INL Site may dampen or attenuate ground motions generated by earthquakes. The 1959 Hebgen Lake earthquake (moment magnitude 7.3), 1983 Borah Peak earthquake (moment magnitude 6.9), and recent March 2020 Central Idaho earthquake (moment magnitude 6.5) were felt at MFC but did not cause any damage. The estimated recurrence of silicic volcanism within the axial volcanic zone is very small at 4.5×10^{-6} per year. Based on the probability analysis of the volcanic history in the axial volcanic zone and volcanic rift zones, the conditional probabilities that MFC and the south-eastern INL Site would be affected by basaltic volcanism would be once in 16,000 and 40,000 years or longer, respectively. Another study shows a 30 percent probability of partial inundation of the INL Site given an eruption on the Eastern Snake River Plain, with an annual inundation probability of 8.4×10^{-5} to 1.8×10^{-4}. An annual probability of 6.2×10^{-5} to 1.2×10^{-4} is estimated for the opening of a new eruptive center within the INL Site boundaries. Also, refer to the response to comment 74-5.

Commenter No. 74 (cont'd): Lew Pence, Chairman, Bob Muffley, Executive Director, Middle Snake Regional Water Resource Commission

74-7 DOE acknowledges that there is not a geological repository for the disposition of the spent nuclear fuel and high-level wastes in the United States. DOE has evaluated the potential impacts of such a repository at Yucca Mountain. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF and high-level wastes. However, how DOE will meet this commitment is beyond the scope of this EIS. The VTR SNF would be compatible with the expected acceptance criteria for long-term storage at any interim storage facility or permanent repository. The VTR SNF would be managed at the site until it is transported off site to an interim storage facility or a permanent repository.

Chapter 7, Section 7.2.1, of this VTR EIS discusses permits and agreements with the State of Idaho, including that referred to in the comment.

74-8 The VTR EIS was revised to more clearly convey the level of analysis that is commensurate with the preliminary nature of the designs under consideration. Precise quantitative assessment of specific events is impractical. However, using conservative assumptions, bounding assessments of potential risks were performed to ensure adequate system design and defense in depth. In the EIS, accidents are assigned to general probability categories based on DOE experience with other facilities. As the design develops and more design details are available, additional fidelity would be added to the assessment models and the updates would be checked to ensure they remain consistent with the initial conservative bounding assessments.

74-9 Council on Environmental Quality (CEQ) regulations (40 CRF 1502.5) require that an agency commence preparation of an EIS as close as practical to the time the agency is developing a proposal so that preparation can be completed in time for the final statement to be included in any recommendation on the proposal. DOE's implementing regulations (10 CFR 1021.212) state, "For any proposed program described in paragraph (a) of this section, DOE shall begin its NEPA [National Environmental Policy Act] review (if otherwise required by this part) as soon as environmental effects can be meaningfully evaluated, and before DOE has reached the level of investment or commitment likely to determine subsequent development or restrict later alternatives." In the case of the VTR project, this has resulted in the development of the EIS before the VTR design is finalized and at this stage the sodium purification system is in the conceptual design phase. Previous sodium-cooled reactors have included a sodium purification system and the technology and design options are well known. The system's final design would

Commenter No. 74 (cont'd): Lew Pence, Chairman, Bob Muffley, Executive Director, Middle Snake Regional Water Resource Commission

incorporate lessons learned from the operation of both the Fast Flux Test Facility (FFTF) and Experimental Breeder Reactor-II (EBR-II).

74-10 DOE recognizes the inherent hazards associated with the use of sodium in a nuclear reactor. These hazards have been considered in the design of the VTR. Design features have been added to limit the exposure of sodium to air (e.g., double walled piping, the use of inert atmospheres). Extensive U.S. sodium-cooled test reactor experience was collected with the successful operation of the EBR-II and FFTF, which provided about 40 years of successful operation as test facilities. The analysis of accidents addresses potential failures of these systems and evaluates their potential impact on the public. Please see the discussion in Section 2.7, "VTR Facility Accidents," of this CRD for additional information.

74-11 DOE acknowledges your opposition to the VTR project and support for the No Action Alternative. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information. Also see the discussion in Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

Campaign A

To: VTR.EIS
Subject: [EXTERNAL] Draft EIS for Versatile Test Reactor at Idaho National Laboratory

Mr. James Lovejoy
Document Manager
U.S. Department of Energy
Idaho Operations Office
1955 Fremont Avenue, MS 1235
Idaho Falls, Idaho 83415

Dear Mr. Lovejoy:

The proposed reactors would be cooled with liquid sodium. Liquid sodium is a highly volatile liquid which burns when exposed to air, and explodes when exposed to water. ***A-1***

The budget for this project is estimated to be $3-6 billion. If history is any indication, the actual costs will end up well beyond that projection. ***A-2*** Taxpayer money should be invested in the development of safer and cleaner renewable energy resources instead of keeping a dying nuclear energy industry on life support. ***A-3***

This type of reactor requires plutonium for fuel, which is a key component in nuclear bombs and thus poses a nuclear proliferation threat. ***A-4***
This reactor would also use uranium enriched at higher levels than are currently used in nuclear reactors. ***A-5***

The DOE has proposed that this type of reactor could operate for 60 years, meaning that one VTR at INL could produce 30 metric tons of spent nuclear fuel over its lifetime. Creating more dangerous radioactive waste with no viable and safe long term waste solution places an enormous threat on the future of Idaho's environmental and human health. ***A-6***

Please see this project is cancelled. ***A-7***

Thank you.

A-1 DOE recognizes the inherent hazards associated with the use sodium in a nuclear reactor. These hazards have been considered in the design of the VTR. Design features have been added to limit the exposure of sodium to air (e.g., double walled piping, the use of inert atmospheres). Extensive U.S. sodium-cooled test reactor experience was collected with the successful operation of the Experimental Breeder Reactor-II (EBR-II) and the Fast Flux Test Facility (FFTF), which provided about 40 years of successful operation as test facilities. Please see the discussion in Section 2.7, "VTR Facility Accidents," of this CRD for additional information.

A-2 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. DOE always strives to learn from its past projects as well as those from the private sector. Specifically, VTR would begin construction after the appropriate level of final design has been completed as well as development of the supply chain, prototype testing of critical components, and completion of labor analysis studies. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost.

A-3 DOE acknowledges your preference for development of renewable energy resources and your position that funds should not be expended on nuclear energy. DOE believes there is a potential societal benefit from the development of advanced reactors and that nuclear energy should be part of the overall mix of energy sources in the United States. Refer to Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic. Support and funding for nuclear energy versus renewable energy technologies is outside the scope of this VTR EIS.

A-4 DOE acknowledges your concern regarding nuclear proliferation. The VTR would use only existing inventories of plutonium. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic.

A-5 While different fuel compositions were evaluated for the VTR (see Chapter 2, Section 2.6, of this VTR EIS), the initial core would use uranium enriched to 5 percent uranium-235. This enrichment is commonly used in commercial light water

Campaign A (cont'd)

nuclear power plants. The core design does have the flexibility to use uranium at higher enrichments, but would use only low-enriched uranium. The commenter is also referred to the discussion in Section 2.3, "Nonproliferation," of this CRD.

A-6 The VTR operation would generate about 1.9 metric tons of heavy metal (MTHM) as spent nuclear fuel (SNF) annually. If the VTR operated continuously for 60 years, it would generate about 110 MTHM of SNF. The VTR EIS includes an evaluation of the construction and operation of a SNF storage facility that could safely store the entire 60-year inventory of SNF generated under the VTR alternatives. Storage would be an active process that includes monitoring and inspections, and if necessary, maintenance actions to ensure that the spent nuclear fuel does not pose a threat to workers, the public, or environment. Over the time it is stored at the Idaho National Laboratory (INL) Site, the goal would be to maintain it in a manner that it is ready for offsite shipment whenever an offsite option becomes available. The storage of spent nuclear fuel has been evaluated in this VTR EIS and is projected to have minimal impacts (i.e., once packaged, there would be no releases to the air, water, or soil and radiation doses would be low). Therefore, there would be no expected impacts on members of the public or the environment in Idaho. Refer to Section 2.5 of this CRD for additional discussion regarding waste and spent nuclear fuel management and disposal.

A-7 DOE acknowledges your opposition to the VTR project. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition," of this CRD for additional information.

Campaign A (cont'd)

Individuals submitting this campaign

Mark Giese
Jody
Theresa Kaufmann
Jeanne Knott
Bryant Kusy
Jonathan Sadler
Kiki Tidwell
Theresa Williams

Campaign A (cont'd)
Individuals submitting "Campaign A" with additional comments

Additionally, most citizens understand that "new nuclear research" means less about energy production - **parity has been reached with wind, solar and battery storage** - unless we're talking space exploration, and more about the US's aging nuclear arsenal and development of new weaponry. *A1-1*

The fact that this is "whitewashed" does at least two things: it discredits and squanders the worthwhile projects and incredible intellectual resources at INL and it steers resources away from what the market forces are clearly demonstrating, that renewables plus battery storage are really what is best for our power grid AND our economy in terms of job creation. *A1-2*

Idaho is better than this. Our farmers, ranchers, outdoors industries know this. But for sake of funding certain Idahoans turn a blind eye to the truer legacy: nuclear waste management nightmares and future security risks. *A1-3*

Bryant Kusy

A1-1 The proposed VTR has nothing to do with the DOE/National Nuclear Security Agency activities to maintain the U.S. nuclear weapon stockpile. As discussed in Chapter 1, Section 1.3, of this VTR EIS, the purpose of the VTR is to provide a fast-neutron source testing capability. Refer to Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic.

A1-2 DOE acknowledges your preference that resources should be committed to renewable energy sources and battery storage technology. DOE believes there is a potential societal benefit from the development of advanced reactors and that nuclear energy should be part of the overall mix of energy sources in the United States.

A1-3 DOE acknowledges the commenter's concerns regarding nuclear waste and security. Refer to Section 2.3, "Nonproliferation"; Section 2.5, "Radioactive Waste and Spent Fuel Management and Disposal"; Section 2.7, "VTR Facility Accidents"; and Section 2.8, "Intentional Destructive Acts," of this CRD for discussion of these topics.

NO, I don't agree with this Versatile Test Reactor above our aquifer.

Water under the high desert

Underlying the desert of Southern Idaho lies the Eastern Snake Plain Aquifer, which is the size of Lake Erie, covering 10,000 square miles[1], This is an amazing resource for Idaho when you look at what other countries without water are having to spend to desalinate water for their people. A couple of years ago, through my investing work, I had the opportunity to hear a speaker from the Saudi AramCo fund share that a 600 cubic-meters-per-day desalination plant was currently being built in the Gulf, but that a 3000 megawatt power plant had to be built at the same time to provide the power for it. Based on the US Energy Information Administration, the average cost to build a natural gas power plant in the US in 2013 was $965 per kw – which would translate to at least $2.9 billion investment to build a 3000 MW power plant, besides the huge cost of the desalination plant. But this is what they have to do; water is a base critical need. *A2-1*

[1]Samantha Wright reporting, Boise State Public Radio.

A2-1 DOE acknowledges your opposition to the Idaho National Laboratory (INL) VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition"; Section 2.6, "Snake River Plain Aquifer"; and Section 2.10, "Ongoing Cleanup," of this CRD for additional information.

Campaign A (cont'd)
Individuals submitting "Campaign A" with additional comments

Another speaker noted that only 3% of the earth's water is fresh and 68.7% of that fresh water is actually frozen. The next speaker, who invests university endowments and family offices in $1 billion projects, noted that alfalfa farmers pay $25 per acre foot for water upstream on the Colorado River, while almond farmers downstream in central California have to pay $2000-$3000 per acre foot and are lucky these days to get any allocation in drought years.

Idaho has a naturally occurring vast amount of fresh water that other countries and states are spending significant dollars to secure. And yet, although we have spent considerable energy in our state appropriating water rights between users, is anyone protecting the aquifer? For many years I have really appreciated Idaho's Attorney General Lawrence Wasden's willingness to take a strong stand for Idaho's aquifer; he has been the only one saying no to more waste while the US government put pressure on the state to bring in more nuclear waste to be stored above the aquifer at INL.

"Lawrence Wasden didn't draft the historic 1995 agreement between Idaho and the U.S. Department of Energy regarding radioactive waste at the Idaho National Laboratory, but he's determined to protect it. It has resulted in Wasden coming under political pressure. That's because he has refused to sign a waiver to bring more spent nuclear-fuel rods to the INL until the DOE makes good on its promise to begin processing 900,000 gallons of liquid sodiumbearing high-level waste stored at the site into a solid form. That liquid waste is currently housed in three large stainless steel tanks reinforced by concrete located above the Snake River Aquifer. It has been there for 60 years"[2].

In the 1950's, the federal government dumped nuclear waste from weapons production at INL in open pits. Since INL is located right on top of the aquifer, some of that waste has leached into the aquifer. We taxpayers have spent $9

A2-1 cont'd

[2]https://www.idahostatejournal.com/members/idaho-a-g-explains-firm-stand-on-nuclearwaste/article ea484799-f84c-5c48-9c71-76153aa83e82.html

Campaign A (cont'd)
Individuals submitting "Campaign A" with additional comments

billion to date to try to clean that up, Beatrice Brailsford from the Snake River Alliance tells me. She has written, "Hazardous and radioactive materials has escaped from every single project, and the leaks are, in fact, too numerous to count. Under Superfund, each of the nine major facilities was made a Waste Area Group, as was the Snake River Aquifer."[3]

About ten days ago, Attorney General Wasden and Governor Brad Little were able to reach an agreement with the U.S. Department of Energy for hopefully a path forward that protects the aquifer and gets the waste out, while working with the DOE to resolve prior breaches. I appreciate their work and hope that our federal government keeps to their promises this time. Idahoans must protect our naturally occurring Snake Plain Aquifer for the valuable asset it is.

[3]Surface contamination has reached the aquifer from, for instance, reactors operating without containment. Some of the big ticket items remaining are drying the 900,000 gallons of sodium-bearing high-level liquid waste and then adding that to the rest of the high-level waste powder and turning it all into a solid. That will be very challenging. The plutonium burial grounds and the high-level waste areas will have to be capped. Except for the core areas where either nuclear activities will continue or substantial contamination will remain even after the Superfund clean, the hope is that INL, including groundwater, will be suitable for unrestricted use in 2095." Beatrice Brailsford

A2-1 cont'd

Tiki Tidwell

Save Idaho, stop the reactors, save lives and our environment, ***A3-1***

What do we do with all that radioactive waste? We had a deal with the government, no more waste, We had a contract, a signed deal with the government-no more nuclear waste in Idaho! Is the government breaking their promise? ***A3-2***

This reactor poses a **nuclear proliferation threat!** ***A3-3***

While the EA states that micro reactors could "provide sustainable and affordable heat and power to remote communities and to industrial users…", renewable energy can already do these things without the nuclear waste and without endangering other beings, present and future. ***A3-4***

A3-1 DOE acknowledges your opposition to the Idaho National Laboratory (INL) VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition"; Section 2.7, "VTR Facility Accidents"; and Section 2.6, "Snake River Plain Aquifer," of this CRD for additional information. Additionally, information about the radiological impact to public health is presented in Chapter 4, Section 4.1.10, of the EIS. As stated in that section, the impacts are well below all regulatory limits for doses to members of the public.

A3-2 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed Section 2.5, "Radioactive Waste and Spent Fuel Management and Disposal," of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged,

Campaign A (cont'd)
Individuals submitting "Campaign A" with additional comments

Continuing to create waste that will remain harmful to the environment and humans for tens of thousands of years and expecting future generations to bear the weight of that responsibility is not only dangerous, it's unjust. ***A3-5***

Jody

It is irresponsible and shortsighted to propose a project that creates waste that we still do not know how to deal with. ***A4-1***

Jonathan Sadler

I strongly oppose the Versatile Test Nuclear Reactor now being discussed for construction at INL. ***A5-1***

Theresa Kaufmann

Opposition to the Versatile Test Reactor proposal. ***A6-1***

Theresa Kaufmann

I am writing about the proposed Versatile Test Reactor. I am opposed to the reactor. ***A7-1***

enviroment and people. It seems an enormous risk to take as well as immensely exspensive. ***A7-2***

Jeanne Knott

stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities. The VTR SNF would also be managed along with other SNF that are currently managed at the site until they are transported off site to an interim storage facility or a permanent repository. The agreements between DOE and the State of Idaho are discussed in Chapter 3, Section 3.1.9.4, and Chapter 7, Section 7.2.1, of this VTR EIS.

A3-3 DOE acknowledges your concern regarding nuclear proliferation. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic.

A3-4 Chapter 1, Section 1.3, of this VTR EIS, describes the purpose and need for the VTR, and Section 1.4 describes the proposed action and scope of this VTR EIS. This VTR EIS evaluates the potential environmental impacts of proposed alternatives for the construction and operation of a new test reactor, as well as associated facilities that are needed for performing post-irradiation evaluation of test articles, producing VTR driver fuel, and managing spent nuclear fuel (SNF). The VTR would be a test reactor; it would not be a micro reactor or a power plant. Support and funding for renewable energy technologies is outside the scope of this VTR EIS.

A3-5 DOE acknowledges the commenter's concerns regarding nuclear waste. DOE acknowledges that there is not a geological repository for the disposition of the spent nuclear fuel and high-level wastes in the United States. DOE has evaluated the potential impact of such repository at Yucca Mountain. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF and high-level wastes. However, how DOE will meet this commitment is beyond the scope of this EIS.

A4-1 DOE acknowledges the commenter's concerns regarding nuclear waste. As discussed Section 2.5, "Radioactive Waste and Spent Fuel Management and Disposal," of this CRD, regardless of the VTR alternative or reactor fuel production options, all radioactive wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for treatment and disposal at permitted or licensed facilities.

DOE acknowledges that there is not a geological repository for the disposition of the spent nuclear fuel and high-level wastes in the United States. DOE has evaluated the potential impacts of such a repository at Yucca Mountain. Notwithstanding the

Campaign A (cont'd)
Individuals submitting "Campaign A" with additional comments

decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF and high-level wastes. However, how DOE will meet this commitment is beyond the scope of this EIS.

A5-1 DOE acknowledges your opposition to the Idaho National Laboratory (INL) VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," and Section 2.3, "Nonproliferation," of this CRD for additional information.

A6-1 DOE acknowledges your opposition to the Idaho National Laboratory (INL) VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

A7-1 DOE acknowledges your opposition to the VTR project. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

A7-2 The health and safety of workers and the public are a high priority in the design and operation of DOE facilities, including the proposed VTR. Refer to Section 2.7, "VTR Facility Accidents," of this CRD for additional discussion of this topic.

As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost.

DRAFT ENVIRONMENTAL IMPACT STATEMENT

PUBLIC HEARING IN THE MATTER OF:)
)
VERSATILE TEST REACTOR)
)

Transcript of Online Meeting Proceedings, beginning at 4:30 p.m. and ending at 8:00 p.m. Eastern, on Wednesday, January 27, 2021, electronically using the Zoom Webinar platform, reported by Eileen Eldridge, Hearing Reporter.

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APPEARANCES:

Moderator: Wendy Lowe

Public Speakers: Peter Rickards
Tami Thatcher
Ian Cotton
Brian Littleton

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Albuquerque, New Mexico, Wednesday, January 27, 2021
6:30 p.m. Eastern

MS. LOWE: Good evening, everyone, and thank you so much for joining this webcast public hearing. My name is Wendy Lowe, and I would like to welcome you to this public hearing hosted by the US Department of Energy. DOE is hosting Internet-based public hearings in place of in-person hearings in part due to the ongoing public health concerns.

DOE has completed the process of preparing an Environmental Impact Statement or EIS to analyze the potential impacts of construction and operation of a Versatile Test Reactor and Idaho National Laboratory or Oak Ridge National Laboratory and the options for reactor fuel production at Idaho National Laboratory and/or the Savannah River Site.

In accordance with the National Environmental Policy Act, the Draft Environmental Impact Statement also evaluates the impacts of a no-action alternative, under which DOE would not pursue the construction and operation of a Versatile Test Reactor.

The goal of this public hearing is to provide you, as members of the public, with information about

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the analysis presented in the Draft Environmental Impact Statement, and an opportunity to comment on the Draft Environmental Impact Statement. Today is Wednesday, January 27, 2021, and the time is now 6:36 p.m. Eastern time.

This webcast hearing is one of two that is being held. The second one will be tomorrow night at 8:30 p.m. Eastern. We will begin with two prerecorded presentations that provide background information about the Versatile Test Reactor project, the National Environmental Policy Act process and findings presented in the Draft Environmental Impact Statement.

Both presentations were previously recorded, so that the same information would be provided regardless of whether you participate in the January 27th or January 28th public hearing. The presentations include an overview of the Versatile Test Reactor project by Tom O' Conner, who is DOE's Versatile Test Reactor Program Director, and the second is an overview of the Draft Environmental Impact Statement and the alternative analysis in the EIS by James Lovejoy, who is DOE's Document Manager for the Versatile Test Reactor EIS.

We anticipate the presentations will take about 30 minutes. We know that some of you may be participating online using a desktop computer, a laptop

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or a tablet. Others may be on the telephone line, those of you on the phone, will only be able to listen to the presentations. If you are participating online and the video does not start automatically, you may need to click the play button on your screen. If it appears your display has frozen as the video begins, please try refreshing your browser.

Once the presentations have concluded, I will review the ground rules for this meeting and we will begin taking comments.

(Presentations presented at this time.)

MS. LOWE: That concludes the information presentation portion of this web meeting. As a moderator, it is my job to make sure this meeting is conducted in a respectful manner and that as many people as possible have a fair opportunity to provide oral comments. Listening tonight we have from DOE Tom O' Conner, the Versatile Test Reactor Program Director and James Lovejoy, the VTR EIS Document Manager.

Please understand that the hearing officials are here to listen and will not be responding directly to your comments during this meeting. Your comments will be considered during the preparation of the Final Environmental Impact Statement. For your information,

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the two presentations that you have just seen during this meeting have been posted on the Office of Nuclear Energy VTR web page.

I would like to emphasize that providing oral comments during this web meeting is only one of the ways that you can submit your comments during the public comment period, which will end on February 16, 2021. Written comments may be sent to Mr. James Lovejoy, Versatile Test Reactor EIS Document Manager by US mail or by e-mail to the addresses shown on your screen.

Those same addresses may be used to request to be added to a distribution list to receive notification. The Final Environmental Impact Statement and Summary will be available at www.energy.gov/nepa, and the Versatile Test Reactor project website shown on the screen.

All comments that are submitted during the public comment period, including oral comments during the two webcast public hearings and written comments will be given equal consideration.

If you are interested in providing comments this evening, you must call in on (877) 407-9221. This is a toll-free number. The operator will confirm that you are calling to provide comments about the Versatile Test Reactor Draft EIS. The operator will ask for your

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name, but you can comment anonymously if you would prefer. The comments you provide over the phone will be broadcast on this webcast and transcribed for the record.

Registration to comment began with the publication of the Notice of Availability that announced the release of the Draft Environmental Impact Statement in the Federal Register.

We have two names on the list already. If you did not register previously, you are still invited to provide comments tonight by calling the number on this slide (877) 407-9221. We will be calling on people on a first come, first serve basis. To allow sufficient time for everyone to speak, oral comments will be limited to three minutes per speaker.

I will be calling up to three people at a time to let you know when your turn is coming up. When it is your turn to speak, please mute the audio on your computer, if you are participating online, to avoid echoing.

If you have a headset, please use that while speaking as it will provide the best audio quality. Begin by stating your name and the name of any organization that you are representing in an official capacity tonight. Your three minutes will begin at that

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point.

This hearing will conclude after two and a half hours or until there are no additional commenters, whichever occurs first. We recognize that three minutes is a brief amount of time to speak and encourage folks to provide more detailed comments in writing to ensure that all of your thoughts, concerns and suggestions are fully captured in the record.

We are producing a recording of this meeting and a verbatim transcription will be prepared. If we're having trouble hearing you or understanding you, we may ask you to clarify so we understand for the record. I will pause the timer, if that is necessary.

I will let you know when you have run out of time. If you're still speaking once your three minutes are up, I will ask you to conclude your remarks and then I will call on the next speaker to begin. Please understand that if I do have to cut you off, it's because it's my job to make sure that everyone who wants to speak during this meeting has a fair opportunity to do so.

We will accommodate as many people as possible until 9:00 p.m. Eastern time. One final request that I would like to make of you tonight, while some of you may have strong opinions about the proposal to build and

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operate the Versatile Test Reactor, we expect that everyone will share their comments respectfully.

The point of a public comment meeting is to give each of you an opportunity to provide your thoughts to DOE about the Draft Environmental Impact Statement. We're grateful that you have taken time out of your busy schedule to participate in this web meeting. With that, we will begin taking comments.

The two names I have on the list at this time are Peter Rickards and Tami Thatcher. So, Mr. Rickards, you may begin when you are ready.

MR. RICKARDS: My name is Peter Rickards and I'm representing PeterForIdaho.com. And I have several comments and I'll see what happens in three minutes here. But, you, of course, have already gotten my very technical scoping questions on 13 separate issues.

And it does appear as if they were acknowledged, the questions, the technical documents which I submitted, which are Department of Energy documents that I've either gotten from the OSTI archive that have been declassified or through Freedom of Information Act for legal action to retrieve hidden documents from the Department of Energy.

And so basically those are the documents I'm submitting. You did acknowledge -- I asked the

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Comments from the Versatile Test Reactor Virtual Meeting (January 27, 2021)

questions like for alpha recoil and the inability of HEPA filters to contain plutonium, but you basically did not actually answer the questions. You just said, somebody asked this question and then you actually specifically on the summary -- excuse me -- Appendix G, web page 13 of 17, respond that -- let me get this exactly here.

"HEPA filters used in support of VTR activities will conform to the latest version of the DOE's standards and specifications for the HEPA filters used by the DOE contractors."

That's specifically not addressing the fact that these four filters in a row cannot contain plutonium, it knocks itself through and the nanoparticles are basically much more toxic according to the NIOSH Federal Protectors, the doctors there, and I submitted their nanotechnology studies that basically said the nanoparticles are way much more toxic than the methods used in the standard analysis.

And as -- in particular the OSTI comment is contrary to your relying on the standards. It says:

"The alpha recoil problem, this process results in the continuous size reduction the transport of the particles containing

200-1

200-1 Please refer to the discussion in Section 2.11, "High-Efficiency Particulate Air (HEPA) Filter Performance," of this CRD.

plutonium 238 atoms, thus explaining the movement of contamination along services and through HEPA filters."

That's an "S," HEPA filters. And I also submitted, of course, to your blind eyes and ignored response, the McDowell Studies from the 1970s in Oak Ridge. The first document -- this is not new, I found the documents in 1991 and I have submitted them like every impact statement. And you have the audacity to simply take millions of dollars and science should be self-correcting.

When I use your documents to correct your assumptions that these HEPA filters work better four times in a row and will contain these particles, and the smaller ones are filtered better, that has been your written claim. And indeed they are not; it's the exact opposite.

And every time the wind blows, these new fragments that are outside of the facility, again, regenerate the whole brand new aerosol attack on human beings that are breathing them, this is extremely important.

And to submit and to document that last statement, I used my FOIA documents and was citing the Department of Energy in my scoping questions.

200-1 cont'd

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MS. LOWE: Conclude your remarks, please.

MR. RICKARDS: Okay. You actually ignored fires, you limited the study to ten minutes, you limited -- you acknowledged disgruntled employees in cyber attacks can destroy the plant, but you -- you say that's just not likely. You missed airplane crash.

MS. LOWE: Mr. Rickards --

MR. RICKARDS: -- destroy the building. And you just said, well, that's not going to happen.

MS. LOWE: Thank you very much for your comments. Our next speaker will be Tami Thatcher.

MS. THATCHER: Hi. Can you hear me?

MS. LOWE: Yes.

MS. THATCHER: Is that better? That should be better.

MS. LOWE: It's a little better, yes. Thank you.

MS. THATCHER: Okay. Hi. I was a nuclear safety analyst with expertise in reactor risk assessment at the Idaho National Laboratory, so I've worked on a material test reactor before. I know what goes on when the Department of Energy is running a nuclear reactor.

And if anyone can do a worse job than the US Nuclear Regulatory Commission, it is certainly the Department of Energy. I have witnesses the Department

200-2

200-3

200-3 cont'd

201-1

200-2 Accidents involving fires are addressed extensively in Appendix D of this VTR EIS. The analyses very conservatively assumed that all of the material is released over a 10-minute interval and that the recipient remains within the plume for the full plume passage. No credit is assumed for emergency actions, warnings, and evacuation. Thus the recipient gets the maximum credible dose. For some fire scenarios, the fire might last for longer than 10 minutes and the wind would likely shift in direction and magnitude, reducing the impacts on a stationary person. As discussed in Section D.1.4.2, a duration of 10 minutes is assumed for all VTR facility accident releases. This is consistent with the accident phenomenology expected for all scenarios, with the possible exception of fire. Depending on the circumstances, the time between fire ignition and extinction may be considerably longer, particularly for the larger beyond-design-basis fires. However, even in a fire of long duration, it is possible to release substantial fractions of the total radiological source term in short periods as the fire consumes areas of high MAR concentrations. The assumption of a 10-minute release duration for fire is intended to represent this circumstance.

200-3 DOE prepared the EIS and included all information necessary to determine the potential for substantial environmental impact. DOE used state-of-the-art science, technology, and expertise to assure quality in the impacts analyses. Personnel with many years of experience performed the impact analyses using computer programs approved for use by DOE and NRC. DOE acknowledges that many different perceptions of event frequency represented in the comments received, but no comments required any of the impact data presented in the EIS to be revised based on technical or scientific reasons. A beyond-design-basis accident is recognized as a potential hazard; however, such an event is extremely unlikely because a large number of independent failures would have to happen before an accident could occur. DOE would have multiple engineered and administrative controls in place to prevent these failures. In the unlikely event an accident were to occur, the potential dose to the public is bounded by the accident analysis in the EIS. No events would be as severe as the beyond-extremely-unlikely event analyzed in this VTR EIS.
The beyond-extremely-unlikely event evaluated in this VTR EIS is appropriately assigned an event frequency of 1×10^{-7} per year. In any case, the event frequency is applied consistently between VTR alternatives and thereby allows a fair comparison between the VTR alternatives. The consequences and risks of cyberattacks are bounded by the analysis in this VTR EIS. Also, please see Section 2.8, "Intentional Destructive Acts," of this CRD for a discussion of cyberattacks.

of Energy in action, and it would avoid doing safety tests. If it got adverse results, it would hide the test results. If it got adverse seismic safety results, it would ignore the results, hide the results and so forth.

Specifically, at the INL materials and fuels complex, around 2000 DOE promulgated a new 10 CFR 830 safety basis regulation, and the Department of Energy signed off that the facilities at the materials and fuels complex were compliant with that new rule.

When the Battelle Energy Alliance took over that facility in 2005, they were aware of the problem, and at that point the Department of Energy said, yeah, it's going to take a decade, many, many more years before the documentation and analysis upgrades are done that would even be close to 10CFR compliant.

And so then more safety studies began to fully be conducted and after they had conducted quite a few more safety analyses, at that point, they had the 2011 Plutonium Inhalation Event that was caused by management ignoring repeated warnings that workers' safety was at risk because of radiological handling they were going to do.

And because it was management's fault that these workers inhaled plutonium and there was inadequate

201-1 cont'd

201-1 In January 2005, as part of the transition to Battelle Energy Alliance, LLC (BEA) assuming responsibility for operating the Idaho National Laboratory (INL), all of the Argonne National Laboratory-West (ANL-W) nuclear safety documents were reviewed by both an independent group of nuclear safety professionals associated with the new INL Management and Operating contractor (BEA) and the Department of Energy, Idaho Operations Office (DOE-ID) facility line management and nuclear safety subject matter experts. The results of both reviews indicated the state of ANL-W nuclear safety documentation was not in concert with the expectations for an approved nuclear safety document and did not fully satisfy the safe harbor provisions of 10 CFR Part 830, Subpart B, Safety Basis Requirements.

Steps taken to rectify this issue included the following:

- DOE-ID documented the identified issues in a vulnerability assessment issued in January 2005.
- Documented Safety Analysis (DSA) issues were subjected to a potentially inadequate safety analysis (PISA) process as part of an MFC Unreviewed Safety Question (USQ) process.
- Actions from a USQ resolution plan were incorporated into the Safety Evaluation Report (SER) as part of the DOE-ID Nuclear Safety Basis Approval.
- These USQ controls were implemented as technical safety requirement (TSR)-level controls.
- DOE identified additional DOE-directed controls that were incorporated through an approved DOE-ID SER.
- BEA incorporated an Integrated Safety Management System (ISMS) that followed DOE G 450.4 1B, "Integrated Safety Management Systems Guide," and 48 CFR 970.5223.1, "Integration of Environment, Safety, and Health into Work Planning and Execution." The ISMS described the safety management programs used to protect workers, the public, and the environment.
- BEA developed and DOE approved Safety Performance Measures, Objectives, and Commitments that were tracked by senior DOE management to monitor the contractor's performance to these commitments. These commitments included nuclear-safety-related performance measures.
- A DOE vulnerability assessment informed the development of a DOE management control plan, resulting in a review of Nuclear Safety Management practices at MFC.

emergency response, which is the tradition at the Idaho National Laboratory for a long time, 1961 firefighters not trained to respond to the SL-1 accident, 2018 four drums explode, again, firefighters not trained and are responding to a radiological event that they don't even know is a radiological event.

Anyway, because it was management's fault, promptly the urine and fecal sample results were falsified and the long-count results were falsified for those workers that had high intakes. This how the Department of Energy conducts its work, and I have witnessed this.

201-1 cont'd

The VTR EIS does include mention of some thyroid cancer, statistics for our region, and it fails to even seem to notice that only the counties surrounding the Idaho National Laboratories have consistently and for the last over the decade have consistently had double the thyroid cancer incident rate than any other county in Idaho and in the US.

201-2

MS. LOWE: Ms. Thatcher, I need you to conclude your remarks, please.

MS. THATCHER: Okay. Well, I appreciate the three minutes. I hope there are other speakers. I certainly could go on far longer. Thank you very much for this opportunity.

201-2 cont'd

- DOE-ID created an approved Action Plan as required by DOE Order 413.1A. MFC DSA upgrade and implementation activities were tracked as part of the Action Plan, which included a DOE and BEA agreed upon MFC facility prioritization for the MFC DSA upgrade plan.
- The MFC DSA upgrade effort and implementation provided an upgraded MFC facility documented safety analysis that was fully compliant with 10 CFR Part 830, Subpart B, and provided the closure action for the MFC PISA/USQ identified during the INL transition reviews.
- In early February 2007, DOE-ID lead two reviews on MFC hazard category 2 and 3 facilities that focused on prioritization of the DSA upgrades and provided an analysis of the adequacy of the existing controls.

As part of the DOE-directed changes from the SER on the MFC DSA USQ, greater emphasis was placed on the identification, operation, and maintenance of safety significant (SS) and safety class (SC) structures, systems, and components (SSCs). DOE-ID personnel developed criteria, review, and approach documents for the conduct of focused reviews on selected MFC facility SS-SSCs and SC-SSCs. These focused reviews ensured that the relied upon safety systems were operating and maintained consistent with DSA assumptions and descriptions. BEA conducted reviews focused on the MFC facility SSCs anticipated for selection as safety class or safety significant in the upgraded MFC DSA that were relied upon in existing, approved facility DSAs for their safety function. These reviews served two functions: (1) they verified that the performance criteria of the existing facility DSAs were satisfied and that surveillance and maintenance activities were complete to ensure long-term operability and (2) they identified additional SSCs that would be necessary for safe facility operations, if any, over the currently identified SSCs. These reviews provided additional information as to the adequacy of the existing control set and if any additional controls were needed for current facility operations. These activities/reviews contributed to the hazard control development for the MFC DSA upgrade effort and implementation for each of the MFC nuclear facilities. While the USQ/PISA issues were resolved during upgrade and implementation period from 2005 through 2018, MFC nuclear facility operations were compliant with 10 CFR Part 830, Subpart B, and DOE orders and safe for facility workers, collocated workers, members of the public and the environment.

DOE-ID and BEA conducted and completed activities to identify potential vulnerabilities with existing MFC nuclear facility DSAs. The follow-on corrective

MS. LOWE: Thank you. At this time, we have no one else registered to comment, and I just wanted to open the opportunity, some people that have called in may have said they did not want to comment, if you want change their mind, please hang up the phone and call back in and let the operator know you're interested in commenting.

We'll pause for a few moments here to see if anyone let's us know they want to speak. It appears that we do not have anyone else that wishes to speak. And now that all participants that wanted to have had a chance to speak, a second three-minute time allotment will be allowed.

If you have already spoken and wish to make additional comments, you will need to hang up and call back into the meeting again at (877) 407-9221. We'll wait a few minutes to allow individuals to call back into the meeting if they're interested.

It is my understanding that Tami Thatcher would like to speak again.

MS. THATCHER: Yes. Can you hear me?

MS. LOWE: Yes. You're welcome to go ahead.

MS. THATCHER: Thank you. I would like to point out that the Versatile Test Reactor EIS, Appendix A, is the Federal Register Notice and, you know, most of

201-3

actions, which are approved by the DOE-ID Safety Basis Approval Authority, bridged any gaps identified and ensured facility operations were bounded by the nuclear safety envelope and were compliant with applicable laws and regulations. DOE-ID and BEA also reviewed the relied upon facility hazard control sets and ensured that equipment which satisfies a DSA identified safety function performs as intended. These actions related to the eleven MFC nuclear facility safety basis documents ensured that facility operations remained safe for human health and the environment and were appropriately described and approved by DOE.

After the November 8, 2011, plutonium contamination accident involving 30-year-old legacy materials at the Zero Power Physics Reactor (ZPPR), the DOE Office of Health, Safety and Security conducted a detailed accident investigation and prepared an Accident Investigation Report (DOE 2012). The Accident Investigation Report included 18 Judgment of Need conclusions for actions where BEA and/or DOE-ID needed to improve. In response to the incident and the Accident Investigation Report, BEA and DOE-ID developed a Corrective Action Plan and have tracked and completed the corrective actions. DOE-ID and BEA have made substantial safety improvements at MFC and INL since the unfortunate 2011 plutonium inhalation incident at ZPPR.

During VTR operation, DOE would require safety analysis of configurations, tests, and experiments associated with the VTR to show that the VTR would continue to operate safely under the new conditions and in compliance with the documented safety analysis. Safe operation of the VTR and support facilities is paramount. DOE is committed to maintaining the safety basis for the VTR and all fuel production and support facilities in compliance with 10 CFR Part 830.

201-2 This EIS provided information on the cancer rates in the area of interest around the INL Site (Chapter 3, Section 3.1.10). It is not the purpose of this EIS to establish a cause for the cancer rates. As noted by the commenter, there are elevated levels of thyroid cancer in the counties surrounding the INL Site. However, it should also be noted that the overall cancer rate for the surrounding counties is lower than that for Idaho and for the U.S. in general. Cancer is caused by both external factors (e.g., tobacco, infectious organisms, chemicals, and radiation) and internal factors (inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). Risk factors for cancer include age, alcohol, cancer-causing substances, chronic inflammation, diet, hormones, immunosuppression, infectious agents, obesity, radiation, sunlight, and tobacco use. Therefore, to determine the cause of any incidence of cancer can be very difficult as there are many confounding factors.

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us want nuclear weapons material to not be proliferated. We want to not spread that material.

The Department of Energy's Federal Register Notice actually says that an objective of VTR is to lead to reduced nonproliferation concerns, but this, if actually translated correctly, would mean you wanted to increase the proliferation concerns. Usually, what we want is to reduce proliferation and improve nonproliferation. Anyway, it's not correct; it's a mistake.

201-3 cont'd

The EIS for VTR without any basis asserts that the VTR would be safer than conventional nuclear reactors, even if the VTR were as safe as conventional nuclear reactors, which its much higher power density and so forth, because of it's a test reactor with rapidly changing configurations every few months and a lot of pressure on getting new tests and experiments and the coolants for those experiments in place, a test reactor is actually far less safe because of the rapid configuration changes, you make a mistake, and you may be not just melting down the experiment, you may be adversely affecting the entire core.

201-4

Now, the VTR EIS points to the Yucca Mountain Spent Nuclear Fuel Repository. Well, it hasn't been -- the research on that is the licensing hasn't been funded

201-5

201-3 DOE appreciates your identifying this misstatement. This language, which was also used elsewhere in Draft VTR EIS, has been corrected in Chapter 1 and the Summary of the Final VTR EIS. Because Appendix A is a copy of a previously issued *Federal Register* notice, that text was not changed.

201-4 Based on a comparison of the annual accident risks at conventional nuclear reactors to the annual accident risk at the VTR as presented in Appendix D of this VTR EIS, the VTR is demonstrated to be much safer than conventional reactors. Controls would ensure that the testing program would not result in sudden and rapid changes to the core configuration. Changes of specimens in test locations primarily would occur during refueling outages (those changes and the use of rabbits would be evaluated carefully and there would be safety envelopes defined for the test designs). For the tests with different coolants, only unique core positions would be used. Potential impacts of the tests on the core would be properly analyzed and the successful testing experience in previous test reactors, EBR-II and FFTF, would be used in the design and conduct of tests. Safe operation of the VTR and support facilities is paramount. DOE is committed to maintaining the safety basis for the VTR and all fuel production and support facilities in compliance with 10 CFR Part 830.

201-5 DOE acknowledges that there is not a geological repository for the disposition of the spent nuclear fuel (SNF) and high-level wastes in the United States. DOE has evaluated the potential impacts of such a repository at Yucca Mountain. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment and other issues associated with the current and future status of the nuclear waste fund and other related costs are beyond the scope of the VTR EIS. This VTR EIS includes an evaluation of the construction and operation of a SNF storage facility that could safely store the entire 60-year inventory of SNF generated under the VTR alternatives. Refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD, for discussion of this topic.

since 2010. It doesn't exist. And interim storage of spent nuclear fuel is not the same as a permanent solution. The Department of Energy has failed to find a permanent solution.

In fact, it can't even come to grips with what it's going to cost to dispose of the spent nuclear fuel that we have. We have enough spent nuclear fuel and in the pipeline for two Yucca Mountains. We don't have one. If you were to build enough nuclear reactors to make a dent in climate, you would need a new Yucca Mountain added every year.

So this EIS has as its legs -- DOE EISs that are based on fiction and on things that haven't happened. All this enthusiasm for innovation, for new ways to make the nuclear fuel and absolutely no enthusiasm for spending the money to clean up the messes, not even to estimate the costs.

DOE has not been collecting nuclear waste fund money from electrical generators since 2014, because the courts found that the Department of Energy had no set nuclear fuel program. And it didn't even have, in its wildest dreams how many trillions of dollars one was going to cost. The money that's been collected, some-30 billion, wouldn't even pay for repackaging the fuel that we have. So --

201-5 cont'd

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Comments from the Versatile Test Reactor Virtual Meeting (January 27, 2021)

MS. LOWE: Okay --
MS. THATCHER: Thank you for that second chance. I appreciate it. Thank you.
MS. LOWE: Thank you for your remarks. We would pause a moment to see if anyone else would like to make comments. Maybe, someone listening is interested now that they have heard what else has just been said.
I would remind you that if you want to make a comment, you need to call in at (877) 407-9221. We'll wait until 45 minutes after the hour. There is another meeting tomorrow evening, if people would like to call in and participate in that. Timing is a little bit different, it's two hours later.
I appreciate everyone's patience. We just want to make sure that we've given people an ample opportunity to let us know they would like to provide comments. We have some additional folks signing up to speak. Brian Littleton will be followed by Ian Cotton.
Mr. Littleton, you may begin when you're ready. Oh, did we lose him? Okay. It looks like we lost him. Ian Cotton, please. You're welcome to go ahead when you're ready.
MR. COTTON: Thanks. Can you hear me?
MS. LOWE: Yes, we can.
MR. COTTON: Thanks. I'm Ian Cotton. I'm

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with the Snake River Alliance in Boise, Idaho. I want to express my concern and opposition to this proposal. And I'll be voicing the following comments for the fact that INL is the preferred site of the VTR. My biggest concern is the fuel and waste that this project would produce. While fuel for all nuclear reactors is, of course, dangerous. **202-1**

The fuel for the proposed VTR is especially concerning as the proposed use of plutonium in addition to uranium would be required to fuel the reactor. That proposed use of plutonium presents typical risks of contamination and hazardous waste, but also the added danger of nuclear proliferation and the threat of terrorism being a key component of nuclear bombs.

The proposed use of plutonium as fuel for the VTR will set a dangerous precedent for the nuclear energy industry in the future. In addition, to the type of fuel, the amount of fuel that would be used over the lifetime of the VTR is also of concern.

According to the Draft EIS, an estimated 34 metric tons of plutonium would be fabricated into fuel over the sixty-year lifespan of the reactor. Processing that much plutonium will lead to an elevated risk of worker exposure and increased environmental impacts **202-2** and could result in plutonium being stranded at **202-3**

202-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, “Support and Opposition,” of this CRD for additional information.

202-2 Please refer to the discussions in Section 2.3, “Nonproliferation”; Section 2.5, “Radioactive Waste and Spent Nuclear Fuel Management and Disposal”; and Section 2.8, “Intentional Destruction Acts,” of this CRD for additional information. The environmental impacts and worker exposure related to the VTR alternatives and fuel production options are the subject of this EIS. Results of the impact analyses are presented in Chapter 4 (worker impacts are discussed in Sections 4.10.1, 4.10.2, 4.10.3, and 4.10.4), and summarized in Chapter 2, Section 2.9.

202-3 Please see Section 2.4, “Plutonium Use and Disposition,” of this CRD for a discussion of this topic.

Comments from the Versatile Test Reactor Virtual Meeting (January 27, 2021)

the fuel fabrication site, whether that's INL or SRS if the project were halted.

202-3 cont'd

If the fuel were sourced domestically thousands of miles of overland transport would be required to deliver it to either proposed fuel fabrication site. And if the fuel were fabricated at Savannah River site, transported from there to the VTR site at INL would also need to be considered.

All right. And if this fuel, namely, if plutonium were resourced internationally there would the added risk of transition and transport. Since there can't be any guarantee of safe transportation of these fuels, it's a risk that should not be taken.

202-4

And in addition to 34 metric tons of plutonium, there would also be an estimated 120 metric tons of uranium required for fuel for this project.

Which, of course, all this fuel would, eventually, become waste. And while it's shortsighted and dangerous to continue to produce spent nuclear fuel at any site, it's especially concerning the possibility of all this spent nuclear fuel staying at INL that is at the top of the Snake River Aquifer. The Snake River Aquifer provides water for more than 300,000 Idahoans as well as irrigation water for our state's richest agricultural regions.

202-5

202-4 The transportation of the reactor fuel (uranium and plutonium) would be carried out by the DOE Office of Secured Transportation (OST). OST is responsible for the safe and secure transport of government-owned nuclear materials in the contiguous United States. Even though the EIS identifies representative routes, specific information on the routes and dates of material movement are classified to ensure operational security. These materials are transported in highly modified secure tractor-trailers and escorted by armed Federal agents in accompanying vehicles for additional security, as needed. Appendix E, Section E.2.4, describes the key elements of the secure transportation asset, which emphasizes the various aspects of the transportation. It should be noted that secure transportation is an ongoing activity within the United States. Finally, as indicated in this EIS, the overall risks of transporting these materials are very small.

If the plutonium is sourced from a foreign nation (e.g., France or United Kingdom), these materials would be transported in specially built vessels that have been used for transport of similar materials internationally with sufficient security and safeguards in place during their transport. The shipments in vessels would be carried out in a carefully managed and well-conceived manner. There are a series of independent barriers between the radioactive material and the outside environment. This system of "safety in depth" encompasses the material being transported, special packages in which the materials are transported, and the protection provided by the ships with their reinforced double hulls. The vessel safety system provides much greater protection than typically exists for other hazardous cargoes (such as chemicals, petroleum products), which are shipped much more frequently. It also removes reliance on the availability of emergency assistance from countries adjacent to the shipping routes. Appendix F of this EIS describes the environmental consequences from ship transport of plutonium from foreign countries to a U.S. port of entry, including impacts under incident-free and accident conditions. Transport of these materials within the U.S. would be carried out by the OST, as discussed above.

202-5 Please refer to Section 2.6, "Snake River Plain Aquifer," of this CRD for a discussion of this topic and DOE's response.

In addition to nuclear fuel, the amount of transuranic waste produced as a result of fuel fabrication and operation of the VTR could be as much as 6 metric tons. Disposal of that waste at WIPP in New Mexico will unnecessarily challenge legal volume cap of WIPP and could negatively impact transgenic waste, disposable plans by DOE.

And lastly, the price tag. The exorbitant estimated cost of this project is also an important consideration. Spending three to six billion dollars to support a nuclear energy industry that has stagnated over the last 20 years is irresponsible use of tax payer money with typical overruns of nuclear energy projects, the final price tag is likely to end well above even the high cost of projection of this proposal.

I thank you for this opportunity to speak and for your consideration of these comments.

MS. LOWE: Thank you, Mr. Cotton.

I believe Brian Littleton has called back in.

Mr. Littleton, are you available?

MR. LITTLETON: Yes, yes. I am here. Can you hear me?

MS. LOWE: You may go ahead when you're ready.

MR. LITTLETON: Okay. This is Brian Littleton. I'm with the Environmental Protection Agency. I have

202-6

202-7

202-6 Transuranic wastes would be managed (e.g., handled, treated, packaged, stored, and transported) in compliance with regulatory and permit requirements and shipped off site for disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico. If the DOE defense plutonium were used to produce VTR driver fuel, the transuranic waste generated as part of the reactor fuel production options would meet the criterion of being defense related. The WIPP Land Withdrawal Act (LWA) (P.L. 102-579 as amended by P.L., 104-201) requires waste disposed at WIPP to (1) meet the definition of “transuranic waste” (WIPP LWA Section 2(18)) and (2) be generated by atomic energy defense activities (WIPP LWA Section 2(19)). Additionally, waste must meet the WIPP LWA, WIPP Hazardous Waste Facility Permit, WIPP waste acceptance criteria, and other applicable requirements. Compliance with these requirements may be demonstrated by acceptable knowledge, non-destructive assay, and other established methods. The waste stream must comply with the WIPP Waste Acceptance Criteria and the WIPP Permit Waste Analysis Plan by passing a transuranic waste certification audit, an inspection by the U.S. Environmental Protection Agency, and New Mexico Environment Department (NMED) approval of the final audit report.

The WIPP LWA stipulates that the transuranic waste capacity of the WIPP facility is a total transuranic waste volume capacity limit of 175,600 cubic meters (6.2 million cubic feet). As of April 3, 2021, the WIPP facility has disposed of 70,115 cubic meters of transuranic waste. This transuranic waste disposal volume is about 40 percent of the total TRU waste volume allowed by Public Law 102-579 as amended by Public Law 104-201. TRU waste volume estimates such as those provided in National Environmental Policy Act (NEPA) documents, are not intended to demonstrate compliance with the WIPP Land Withdrawal Act TRU waste volume capacity limit. TRU waste volumes projected in NEPA documents will be incorporated, as appropriate, into future ATWIR [Annual Transuranic Waste Inventory Report] TRU waste inventory estimates.

The Department is conducting preliminary planning to evaluate options to be able to continue uninterrupted transuranic waste disposal operations up to the total transuranic waste volume capacity limit. Additional transuranic waste disposal panels that would provide capacity to dispose of transuranic waste up to the WIPP LWA total transuranic waste volume capacity limit may be authorized under a future permit modification. The WIPP Permit, consistent with Resource Conservation Recovery Act regulations at 40 CFR 270.42, can be modified by submittal of a Permit Modification Request (PMR) and decision by NMED to

Comments from the Versatile Test Reactor Virtual Meeting (January 27, 2021)

one comment at this time, and we will be providing written comments later before the end of the comment period. My comment at this time would have to do with the length of the comment period.

We were wondering if there's a possibility that the Department will consider an extension of the deadline for providing comments on the EIS. It's a little tight. That's my only comment at this time.

203-1

MS. LOWE: Okay. Thank you, Mr. Littleton.

MR. LITTLETON: Thank you.

MS. LOWE: We will, again, pause to see if anybody would like to call in and make comments. Just a reminder that the Office of Nuclear Energy VTR web page has additional information about the project as well as copies of the presentation that were provided earlier this evening.

There is another meeting tomorrow evening and you can find the link for registering for that -- for participating in that meeting tomorrow night on the VTR EIS website, web page.

I'll make one final announcement, if you're interested in providing comments tonight, we need you to call (877) 407-9221 and let the operator know that you would like to provide comments.

If you're just joining us, we are pausing to

approve the PMR. Both Class 2 and Class 3 PMRs include a public comment period as a step in the regulatory process. Also, refer to Section 2.5, "Radioactive Waste and Spent Nuclear Fuel Management and Disposal," of this CRD.

202-7 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost.

203-1 The official comment period started on December 31, 2020, with the Environmental Protection Agency Notice of Availability, and was originally scheduled to end on February 16, 2021. In response to a number of requests, DOE extended the comment period to March 2, 2021. In addition, the Draft VTR EIS was available upon DOE's Notice of Availability on December 21, 2020, 10 days prior to the start of the official comment period.

Comments from the Versatile Test Reactor Virtual Meeting (January 27, 2021)

see if anyone else would like to speak. If you would like to provide comments, we need you to call in to the number on the screen. It's (877) 407-9221. We have called all of the registered speakers, but we want to make sure that everyone has an opportunity to speak that would like to.

The VTR EIS website that is listed on the slide is a source of additional information about the project and the Environmental Impact Statement. But if you go to that web page, there will be another meeting tomorrow night starting two hours later than the meeting that started tonight.

Any information about how to participate in that meeting is available on the VTR EIS -- on the VTR website, the one that is on the screen. I'm sorry. Of course, if you're interested in providing comments and don't want to make them orally, the information about how to submit comments in writing is also available on the screen right now.

The address -- it should be sent to Mr. James Lovejoy. It can be either mailed or e-mailed. If you're just joining us and you would like to make comments on the Draft Environmental Impact Statement on the Versatile Test Reactor, we need you to call in to register to speak. The phone number for calling is

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Comments from the Versatile Test Reactor Virtual Meeting (January 27, 2021)

(877) 407-9221.

All registered speakers have been called upon already, so we're just waiting to see if we have any more people that would like to provide comments. The web page address on the slide is a source of information for you to go and find the Environmental Impact Statement and to observe the presentations that were shared this evening or to find the information about the second public hearing, which will be held tomorrow evening.

We're going to wait until the top of the hour, which is 8:00 p.m. Eastern or 6:00 p.m. Mountain, so we'll wait and see if anyone else wants to comment by that time.

If you're still with us, I would like to thank you for your patience. We're just wanting to make sure that we have provided the opportunity for people that want to make comments. If you do want to participate by providing comments tonight, we need you to call (877) 407-9221 and let the operator know that you're interested in making comments.

On the slide right now, there is the web page address for the Versatile Test Reactor Environmental Impact Statement. You can go there to see the EIS, to listen the presentations that have been provided tonight

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and to get the information about participating in the second hearing, which will be tomorrow evening beginning at 8:30 p.m. Eastern.

I would like to make a last call for commenters for this public hearing. If you're interested in making comments tonight, please call (877) 407-9221, and let the operator know that you're interested in providing comments.

Again, providing comments orally is only one way you can provide comments. The address for submitting comments via e-mail or by mail is available on the screen at the moment. The web page for additional information about the Environmental Impact Statement is also on the slide right now.

On behalf of the US Department of Energy, I want to thank you very much for your time and attention. Let the record reflect that it is now 8:00 p.m. Eastern time. All registered speakers have been called upon to speak.

The project team looks forward to working with you throughout this process. We will now adjourn this meeting. Thank you so much for participating tonight.

(End time: 8:00 p.m. Eastern.)

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Comments from the Versatile Test Reactor Virtual Meeting (January 27, 2021)

HEARING REPORTER'S CERTIFICATE

I, EILEEN ELDRIDGE, HEARING REPORTER, IN AND FOR THE STATE OF CALIFORNIA, DO HEREBY CERTIFY:

THAT THE FOREGOING TRANSCRIPT OF PROCEEDINGS WERE TAKEN BEFORE ME AT THE TIME AND PLACE THEREIN SET FORTH; THAT THE TESTIMONY AND PROCEEDINGS WERE REPORTED STENOGRAPHICALLY BY ME AND LATER TRANSCRIBED BY COMPUTER-AIDED TRANSCRIPTION UNDER MY DIRECTION AND SUPERVISION; THAT THE FOREGOING IS A TRUE RECORD OF THE TESTIMONY AND PROCEEDINGS TAKEN AT THAT TIME.

I FURTHER CERTIFY THAT I AM IN NO WAY INTERESTED IN THE OUTCOME OF SAID ACTION.

I HAVE HEREUNTO SUBSCRIBED MY NAME THIS 9TH DAY OF FEBRUARY 2021.

EILEEN ELDRIDGE
HEARING REPORTER

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DRAFT ENVIRONMENTAL IMPACT STATEMENT

PUBLIC HEARING IN THE MATTER OF:)
)
VERSATILE TEST REACTOR)
)

Transcript of Online Meeting Proceedings, beginning at 6:30 p.m. and ending at 10:00 p.m. Eastern, on Thursday, January 28, 2021, electronically using the Zoom Webinar platform, reported by Eileen Eldridge, Hearing Reporter.

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Comments from the Versatile Test Reactor Virtual Meeting (January 28, 2021)

APPEARANCES:

Moderator: Wendy Lowe

Public Speakers: Terri Kaufman
Lee Ford
Max Bell
Tim Andrea
Julie Hoffnagle
Danika Lester
Kirk Mac Gregor

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Comments from the Versatile Test Reactor Virtual Meeting (January 28, 2021)

Albuquerque, New Mexico, Thursday, January 28, 2021
6:30 p.m.

MS. LOWE: Good evening, everyone, and thank you so much for joining this webcast public hearing. My name is Wendy Lowe and I would like to welcome you to this public hearing hosted by the US Department of Energy. DOE is hosting Internet-Based public hearings in place of in-person hearings in part due to the ongoing public health concerns.

DOE has completed the process of preparing an Environmental Impact Statement or EIS to analyze the potential impact of construction and operation of a Versatile Test Reactor and Idaho National Laboratory or Oakridge National Laboratory and the options for reactor fuel production at Idaho National Laboratory and/or Savannah River Site.

In accordance with the National Environmental Policy Act, the Draft Environmental Impact Statement also evaluates the impacts of a no-action alternative, under which DOE would not pursue the construction and operation of a Versatile Test Reactor.

The goal of this public hearing is to provide you, as members of the public, with information about the analysis presented in the Draft Environmental Impact

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Statement, and an opportunity to comment on Draft EIS. Today is Thursday, January 28, 2021, and the time is now 8:31 p.m. Eastern time

This webcast hearing is one of two that are being held. The first one was held yesterday at 6:30 p.m. Eastern. We will begin with two prerecorded presentations that provide background information about the Versatile Test Reactor process, the National Environmental Act process and findings presented in the Draft Environmental Impact Statement.

Both presentations were previously recorded, so that the same information would be provided regardless of whether you participate in the January 27th or January 28th public hearing. The presentations include an overview of the Versatile Test Reactor project by Tom O' Conner, who is DOE's Versatile Test Reactor program director, and an overview of the Draft Environmental Impact Statement and the alternative analysis of the EIS by James Lovejoy, DOE's Document Manager for the Versatile Test Reactor EIS.

We anticipate the presentations will take about 30 minutes. We know that some of you may be participating online using a desktop computer, a laptop or a tablet. Audio from the webcast and over the phone will be the same for this meeting. If you have joined the webcast online and are able to hear the presentation through your computer, you

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do not need to call into the meeting unless you intend to make comments.

Others may be on the telephone line, those of you on the phone will only be able to listen to the presentation. If you are participating online and the video does not start automatically, you may need to hit the play button on your screen. If it appears your display has frozen as the video begins, please try refreshing your browser.

Once the presentations have concluded, I will review the ground rules for this meeting and begin taking comments.

(Presentations presented at this time.)

MS. LOWE: As the moderator, it is my job to make sure that this meeting is conducted in a respectful manner and that as many people as possible have a fair opportunity to provide oral comments. Listening tonight from DOE, we have Tom O' Conner, the Versatile Test Reactor Program Director and James Lovejoy, the VTR EIS Document Manager.

Please understand that the hearing officials are here to listen and will not be responding directly to your comments during this meeting. Your comments will be considered during the preparation of the Final Environmental Impact Statement. For your information, the two presentations you saw this evening have been posted on the

Transcript of Proceedings
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Office of Nuclear Energy VTR web page.

I would like to emphasize that providing oral comments during this web meeting is only one of the ways that you can submit your comments during the public comment period, which will end on February 16, 2021. Written comments may be sent to Mr. James Lovejoy, Versatile Test Reactor EIS Document Manager by US mail or by e-mail to the addresses shown on your screen.

Those same addresses may be used to request to be added to a distribution list to receive notification. The Final Environmental Impact Statement and Summary will be available at www.energy.gov/nepa, and the Versatile Test Reactor project website address shown on the screen.

All comments that are submitted during the public comment period, including oral comments during the two webcast public hearings and written comment will be given equal consideration.

If you are interested in providing comments this evening, you must call in on (877) 407-9221. This is a toll-free number. The operator will confirm that you are calling to provide comments about the Versatile Test Reactor Draft EIS. The operator will ask for your name, but you can comment anonymously if you would prefer. The comments you provide over the phone will be broadcast on this webcast and transcribed for the record.

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Registration to comment began with the publication of the Notice of Availability that announced the release of the Draft Environmental Impact Statement in the Federal Register.

As of right now, we have no names on the list of people that want to speak tonight. You are still invited to comment tonight by calling the number on the slide. Again, (877) 407-9221, and we will begin calling people on a first come, first serve basis.

To allow sufficient time for everyone to speak, oral comments will be limited to three minutes per speaker. I will be calling on people, three people at a time, to let you know when your turn is coming up. When it is your turn to speak, please mute the audio on your computer, if you are participating online, to avoid echoing.

If you have a headset, please use that while speaking as it will provide the best audio quality. Begin by stating your name and the name of any organization that you are representing in an official capacity tonight. And you three minutes will begin at that point.

This hearing will conclude after two and a half hours or until there are no additional commenters, whichever occurs first. We recognize that three minutes is a brief amount of time and encourage folks to provide detailed comments in writing to ensure that all of your thoughts,

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Comments from the Versatile Test Reactor Virtual Meeting (January 28, 2021)

concerns and suggestions are fully captured in the record.

We have a court reporter who is created a verbatim transcription of this meeting. Because of that person's job to accurately capture your comments, we may interrupt you if we're having trouble hearing or understanding you. I will pause the timer, if that is necessary.

I will let you know when you have run out of time. If your still speaking once your three minutes are up, I will ask you to conclude your remarks and then I will call on the next speaker to begin. Please understand that if I do have to cut you off, it will be because it's my job to make sure that everyone who wants to speak during this meeting has a fair opportunity to do so.

We will accommodate as many people as possible until 11:00 p.m. Eastern time. One final request that I would make of you tonight, while some of you may have strong opinions about the proposal to build and operate the Versatile Test Reactor, we expect that everyone will share their comments respectfully.

The point of a public comment meeting is to give each of you the opportunity to provide your thoughts to DOE about the Draft Environmental Impact Statement. We're grateful that you have taken time out of your busy schedule to participate in this web meeting. With that, we will begin taking comments.

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It appears that we had two people sign up, and those names are Terri Kaufman and Lee Ford.

With that, Terri Kaufman, you may begin.

MS. KAUFMAN: All right. Thank you very much. My name is Terri Kaufman, I live in Pocatello, and I am with the Snake River Alliance. I am strongly opposed to the Versatile Test Reactor for several reasons, but the main one is the nuclear waste and the need to protect and preserve the Snake River Aquifer above which INL and these reactors sit.

300-1

We all know INL was a nuclear waste dumping ground for years and we know radioactivity had reached into the aquifer. Taxpayers have spent many, many billions of dollars to try to clean up the nuclear waste mess at INL, and I will say that DOE Idaho has done a good job of cleaning up so far. But there still remains a significant burden of nuclear waste above the aquifer already.

300-2

This project which could produce another 30 metric tons of spent nuclear fuel over its lifetime will significantly increase that burden. And INL has been designated as the testbed for a whole new range of reactors and this could be the first of an unknown number of nuclear reactors.

Also the fact that there is no viable and long-term nuclear waste solutions in this country places an enormous

300-3

300-1 DOE acknowledges your opposition to the VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, “Support and Opposition,” of this CRD for additional information.

300-2 Section 3.1.3.2.2 of this VTR EIS describes the groundwater quality in the Snake River Plain Aquifer as well as the extensive groundwater quality monitoring network that is maintained by the USGS and INL contractors. Groundwater monitoring has generally shown long-term trends of decreasing radionuclide concentrations, and current concentrations are near or below the U.S. Environmental Protection Agency maximum contaminant levels for drinking water. Please refer to Section 2.6, “Snake River Plain Aquifer,” of this CRD for a discussion of this topic and DOE’s response.

300-3 For information on spent fuel storage and disposal, please see Section 2.5, “Radioactive Waste and Spent Nuclear Fuel Management and Disposal,” of this CRD. Chapter 5, Section 5.2 of this VTR EIS describes the reasonably foreseeable actions considered for cumulative impacts. Decisions on many of the potential future reactor projects have not been made and therefore, information on their environmental impacts is not available.

Comments from the Versatile Test Reactor Virtual Meeting (January 28, 2021)

300-3 cont'd

threat on the future of Idaho's environment and the health of Idahoans.

300-4

Another problem is just the outrageous cost to taxpayers, estimated in this case to be three to six billion taxpayer dollars. But we all know the cost of these projects always exceeds the initial estimate.

And I believe our taxpayer dollars should not be wasted on cropping up a dying industry, but rather invested in the development of safer and cleaner renewable energy resources.

300-5

The only other -- the other problem is that this type of reactor requires plutonium for fuel, which is a key component in nuclear bombs, and this seems to pose a problem with nuclear proliferation.

So any way I hope you will consider my comments and thank you for allowing me to make a comment.

MS. LOWE: Thank you, Ms. Kaufman. The next commenter, the only other commenter we have registered right now, is Lee Ford.

MS. FORD: Hi, can you hear me okay?

MS. LOWE: We can.

MS. FORD: All right. Well, thank you for the opportunity to comment.

301-1

I respectfully request, for the record, that the comment period be extended. We're currently experiencing a pandemic as well as political and economic turmoil, and my concern is that while Americans are trying to just survive the times the people who this test

300-4 DOE is following a disciplined approach to managing the VTR project in accordance with the DOE Order for Program and Project Management for the Acquisition of Capital Assets. It is DOE's intent to define technical, cost, and schedule baselines and work hard to perform work as close to those baselines as practical. DOE acknowledges your preference for development of renewable energy resources and your position that funds should not be expended on nuclear energy. DOE believes there is a potential societal benefit from the development of advanced reactors and that nuclear energy should be part of the overall mix of energy sources in the United States. Refer to Section 2.2, "Purpose and Need," of this CRD for additional discussion of this topic.

300-5 DOE acknowledges your concern regarding nuclear proliferation. Please see Section 2.3, "Nonproliferation," of this CRD for a discussion of this topic.

301-1 The official comment period started on December 31, 2020, with the Environmental Protection Agency Notice of Availability, and was originally scheduled to end on February 16, 2021. In response to a number of requests, DOE extended the comment period to March 2, 2021. In addition, the Draft VTR EIS was available upon DOE's Notice of Availability on December 21, 2020, 10 days prior to the start of the official comment period.

reactor would effect the most, does not have the time to read and comment.

I don't think six weeks is long enough to submit meaningful comments on a thousand plus pages of the Draft EIS. Decisions of such magnitude, I think, deserve more time for consideration. The outcome would effect the sole source of drinking water for hundreds of thousands. It could put us at risk for terrorist attacks and it subjects and saddles future generations to deal with the radioactive waste that we create today.

Over its lifetime the VTR is estimated to use 34 metric tons of plutonium as well as uranium fuel. Processing these radioactive materials puts workers and our environment as risk locally. Additionally, transporting the fuel for VTR across the nation and across the ocean, it sounds like it might be coming from international territories.

It's first -- it's first in the US locally. It causes additional risks of contamination -- contaminating -- excuse me -- all the biological things along the way.

Using taxpayer dollars on a project like this with an estimated price tag of three to six billion, I don't think it's fair or responsible. And we don't need this reactor here or anywhere else.

Public works is time and careful consideration,

301-1 cont'd

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301-1 cont'd

301-2 Please refer to Section 2.6, "Snake River Plain Aquifer," of this CRD for a discussion of this topic and DOE's response.

301-3 DOE takes intentional destructive acts quite seriously. Please see Section 2.8, "Intentional Destructive Acts," of this CRD for a discussion of cyberattacks and Section 2.5, "Radioactive Waste and Spent Fuel Management and Disposal" for a discussion of waste management. Security forces are constantly training to thwart intentional destructive acts. Furthermore, the form of materials associated with the VTR serves to inhibit consequences from an intentional act of destruction. The VTR fuel and the VTR radioactive waste by their very nature are not susceptible to an intentional act of destruction.

301-4 The environmental impacts and worker exposure related to the VTR alternatives and fuel production options are the subject of this EIS. Results of the impact analyses are presented in Chapter 4 (worker impacts are discussed in Sections 4.10.1, 4.10.2, and 4.10.3, and 4.10.4) and summarized in Chapter 2, Section 2.9. The commenter is also referred to several of the Topics of Interest in Section 2 (e.g., Section 2.6, "Snake River Plain Aquifer") of this CRD for additional discussions of environmental impacts.

301-5 The transportation of VTR fuel would be carried out by the DOE Office of Secure Transportation (OST). OST is responsible for the safe and secure transport of government-owned nuclear materials in the contiguous United States. These transports are carried out in highly modified secure tractor-trailers and escorted by armed Federal agents in accompanying vehicles for additional security, as needed. There have been no recorded accidents in these transport types. Given the OST safety record, DOE expects the transports to occur without any release of radioactive material or contamination of the environment. The transportation accident risks evaluated in this EIS indicate the population risks of any accidents, actual or perceived, to be very small.

If the plutonium materials are sourced from Europe, they would be transported in purpose-built vessels (i.e., ships) that have been used for transport of similar materials internationally with sufficient security and safeguards in place during their transport. The shipments in vessels would be carried out in a carefully managed and well-conceived manner. There are a series of independent barriers between the radioactive material and the outside environment. This system of "safety in depth" encompasses the material being transported, special packages in which the materials are transported, and the protection provided by the ships with their

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please extend the comment deadline so that people have an opportunity to make a meaningful comment. Thank you so much for your time.

MS. LOWE: Thank you, Ms. Ford.

At this time, those were the only two people that we have had registered to speak, but we will be waiting to see if additional people are interested in providing comments this evening. And I hope you'll be patient while we wait.

If you're currently on the phone and decide that you would like to make a comment, you'll need to hang up and call back into the meeting to be added to the comment list. With that, we'll pause.

I'll repeat, if you would like to provide comments, you must call in to (877) 407-9221. The operator will confirm that you're calling to provide comments on the Versatile Test Reactor Environmental Impact Statement and ask for your name. You are allowed to provide your comments unanimously, if you prefer.

Your comments provided using your cell phone will be broadcast, so that all the people participating can hear them. Oral comments are being limited to three minutes per person. We will continue waiting.

If you're just joining us, the presentations that were provided earlier on this webcam have been posted on the

301-1 cont'd

reinforced double hulls. The vessel safety system provides much greater protection than typically exists for other hazardous cargoes (such as chemicals, petroleum products), which are shipped much more frequently. It also removes reliance on the availability of emergency assistance from countries adjacent to the shipping routes. Additionally, the vessels are routed away from areas of international instability and do not travel through seas that are considered vulnerable to acts of piracy. These considerations and inherent safety and security features greatly reduce or preclude the potential for any intentional damage and destruction. In over 40 years of transports of radioactive materials there has never been a single incident resulting in the release of radioactivity (PNTL 2020)

301-6 As described in Chapters 1 and 2 of this VTR EIS, cost was an important consideration in selecting a design for the VTR. Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD 1, Approve Alternative Selection and Cost Range) (DOE 2020b), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. The U.S. Government would provide funding for the VTR and associated facilities through congressional appropriation. The 2021 Energy and Water Development and Related Agencies appropriations bill (R46384), directed DOE to give the Appropriations Committees "a plan for executing the Versatile Test Reactor project via a public-private partnership with an option for a payment-for-milestones approach." The bill also included the Energy Act of 2020, which, in Section 2003, further directed DOE to proceed with the design and construction of VTR and authorized its funding. DOE plans to continue to work with private sector and foreign governments to establish needed collaborations and partnerships to successfully complete the project. Congressional appropriations and funding priorities are outside the scope of this VTR EIS. In making a decision regarding construction and operation of the VTR, DOE will consider the analysis in this EIS, comments received on the Draft EIS, and other factors such as mission and programmatic need, technical capabilities, work force, security, and cost.

301-7 DOE acknowledges your opposition to the Idaho National Laboratory (INL) VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, "Support and Opposition," of this CRD for additional information.

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Office of Nuclear Energy Versatile Test Reactor web page. The Draft Environmental Impact Statement and additional information about the VTR project are also available at that web page.

It appears that we have another person who is interested in speaking. That person's name is Max Bell.

MR. BELL: Hi.

MS. LOWE: Ready? Thank you.

MR. BELL: Yep. Hi my name is Max Bell. I'm 20 years old and I was born and raised in Boise, Idaho. And I just wanted to comment on the reactor, because from what I've heard about it, I don't know, I just don't like the idea of putting any kind of radioactive material above our aquifer. It's vital to protect our natural resources, especially our water. **302-1**

And, yeah. That was pretty much my public comment.

MS. LOWE: Well, thank you very much, Mr. Bell.

We will continue waiting to see if anyone else would like to provide comments. We have another person.

Tim Andrea, you may speak when you're ready.

MR. ANDREA: Okay. I would like to speak in opposition to the VTR, the Versatile Test Reactor. **303-1** I -- it's a huge amount of taxpayer dollars, several billion dollars. That's going to create a test reactor that is to be used testing materials for a whole fleet of reactors that have yet to be **303-2**

302-1 DOE acknowledges your opposition to the Idaho National Laboratory (INL) VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, “Support and Opposition,” and Section 2.6, “Snake River Plain Aquifer,” of this CRD for additional information.

303-1 DOE acknowledges your opposition to the Idaho National Laboratory (INL) VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussion in Section 2.1, “Support and Opposition,” of this CRD for additional information.

303-2 The purpose of the VTR is to provide a testing capability that would facilitate the testing and effective evaluation of nuclear fuels, materials, sensors, and instrumentation for use in advanced reactors. In other words, the VTR logically precedes the development of advanced fast reactors. Refer to Section 2.2 of this CRD for additional discussion of the purpose and need for the VTR.

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built.

To me that is premature to spend so much money on a project like this, especially when the materials involved are incredibly volatile, both sodium as the cooling agent and plutonium as the fuel. Of course, there's the risk of proliferation when you start to consider a reactor that produces plutonium.

So for many reasons this is a -- besides the proliferation hazard, if this happens to be replicated in a non-weapon state, but since the INL is jointly developing fire processing technology with Korea, Atomic Energy Research Institute with the breeder reactor that was shut down in the 90's, also a plutonium producer.

Part of the reason, I believe, it was shut down is that it was part of how India developed its nuclear weapons program.

I don't think we should repeat the mistakes of the past. Not only that, it's -- I think the value, the treasure that our aquifer is has not been honored in the past as a previous caller mentioned. The waste has been buried over our aquifer. And, again, there's no repository for the waste and so on many fronts, I think it's a terrible idea.

So I think that's all I have to say for now.

MS. LOWE: Well, thank you, Mr. Andrea.

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303-2 cont'd

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303-3 DOE recognizes the inherent hazards associated with the use of plutonium and sodium in a nuclear reactor. These hazards have been considered in the design of the VTR. Design features have been added to limit the exposure of sodium to air (e.g., double walled piping, the use of inert atmospheres). Similarly design features to limit the exposure of plutonium to air have also been incorporated. These include such features as inert atmospheres in all casks used to move the fuel and sealed systems for the transfer of fuel to and from the reactor vessel. Additionally, the analysis of accidents addresses potential failures of these systems and evaluates their potential impact on the public. Please see Section 2.7, "VTR Facility Accidents," of this CRD for additional information. In terms of proliferation, DOE notes that VTR would use existing plutonium and would be a consumer of the material. Please refer to Section 2.3, "Nonproliferation," of this CRD for additional discussion of this topic.

303-4 DOE acknowledges your concern regarding nuclear proliferation. The VTR project proposes to use plutonium as a component of the fuel. The purpose of the reactor is to provide fast-neutron source test environment, it is not to produce or demonstrate the production of additional plutonium. VTR would use only existing plutonium. Upon removal from the VTR, the spent nuclear fuel is to be processed to prepare it for disposal. There would be no recovery of nuclear material (e.g., plutonium) from the fuel. Please see Section 2.3, "Nonproliferation," of this CRD for additional discussion of this topic.

303-5 Please refer to Section 2.6, "Snake River Plain Aquifer," of this CRD for a discussion of this topic and DOE's response.

303-6 DOE acknowledges that there is not a geological repository for the disposition of the spent nuclear fuel and high-level wastes in the United States. DOE has evaluated the potential impacts of such a repository at Yucca Mountain. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF. However, how DOE will meet this commitment is beyond the scope of the VTR EIS.

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MR. ANDREA: Thank you.
MS. LOWE: We have another speaker, Julie Hoffnagle. Julie, you may begin when you're ready.
MS. HOFFNAGLE: Okay. Thank you very much. My name is Julie Hoffnagle, and I'm a longtime Idaho resident. Southern Idaho's vast freshwater aquifer provides water for homes and agriculture for the loin's share of this part of the State's inhabitants.
And I feel like it's a rare and priceless resource and that we must continue to ensure that it is protected in every way possible. I think that putting a new source of potential nuclear pollution right over this aquifer doesn't really make any sense.
I agree with the other speakers about the dangers of a plutonium fueled plant. And I'm very concerned about transport of nuclear materials: Plutonium, uranium, plutonium across whatever territories that would take in order to get it to Idaho. I'm also very concerned about the potential of increased, over the next years, production of more nuclear waste sitting above our aquifer.
And I think the last speaker, in many cases, talked about the fact that there was minimal risks of accidents, minimal risks of environmental effects that I feel like they're minimizing very much. I think that the possible danger to Idaho Falls, to the Fort Hall Indian Reservation,

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304-1

304-2

304-1 cont'd

304-3

304-1 Please refer to Section 2.6, "Snake River Plain Aquifer," of this CRD for a discussion of this topic and DOE's response.

304-2 The transportation of the VTR fuel (plutonium and uranium) would be carried out by the DOE Office of Secure Transportation (OST). OST is responsible for the safe and secure transport of government-owned nuclear materials in the contiguous United States. These transports are carried out in highly modified secure tractor-trailers and escorted by armed Federal agents in accompanying vehicles for additional security, as needed. There have been no recorded accidents in these transport types. Given the OST safety record, DOE expects the transports to occur without any release of radioactive material or contamination of environment. The transportation accident risks evaluated in this EIS indicate the population risks of any accidents, actual or perceived, to be very small.

If the plutonium materials are sourced from Europe, they would be transported in purpose-built vessels (i.e., ships) that have been used for transport of similar materials internationally with sufficient security and safeguards in place during their transport. The shipments in vessels are carried out in a carefully managed and well-conceived manner. The vessel safety system provides much greater protection than typically exists for other hazardous cargoes (such as chemicals, petroleum products), which are shipped much more frequently. It also removes reliance on the availability of emergency assistance being available from countries adjacent to the shipping routes. These considerations and inherent safety and security greatly reduce and preclude the potential for any intentional accidental damage and destruction. In over 40 years of transporting of radioactive materials, there has never been a single incident resulting in the release of radioactivity (PNTL 2020)

304-3 The purpose of the accident analysis is to provide a means for comparing the consequences between alternatives and options. The analyses provide a conservatively high measure of consequences for any of the receptors. Although consequences may appear high, these consequences represent a bounding estimate of the actual risk to receptors. Based on a comparison of the annual accident risks at conventional nuclear reactors to the annual accident risk at the VTR, the VTR is demonstrated to be much safer than conventional reactors. DOE requires safety analysis of configurations, tests, and experiments associated with the VTR to show that the VTR would continue to operate safely under the new conditions and in compliance with the documented safety analysis. Safe operation of the VTR and support facilities is paramount. DOE is committed to maintaining the safety basis for the VTR and all fuel production and support facilities in compliance with 10 CFR Part 830.

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to critters, the whole area, plus the aquifer and all the recipients of the aquifer's water are really not taken into adequate account given the potential for damage.

304-3 cont'd

And especially if the past (Inaudible) of the feds, since there's no current repository for waste. It's very likely to be piling up over our of aquifer.

304-1 cont'd

I also agree with past speakers about the input period being too short given the pandemic. I think that it should be extended, so that the public can become more aware of this and really have a chance to give it more thought and to let the powers that be know how they feel.

304-4

I very much appreciate the opportunity for virtual participation. Thank you very much.

MS. LOWE: Thank you, Ms. Hoffnagle.

I do not see other people registered yet, so we'll continue to wait a few minutes to see if there are additional people who are interested in providing comments. I hope you'll be patient with us while we wait.

I'm going to wait until 9:45 p.m. Eastern to see if anyone else would like to comment. A reminder is that if you would like to provide comments during this public hearing, you need to call (877) 407-9221, and the operator will confirm that you're calling to provide comments on this EIS, on the VTR EIS, and ask for your name.

Your comments will be provided using your telephone

304-4 The official comment period started on December 31, 2020, with the U.S. Environmental Protection Agency Notice of Availability, and was originally scheduled to end on February 16, 2021. In response to a number of requests, DOE extended the comment period to March 2, 2021. In addition, the Draft VTR EIS was available upon DOE's Notice of Availability on December 21, 2020, 10 days prior to the start of the official comment period.

line and they'll be broadcast to everyone who is participating. I would like to remind you that information resources about the Versatile Test Reactor are available on the Office of Nuclear Energy VTR web page. Copies of the presentations that were provided tonight have been posted as well as other information about the VTR project.

If you are just joining us and you would like to provide comments during this public hearing, you need call in to (877) 407-9221. An operator will confirm that you're calling to provide comments on the Versatile Test Reactor Environmental Impact Statement and ask for your name. You can provide your comments unanimously if you would prefer. Your comments provided using your telephone will be broadcast, so that all the people participating can hear them.

As of right now, all registered speakers have had the opportunity to provide comments. We will be waiting an additional ten minutes to see anyone is interested in providing comments. We appreciate your patience while we wait to see if anyone else would like to speak.

It appears that we have another person that would like to speak.

Danika Lester, you may begin when you're ready.

MS. LESTER: Okay. Hello my name Danika Lester. I am 13 years old. And my mom told me about the VTR that's going

305-1

305-1 DOE acknowledges your opposition to the Idaho National Laboratory (INL) VTR Alternative and appreciates your feedback. Considering public comments on the Draft EIS is an important step in the EIS process. Please see the discussions in Section 2.1, "Support and Opposition," and Section 2.6, "Snake River Plain Aquifer," of this CRD for additional information.

to be above the freshwater, and I would just like to say that I really hope that this doesn't happen. And I plan to live in Idaho, I really love it. And I really don't want this to be a part of my future.

305-1 cont'd

And that's pretty much all I have to say.

MS. LOWE: Well, thank you for providing your comments.

MS. LESTER: Yeah, sure.

MS. LOWE: We will continue waiting to see if anyone else would like to provide comments. In case you're just joining us, the presentations that were provided earlier have been posted on the Office of Nuclear Energy Versatile Test Reactor web page along with other information about the Versatile Test Reactor project. Please go there for further information.

We are currently waiting to see if there are additional people that would like to provide comments during this public hearing. Thank you for your patience while we wait to see if anyone else would like to speak.

If you're just joining us, I would like to welcome you to the web-based public hearing for the Versatile Test Reactor Draft Environmental Impact Statement. The presentations that were provided earlier have been posted on the Office of Nuclear Energy Versatile Test Reactor web page. We are waiting to see if additional people would like to speak. We've called on all of the folks who registered

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to speak so far.

Okay. So it looks like we have another person.

So, Kirk MacGregor, you may go ahead.

MR. MAC GREGOR: Sure, yeah. Hi. I would like to make a comment about any potential new detectors or sensor equipment that would be at the test reactor. Other countries like Austria have already surpassed the United States in quantum neutron interferometry. And in order to build out even safer nuclear detector options for reactors or any type of equipment that we use in national laboratories in universities, we have a great opportunity in new types of interferometry.

And if this placed is configured for advanced quantum neutronics and other types of interferometry, this would allow us to build better digital treads for any potential reactors or test equipment. And if there was additional prerogatives of the National Laboratory and the Department of Energy for perhaps considering what quantum neutronics really could be for increases in Space E, that would be great.

306-1

MS. LOWE: Have you finished?

MR. MAC GREGOR: Yes. That's fine.

MS. LOWE: Okay. Thank you so much, Mr. MacGregor.

As a final reminder, if you would like to provide comments during this public hearing, you must call in to

306-1 Thank you for your comment.

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(877) 407-9221, and the operator will confirm that you're calling to provide comments on Versatile Test Reactor Environmental Impact Statement and ask for your name. You're welcome to provide your comments unanimously if you would prefer.

Your comments provided via your telephone will be broadcast, so that all the people that are participating can hear them. If you're just joining us, the presentations that were provided earlier have been posted on the Office of Nuclear Energy Versatile Test Reactor web page. There's additional information about the project and the Environmental Impact Report Statement at that location as well.

For those of you on the phone, if you initially told the operator that you did not want to speak, but you've changed your mind, please hang up and call in again, so that we will know that you want speak. So if you previously said no and you've changed your mind, let's us know.

If your just joining us and you would like to provide comments during this public hearing, please understand that you need to call (877) 407-9221. And when you do that an operator will confirm that you're calling to provide comments on the VTR Environmental Impact Statement and ask for your name. If you would prefer, you can provide your comments unanimously.

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Any comments provided using your telephone will be broadcast, so that all the people participating can hear them.

So far all registered speakers have had the opportunity to provide their comments. We'll be waiting a few more minutes to see if any additional people are interested in providing comments this evening. I appreciate your patience while we wait.

If you're just joining us, I would like to thank you for attending this webcast public hearing for the US Department of Energy Draft Environmental Impact Statement for the Versatile Test Reactor. We have called all the registered speakers who have indicated an interest in providing comments.

We're waiting just a few more minutes to see if anyone else would like to speak. Please be aware that if you want to speak, you need to call (877) 407-9221. The presentations that were provided earlier this evening have been posted on the Office of Nuclear Energy's Versatile Test Reactor web page along with information about the Versatile Test Reactor project and the Environmental Impact Statement.

Please be aware that providing comments tonight is not the only way that you can provide comments. It can be submitted in writing via e-mail or through US mail to the address that is on the screen right now, addresses that are

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on the screen now. The public comment period will end on February -- uh-oh. I've lost my place.

The deadline for commenting will be February 16, 2021. So there is additional time to provide your comments in writing, even if you -- and you can provide comments in writing as well as orally. So if you have additional things you would like to say that you didn't say tonight, please feel free to submit your comments in writing.

If you're just joining us, all registered speakers have had the opportunity to provide their comments. We're going to wait five more minutes to see if anyone else would like to speak this evening. If you are interested in providing comments during this public hearing, you must call (877) 407-9221, an operator will confirm that you're calling to provide comments on the Versatile Test Reactor Environmental Impact Statement and ask for your name.

You can provide your comments unanimously if you would prefer. And any comments you provide using your telephone will be broadcast to all the people who are participating so they can hear them.

If your just joining us, the presentations that were provided earlier, have been posted on the Office of Nuclear Energy Versatile Test Reactor web page. You can also find the Draft Environmental Impact Statement there as well other project information.

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So we'll wait these final few minutes to see if anyone else would like to speak. If you called in and said you didn't want to speak and you've changed your mind, please feel free to call back and we'll call on you.

As a final reminder, presenting your comments tonight is not the only way you can comment, you're welcome to submit your comments in writing.

Can you put the slide back up, please? The addresses that are available on the slide, you can send your comments to James Lovejoy, either e-mail or by mail or by e-mail. The deadline for public comments for this public comment period is February 16, 2021.

On behalf of the US Department of Energy, I want to thank you very much for your time and attention. Let the record reflect that it is now 8:00 p.m. -- excuse me -- 10:00 p.m. Eastern. All registered speakers have been called upon to speak. The project team looks forward to working with you throughout this process.

And we will now adjourn this meeting. Thank you so much for participating tonight.

(End time: 10:00 p.m. Eastern)

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Comments from the Versatile Test Reactor Virtual Meeting (January 28, 2021)

HEARING REPORTER'S CERTIFICATE

I, EILEEN ELDRIDGE, HEARING REPORTER, IN AND FOR THE STATE OF CALIFORNIA, DO HEREBY CERTIFY:

THAT THE FOREGOING TRANSCRIPT OF PROCEEDINGS WERE TAKEN BEFORE ME AT THE TIME AND PLACE THEREIN SET FORTH; THAT THE TESTIMONY AND PROCEEDINGS WERE REPORTED STENOGRAPHICALLY BY ME AND LATER TRANSCRIBED BY COMPUTER-AIDED TRANSCRIPTION UNDER MY DIRECTION AND SUPERVISION; THAT THE FOREGOING IS A TRUE RECORD OF THE TESTIMONY AND PROCEEDINGS TAKEN AT THAT TIME.

I FURTHER CERTIFY THAT I AM IN NO WAY INTERESTED IN THE OUTCOME OF SAID ACTION.

I HAVE HEREUNTO SUBSCRIBED MY NAME THIS 2ND DAY OF FEBRUARY 2021.

Eileen Eldridge

EILEEN ELDRIDGE
HEARING REPORTER

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SECTION 4
REFERENCES

4.0 REFERENCES

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