Commentor No. 29: United States Senate, Moseley-Braun, Carol; Durbin, Richard & Poshard, Glenn Washington, D.C.

CAROL MOSELEY-BRAUN
ILLINOIS

United States Senate
WASHINGTON, DC 20510-1303

COMMITTEES:
BANKING, HOUSING, AND URBAN AFFAIRS
FINANCE
SPECIAL AGING

March 19, 1998

The Honorable Frederico Pena
Secretary
The United States Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Secretary Pena:

We are writing to express our interest in the important work underway at the Department of Energy (DoE) to evaluate strategies for the long-term management and use of depleted uranium hexafluoride. As you know, there are over 1 billion pounds of this uranium enrichment by-product stored at the enrichment plants in Ohio and Kentucky, as well as in Oak Ridge, Tennessee. We are aware that the Department is currently soliciting public comments on a Draft Programmatic Environmental Impact Statement on various uranium hexafluoride management strategies. We commend you for moving to address this health, safety and environmental issue for the employees and neighbors of these facilities. 29-1

One of the options under the consideration by DoE is a technology which can convert uranium hexafluoride to a safe and stable form of uranium suitable for long-term storage, retrievable disposal, or further use. This process is essentially the reverse of the uranium conversion process performed by AlliedSignal in Metropolis, Illinois. The technology, which is being tested through a joint DoE - industry partnership in Metropolis, offers two key benefits.

First, it converts the uranium to a solid, or oxide state, making it safer to store and available for possible future use. Secondly, it captures the Hydrogen Fluoride contained in the uranium hexafluoride which can then be recycled for use in the ongoing uranium conversion process, and for other manufacturing processes such as the production of non-ozone depleting refrigerants. The benefit to DoE and the country is that the danger posed by the existing uranium hexafluoride containers can be removed and the government can be compensated for the value of the captured Hydrogen fluoride. 29-2

We realize that DoE will not make a final decision on a uranium hexafluoride management strategy until early next year. Our hope is that the time between now and then can be used productively to fully demonstrate this technology so its full costs and benefits can be determined. In order for this to happen, DoE funding needs to continue through fiscal year 1999. We hope that sufficient funding for the current fiscal year is available within the Department's FY 1998 appropriation. Please inform us of the current and future funding plans for this

Commentor No. 29: United States Senate, Moseley-Braun, Carol; Durbin, Richard & Poshard, Glenn (Cont'd.) Washington, D.C.

important environmental management program.

We thank you for your time and attention to this matter.

Sincerely,

Carol Moseley-Braun
U.S. Senator

Richard Durbin
U.S. Senator

Glenn Poshard
Member of Congress

Commentor No. 30: University of Illinois at Urbana-Champaign Urbana, Illinois

University of Illinois
at Urbana-Champaign

Department of Chemical Engineering
114 Roger Adams Laboratory, Box C-3
600 South Mathews Avenue
Urbana, Illinois 61801
USA

March 23, 1998

Charles E. Bradley, Jr., Program Manager
Depleted Uranium Hexafluoride Management Program
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U. S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Dear Charles:

I am interested to see that things are moving ahead much as you told us they would, when we were preparing our National Research Council Report, "Affordable Clean Up". {Dr. Fred Schneider and I wrote the chapter on "Disposition of the UF_6".

At the time we saw little to suggest that conversion to metal made any sense, but I see that mentioned as one of DOE's ambitions. I wonder if you are really serious about that.

In your PEIS (Summary version, page S-44) you indicated that DOE is "committed to continuing its support for the development of applications for depleted uranium products and, for as long as is necessary, to continue the safe management of its depleted UF_6 cylinder inventory". Now that position bothers me! We have had this material in storage for 50 years and have been studying options for using the stuff for a large number of those years. Continued storage and study is just a way of avoiding a decision in my opinion. Only DOE would consider such an option! 30-1

I read where the money allotted to DOE clean-up activities is well below that required for expeditious clean-up. But the UF_6 ought to be on the list somewhere, not just relegated perpetually to the future.

Sincerely,

Walter G. May

W. G. May
Professor of
Chemical Engineering

WGM:djj

Phone (217) 333-3640 • Fax (217) 333-5052

Commentor No. 31: Friends of Oak Ridge National Laboratory Oak Ridge, Tennessee

Friends of Oak Ridge National Laboratory

1052 West Outer Drive
Oak Ridge TN 37830

2 April 1998

Mr. Charles E. Bradley, Jr
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874

Subject: Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride. Summary, DOE/EIS-0269, December 1997.

The Friends of Oak Ridge National Laboratory, an organization of retired and present employees and of others interested in the welfare of the Laboratory and the community, wishes to comment on the referenced PEIS.

Roughly 46,000 cylinders containing depleted UF_6 (not counting 8000 under management of the United State Enrichment Corporatiion) are stored at the three gaseous diffusion sites, about 4,700 of them in Oak Ridge. Each is partially filled with 10 to 14 tons, solid at ambient temperature, for a total in the neighborhood of 500,000 tons. DOE plans between 2009 and 2028 to convert the material to HF and a solid form of uranium, likely U_3O_8. There is an established market for HF, and the hope is to find beneficial uses for the uranium. Barring the breeding of nuclear fuel, not likely in the next few decades, prospects for use of a substantial fraction of it are dim. 31-1

There does not seem to be agreement in estimates of the costs of conversion, except that they will be large. If we assume for discussion, $3 a pound, net of HF value, a total of about $3 billion would be be required. Quoted current costs for management of the inventory range from fifteen to thirty million/year. If there were no significant risks involved and if the maintenance costs were to track inflation, there would be no particular urgency for getting on with conversion, because interest on the conversion investment would easily exceed present annual outlays. We have serious doubts about both premises. 31-2

1

Commentor No. 31: Friends of Oak Ridge National Laboratory (Cont'd.) Oak Ridge, Tennessee

The cylinders are constructed of carbon steel, of nominal thickness 0.312 inches (older ones were of twice this thickness). Although internal corrosion from UF_6 appears small, so long as integrity of containment is maintained, there is abundant evidence of general external corrosion from exposure to the elements, particularly of those in Oak Ridge, which tend to be older. Of more concern, there is pitting and crevice corrosion. Seven of the cylinders are known to have developed cracks, five involving handling, but two from corrosion alone. In these cases, atmospheric moisture has hydrolyzed the uranium hexafluoride to UO_2F_2, which has acted as a seal. The HF produced has dissipated harmlessly, and the contamination of water with soluble uranium compounds has not yet caused serious embarrassment. The benign effects of these failures seem to have lulled policy makers about untoward events during the thirty years projected before completion of conversion to a form safe for indefinite storage. 31-3

However, even if events having serious consequences are discounted, steep rises in the annual costs of custodial care and in the eventual costs of conversion seem inevitable. As corrosion worsens, there will be increasing numbers of breaches requiring patches. The weakening of the cylinders will increase the costs and dangers of handling them in periodic painting or in removing the contents for conversion. If all are to be converted at a single site, more and more will have walls that do not meet the minimum 0.25-inch walls DOE specifies for safe transportation by highway or rail. 31-4

Confidence that there is small risk of more damaging events may be misplaced. The cylinders support about 250,000 pounds force from the atmosphere (25000 in^2 times 10 psi differential). In addition to this evenly distributed stress is that from resting on the surface and, for the bottom layer, from those stacked on top. Many of the cylinders are forty years old. The program to clean and paint the outer surfaces lags deterioration. 31-5

There are a number of conceivable scenarios for catastrophic failures of containment, beyond what uranyl fluoride could seal, from an earthquake or transportation accidents, for example. Over the interval before planned conversion, with the number involved, stacked as they are, collapse in place of some is hard to exclude. If such an event occurred in a wet situation, a dangerous plume of HF could be produced. In Table S.2 on page S-17 of the referenced Summary, it is estimated that such a failure might occur in 1 to 10 years under dry conditions; on the next page, the frequency of a more serious accident, involving three cylinders apparently being transported, is given as 1 in 100,000 years under wet conditions. Chemical exposure from the latter is projected to have adverse effects on 1900 of the public, and on 1000 non-involved workers (of which 300 would suffer irreversible effects). With the climate here and the difficulty of reaching cylinders in the middle of storage areas, the 1 to 10 year single-cylinder failure might well occur under wet 31-6

2

Commentor No. 31: Friends of Oak Ridge National Laboratory (Cont'd.) Oak Ridge, Tennessee

conditions, perhaps with less, but still unacceptable, effects.

There seems to be general agreement that conversion is eventually necessary. We advocate acceleration. We recommend that conversion begin in Oak Ridge as the pilot. The cylinders here are in the worst condition and are likely most risky to transport. We believe that work should not be delayed until a market for the uranium develops, a long shot at best. We encourage research to lower costs of conversion, but not at the expense of timely action. In the meantime a major overhaul of the cylinder storage situation at Oak Ridge should be a high priority. 31-7

As we understand it, the cylinders are not considered waste, and as a result conversion is not on the table when remediation priorities are set. If funding for conversion is not available in the appropriate category, we believe DOE should rise above administrative barriers and assess the possible problems from the cylinders in comparison with the risks from delays of other remediation projects. 31-8

Respectfully,

William Fulkerson, President

3

Commentor No. 32: Public Hearings Paducah, Kentucky

UNITED STATES DEPARTMENT OF ENERGY

PUBLIC HEARING REGARDING

DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR ALTERNATIVE STRATEGIES FOR THE LONG-TERM MANAGEMENT AND USE OF DEPLETED URANIUM HEXAFLUORIDE

HEARING DATE: February 19, 1998

TIME: 7:00 p.m.

****
A&A COURT REPORTING
****

Anita Gale, CSR
240 Colonial Drive
Paducah, Kentucky 42001
(502) 554-9349 (800) 253-7866

Commentor No. 33: Public Hearings Oak Ridge, Tennessee

TRANSCRIPT OF THE

DEPARTMENT OF ENERGY'S PUBLIC HEARING

ON THE DRAFT

PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR ALTERNATIVE STRATEGIES FOR THE LONG TERM MANAGEMENT AND USE OF DEPLETED URANIUM HEXAFLUORIDE

DARRYL ARMSTRONG FACILITATOR

FEBRUARY 24, 1998
5:00 to 9:00 p.m.
RAMADA INN AND SUITES
OAK RIDGE, TENNESSEE

****

ARIANNE KYSER, RPR
MILLER & MILLER COURT REPORTERS
12804 UNION ROAD, KNOXVILLE TN 37922
1-423-675-1471 * 1-800-532-5950

Commentor No. 34: Public Hearings Portsmouth, Ohio

UNITED STATES DEPARTMENT OF ENERGY

In re: :

Public Hearing :

Riffe Vocational School
Piketon, Ohio
February 26, 1998
5:00 p.m.

BEFORE:

Darryl Armstrong, Facilitator.

Also present:

Charles Bradley and Thomas Marshall, Cylinder Management Program;

Halil Avci and Marsha Goldberg, Argonne National Laboratory;

Gene Gillespie, Plant Manager.

JENNIFER L. RENO REPORTING
P.O. BOX 594
WAVERLY, OHIO
(614) 947-9001

Commentor No. 35: Public Hearings Washington, D.C.

1

UNITED STATES OF AMERICA

DEPARTMENT OF ENERGY

PUBLIC HEARING ON THE DRAFT
PROGRAMMATIC ENVIRONMENTAL IMPACT
STATEMENT FOR ALTERNATIVE STRATEGIES
FOR THE LONG TERM MANAGEMENT AND
USE OF DEPLETED URANIUM HEXAFLUORIDE

- - - - -

TUESDAY
MARCH 10, 1998

- - - - -

WASHINGTON, D.C.

The public hearing was held in Room 1E-245 of the U.S. Department of Energy Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C., at 1:00 p.m., Darryl Armstrong, facilitator, presiding.

PRESENT:

Darryl Armstrong
Charles Bradley, Jr.
Andrew Lukimer
Annie Makhijani
William Quapp
Gene Hollman

NEAL R. GROSS
COURT REPORTERS AND TRANSCRIBERS
1323 RHODE ISLAND AVE., N.W.
(202) 234-4433 WASHINGTON, D.C. 20005-3701 (202) 234-4433

Commentor No. 36: State of Illinois, Department of Nuclear Safety Springfield, Illinois

STATE OF ILLINOIS
DEPARTMENT OF NUCLEAR SAFETY
1035 OUTER PARK DRIVE
SPRINGFIELD, ILLINOIS 62704
217/785-9900
217-782-6133 (TDD)

Jim Edgar
Governor

Thomas W. Ortciger
Director

April 1, 1998

Charles E. Bradley, Jr., Program Manager
Depleted Uranium Hexafluoride Management Program
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Dear Mr. Bradley:

The Illinois Department of Nuclear Safety (IDNS) hereby submits its comments on the Department of Energy (DOE) Preliminary Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride (UF6). IDNS applauds DOE's early recognition of Illinois' unique situation relative to this issue and appreciates the opportunity to comment on the Draft. IDNS considers itself a stakeholder in this process for two reasons. Clearly, IDNS is interested in any environmental impacts from changes in the mission of the Paducah Gaseous Diffusion Plant (PGDP) facility because of its proximity to Illinois. However, IDNS is also interested for a reason not reflected in the PEIS; the close proximity to the subject facility of the Allied-Signal Metropolis Works in Illinois. **36-1**

Fundamentally, IDNS supports the general strategy of converting UF_6 to more chemically stable forms such as U_3O_8 as soon as possible. We agree that DOE needs a longer-term plan for management of UF_6 that goes beyond inspections and repairs of leaking cylinders in storage yards. We also agree with the general strategy of trying to find markets for the by-products of the conversion process, although we have some concerns about radioactive contaminants in these by-products which we will discuss below. **36-2**

The major shortcoming of the PEIS in our view, however, is its failure to recognize that the Allied-Signal Metropolis Works does exist and that there is a reasonably high probability that it will have an important role to play in DOE's UF_6 management strategy. DOE must recognize that given Allied-Signal's **36-3**

Commentor No. 36: State of Illinois, Department of Nuclear Safety (Cont'd.) Springfield, Illinois

Charles E. Bradley, Jr.
Page 2
April 1, 1998

experience in the conversion business and the existing infrastructure at Metropolis, the Metropolis Works may be the only facility in the United States capable of handling the UF_6 to oxide conversion at a reasonable cost. **36-3 (Con't.)**

IDNS understands that given the method that DOE generally employs to develop a PEIS, siting issues are not addressed until the second phase of the NEPA approach. However, we feel that the decision to recognize or ignore Allied-Signal, even at this early stage, has significant impact on evaluating the risks and benefits of DOE's management options. **36-4**

Page 2-5 - This section describes the option of long-term storage as depleted UF_6. This option is the least desirable from IDNS' point of view. Associated with this option would be all the risks of transportation with none of the benefits of conversion to oxide. We suggest that this option be given no further serious consideration. **36-5**

Section 3.1.7 - The description of the affected environment surrounding the PGDP fails to recognize the presence of the Allied-Signal Metropolis Works as another major uranium processing facility in the immediate vicinity. Allied-Signal's effluent releases and impacts on the environment are thereby not considered in this review. **36-6**

Page 3-14 - The region of influence includes Massac County, Illinois (not Massaic). **36-7**

Page 3.4 - Check the map scale. 3000 km is not roughly equivalent to 2 miles. **36-8**

Table F.2 - If Allied Signal were considered as a site for a conversion facility, most of the health risks and potential benefits would need to be evaluated. Risks and benefits from construction activities would be particularly impacted. While on one hand, ecological and land use impacts would be smaller, economic benefits from increased employment would also be smaller. **36-9**

Page F-11 - Anhydrous HF may have been a valuable product at one time, however, given the glut of UF_6 on the market, one questions the value of a product whose primary use is the production of more UF_6 from ore. **36-10**

Page F-12 - IDNS is concerned about the depleted uranium content of the anhydrous HF that could be produced by a conversion process. IDNS would be interested in any uncertainties associated with the 1 ppm figure quoted. In any **36-11**

COMMENTOR NO. 36: STATE OF ILLINOIS, DEPARTMENT OF NUCLEAR SAFETY (CONT'D.) SPRINGFIELD, ILLINOIS

Charles E. Bradley, Jr.
Page 3
April 1, 1998

case, we do not believe it is certain that the material will have commercial value if it is known to be contaminated at any level.

Table F.25 - We assume that the source of the figures in this table are from (LLNL 1997) which is an estimate based on theoretical considerations. We suggest that actual historical low-level radioactive waste generation figures from Allied-Signal would be more useful. *36-12*

Page J-7 - The failure to consider existing facilities has led to inconsistencies in making assumptions. In Appendix J, the analysis of transportation risks is based on the assumption that the distance between the storage and conversion facilities is 1000 km. However, in Appendix F, it assumed that the facilities are co-located. *36-13*

Questions on our comments should be addressed to Richard Allen, Manager, Office of Environmental Safety at 217-782-1322.

Sincerely,

Thomas W. Ortciger
Director

TWO:tlk

COMMENTOR NO. 37: NURMELA, LILLIAN OAKLAND, CALIFORNIA

Lillian Nurmela, 145 Monte Cresta Ave., #201; Oakland, CA 94611 (510) 652-5766

April 4, 1998

Mr. Charles E. Bradley, Jr.
U.S. Department of Energy
Office of Nuclear Energy, Science and Technology
19901 Germantown Road
Germantown, MD 20874

Dear Mr. Bradley:

Re: Disposition of Depleted Uranium

The only responsible course for the Department of Energy to follow regarding the huge DU inventory is to establish safe, long-term storage of this material, which remains radioactive for what amounts to eternity. *37-1*

DU should definitely NOT be used for military purposes. We must not be responsible for blanketing battlefield areas with this long-lived radioactive material. *37-2*

Sincerely yours,

Lillian Nurmela

Commentor No. 38: Oak Ridge National Laboratory
Oak Ridge, Tennessee

OAK RIDGE NATIONAL LABORATORY
MANAGED BY LOCKHEED MARTIN ENERGY RESEARCH CORPORATION
FOR THE U.S. DEPARTMENT OF ENERGY

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April 3, 1998

Mr. Charles E. Bradley, Jr.
Office of Nuclear Energy, Science and Technology
Office of Facilities, NE-40
Department of Energy
19901 Germantown Road
Germantown, Maryland 20874-1290

Dear Mr. Bradley:

Comments on the *Draft Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride*

I am enclosing comments and observations generated by my staff pertaining to a review of the subject document. Please contact Gordon E. Michaels (423) 574-4187 or David L. Moses at (423) 574-6103 if you have questions concerning these comments.

Sincerely,

R. G. Gilliland

R. G. Gilliland
Associate Director for
Energy and Engineering Sciences

Enclosure

RGG:jlp

c/enc: H. E. Clark, DOE-ORO
A. G. Croff
C. W. Forsberg
E. C. Fox
S. R. Greene
M. J. Haire
G. T. Mays
G. E. Michaels
D. L. Moses
R. L. Reid
A. W. Trivelpiece - RC
V. S. White
D. L. Williams

ornl - Bringing Science to Life

Commentor No. 38: Oak Ridge National Laboratory (Cont'd.)
Oak Ridge, Tennessee

1. **Retain adequate depleted UF_6 to support the Surplus Plutonium Disposition Program under the "No action alternative" long-term management strategy for depleted UF_6.**

One of the options for dispositioning the surplus weapons-grade plutonium is for use as mixed-oxide (MOX) fuel in light water reactors. A small portion, less than 0.3% of the available supply of the depleted UF_6 (ORNL/TM-13417 Rev. 1), should be set aside and reserved for use in the Surplus Plutonium Disposition Program. The required UF_6 to be removed from inventory is approximately 1400 MT as indicated in ORNL/TM-13466, Rev. 1, which is a Data Report to be released concurrently with the Surplus Plutonium Disposition Environmental Impact Statement.

The depleted UF_6 should be stored at the Portsmouth site since that is the only facility with operating transfer autoclaves for emptying the depleted UF_6 from the 12.7 MT (14 ton) storage cylinders into 2.28 MT (2.5 ton) feed cylinders. The smaller cylinders are required for transporting the depleted UF_6 by truck to commercial conversion facilities where the depleted UF_6 will be converted to uranium oxide and subsequently blended with oxide derived from surplus plutonium to make MOX fuel at a proposed government-owned fuel fabrication facility. The UF_6 cylinders will be selected based on a depleted uranium assay specified by the consortium selected to provide MOX fuel fabrication and reactor irradiation services. The feed requirement for the depleted uranium expected to be required by the Surplus Plutonium Disposition Program is approximately 0.25 wt % as indicated in ORNL/TM-13466, Rev. 1. 38-1

The PEIS (Section S.5.1 and Section 1.6) acknowledges that other DOE programs, such as the Surplus Plutonium Disposition Program, have requirements for small amounts of depleted UF_6. It is stated that this small fractional requirement of the UF_6 inventory would not affect the selection of a long-term management strategy in the Record of Decision (ROD) to be issued following the publication of the final version of the PEIS. However, the comments under Item 1 above are relevant in that specific cylinders of excess depleted UF_6 should not be considered surplus to all government programs and will be requested to be stored at Portsmouth for potential use in the disposition of surplus plutonium.

Commentor No. 38: Oak Ridge National Laboratory (Cont'd.) Oak Ridge, Tennessee

2. **Consider the benefit of using the depleted uranium in geological disposal sites such as Yucca Mountain and the Waste Isolation Pilot Plant (WIPP) under the "Use as Uranium Oxide" long-term management strategy for depleted UF_6.**

Depleted uranium can be used to improve the performance of the repository for disposal of spent nuclear fuel (SNF). Depleted uranium reduces the radionuclide release rate from a SNF waste package and minimizes the potential for long-term nuclear criticality. In this context, the U.S. Nuclear Waste Technical Advisory Panel—the Congressionally-mandated scientific review panel for the DOE Yucca Mountain project— stated (U.S. Nuclear Waste Technical Review Board, *Report To The Congress And The Secretary of Energy: 1995 Findings and Recommendations*, Arlington, Virginia, April 1996):

"The Board suggests that DOE consider increasing the criticality control robustness of the EBS (Engineered Barrier System)... In particular, the use of depleted uranium in filler, invert, or backfill material, or in all three, is a concept the program has not yet explored adequately. Conceivably, increasing the criticality control robustness of the EBS could turn a potentially intractable analysis of external criticality into a comparatively easy one." ***38-2***

The recommendations of nationally recognized, congressionally-mandated scientific review boards on uses of depleted uranium should be explicitly considered in the PEIS. It is also noted that the Spanish repository program is investigating the use of depleted uranium to improve repository performance. This use of depleted uranium is receiving attention worldwide.

Additional information on this option can be found on pages 8-9 of the paper "Beneficial Uses Of Depleted Uranium," authored by Colette Brown of DOE and Allen Croff and M. Jonathan Haire of ORNL. The paper was prepared for the Beneficial Re-Use '97 Conference held in Knoxville, Tennessee, on August 5-7, 1997.

3. **Expand the discussion in the PEIS of potential "Use Options" of the depleted UF_6, either as Uranium Oxide or Uranium Metal,**

The primary use of the depleted UF_6 discussed in the PEIS, either as uranium oxide used to make high density concrete (Section 2.2.4) or as uranium metal (Section 2.2.5), is as ***38-3*** shielding for spent nuclear fuel or high-level waste (HLW) storage containers. The detailed discussion should be expanded to include other options which could potentially use substantial amounts of the depleted UF_6, such as its use in industrial counterweights for forklift trucks. Another potential option would be the use of the depleted UF_6 in the manufacture of casks for low-level wastes (LLW), as recently proposed in a Technical Development Initiative for Fernald. The discussion of each "use option," including the use of the depleted UF_6 as shielding, should address the economic and technical viability of each option since these issues have been challenged in the public hearings for this PEIS held in Paducah and Oak Ridge. Additional information on these options can be found in the paper "Beneficial Uses of Depleted Uranium," referenced in Item 2. ***38-3 (Con't.)***

4. **Account for the end of life disposal requirement for any application under the "Use Options" for long-term management strategy for depleted UF_6.**

DOE is considering using depleted uranium in the manufacture of casks for spent nuclear fuel or high-level waste (HLW) storage containers. One application is to covert the depleted UF_6 to an oxide which in turn would be used as the aggregate to make depleted-uranium-concrete. The high density of the uranium allows the same shielding effectiveness with approximately half the thickness of conventional concrete. This concrete would then be used to manufacture oxide-shielded casks.

Another option would be to chemically-convert the depleted UF_6 to uranium metal which could be enclosed between the stainless steel shells making up the body of the casks. The uranium metal would be the primary shielding material in the casks which could be reduced in thickness relative to casks using only steel as the shielding material. The PEIS (pages 2-14 and 2-15) states that no assumptions were made regarding the fate of depleted-uranium-concrete casts or the uranium metal casks following use. However, the disposal requirements for depleted uranium at end of life have a major impact on "use options." When the depleted uranium is used for an application such as shielding, at the end-of-life it must be converted into an acceptable waste form. The end-of-life costs to convert depleted uranium into an acceptable form may far exceed manufacturing costs. The consequence of this requirement should be evaluated in the PEIS. ***38-4***

Commentor No. 38: Oak Ridge National Laboratory (Cont'd.) Oak Ridge, Tennessee

5. **Consider disposal of the depleted uranium at the Yucca Mountain repository for spent nuclear fuel and high-level waste under the "Disposal Alternative" long-term management strategy for depleted UF_6.**

The draft PEIS (Section 2.2.6) lists three options under the "Disposal Alternative": shallow-land earthen structures, below ground vaults, and mine disposal. At least two of these three options, shallow-land earthen structures and below ground vaults, do not meet regulatory requirements for protection of public health and safety according to the detailed analysis in Appendix I of the draft PEIS. The detailed analysis within the draft PEIS on page I-23 states:

"The maximum dose to an individual, assumed to live at the edge of the disposal site and use the contaminated water, was estimated to be about 110 mrem/yr, which would exceed the 25 mrem/yr limit specified in 10 Code of Federal Regulations Part 61. Possible exposures (on the order of 10 rem/yr) could occur for shallow earthen structures and vaults if the cover material were to erode and expose the uranium material..."

The detailed technical analysis within the draft PEIS Appendix I is consistent with the U.S. Nuclear Regulatory Commission (NRC) analysis that near surface disposal of large quantities of depleted uranium is not acceptable (J. W. N. Hickey, *Letter from J. Hickey, Chief Fuel Cycle Safety Branch, U.S. Nuclear Regulatory Commission To Louisiana Energy Services, L.P.*, Docket No 70-3070, U.S. Nuclear Regulatory Commission, Washington D.C., September 22, 1992). It is also consistent with DOE performance assessments for near-surface disposal at specific sites (Martin Marietta Energy Systems, Inc.; EG&G Idaho, Inc.; and Westinghouse Savannah River Co., *Radiological Performance Assessment for the E-Area Vaults Disposal Facility*, WSRC-RP-94-218, Oak Ridge National Laboratory, Grand Junction, CO., 1994). Additional analysis is necessary to determine the viability of mine disposal of the depleted uranium to meet regulatory requirements for protection of public health and safety. **38-5**

Commentor No. 38: Oak Ridge National Laboratory (Cont'd.) Oak Ridge, Tennessee

At the current time, the only facility being planned in the United States that would meet the requirements for disposal of this material is the proposed Yucca Mountain repository for spent nuclear fuel and high-level waste. Because this is the only current option that meets the regulatory requirements for safe disposal of this material, it should be included as a disposal option in the PEIS.

6. **Clarify the "no action alternative" long-term management strategy for depleted UF_6 in the PEIS with the preferred waste form for final disposition of depleted uranium favored by the U.S. NRC.**

The no action alternative as initially announced in the "Notice of Intent" to prepare this PEIS included eventual chemical conversion of the UF_6 to oxide followed by storage. However, after public scoping and internal DOE reviews, it was determined that the no action alternative should consider the continued storage of UF_6 cylinders indefinitely at the three current storage sites, as indicated on page 2-2 of the PEIS. The NRC stated that the preferred waste form for final disposition of depleted uranium is U_3O_8 (J. W. N. Hickey, *Letter from J. Hickey, Chief Fuel Cycle Safety Branch, U.S. Nuclear Regulatory Commission To Louisiana Energy Services, L.P.*, Docket No 70-3070, U.S. Nuclear Regulatory Commission, Washington D.C., September 22, 1992). The NRC, in the referenced license application for the private Louisiana Energy Services enrichment plant, further stated that conversion of the depleted UF_6 to uranium oxides should be done on a specific schedule. **38-6**

It is ORNL's recommendation that the two points of view on the storage form of depleted UF_6 be reconciled between the DOE and NRC.

Commentor No. 39: City of Oak Ridge, Environmental Quality Advisory Board Oak Ridge, Tennessee

CITY OF
OAK RIDGE

ENVIRONMENTAL QUALITY ADVISORY BOARD

POST OFFICE BOX 1 • OAK RIDGE, TENNESSEE 37831-0001

April 9, 1998

Charles E. Bradley, Jr.
U.S. Department of Energy
Office of Nuclear Energy, Science and Technology
Office of Disposition Technologies
19901 Germantown Road
Germantown, MD 20874

Dear Mr. Bradley:

Members of the Environmental Quality Advisory Board (EQAB) have reviewed the Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management of Depleted Uranium Hexafluoride (DOE/EIS-0269). The City of Oak Ridge has a strong interest in the future management of the DOE depleted uranium hexafluoride (UF_6) inventory, since about 10% of this inventory is stored at the East Tennessee Technology Park (ETTP, formerly K-25 Site) in Oak Ridge.

As explained in the draft programmatic environmental impact statement (PEIS), the continued storage of depleted hexafluoride in steel cylinders in outdoor storage yards does not pose an imminent threat to workers, public, or the environment. However, continued safe storage requires an ongoing program of surveillance and maintenance, and the job of assuring safe storage will become more difficult as time passes. Furthermore, the continued presence of this material at the ETTP may adversely affect ongoing site reuse initiatives, both by presenting a negative aesthetic image to prospective ETTP tenants and by preventing new uses of the areas occupied by cylinder storage yards. **39-1**

EQAB members support the concept, embodied in most of the alternatives considered in the PEIS, of converting the depleted UF_6 to a more stable form (either uranium oxide or metal) that would be suitable for long-term storage, reuse, or disposal. However, we think the timetable for action that is presented in the PEIS is much too slow. Instead of waiting until 2009 to start converting this material (and finishing the job in about 2028), DOE should act now to start the conversion process as soon as feasible. (There appear to be no technical barriers to starting the conversion process.) The Oak Ridge Gaseous Diffusion Plant operated for about 40 years (1945 to 1985); the federal government owes it to this community not to wait an additional 43 years (1985 to 2028) to deal responsibly with the byproducts of gaseous diffusion. **39-2**

Thank you for the opportunity to review and comment on this document.

Sincerely,
For the Board

Gerald L. Palau

Gerald L. Palau
Chairman

cc: Honorable Mayor and Members, Oak Ridge City Council
Amy S. Fitzgerald, Special Assistant to the City Manager
James Hall, DOE Oak Ridge Operations Office

Commentor No. 40: Dortch, Jotilley Paducah, Kentucky

4305 Buckner Lane
7 April 1998

Charles E. Bradley, Jr., Program Manager
Depleted Uranium Hexafluoride Mgmt. Program
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, Md 20874-1290

Dear DOE Representatives:

A PEIS for UF_6 strategies and management must take all available information on the subject into consideration. This PEIS does not cite the following:

1. "Draft Preliminary Report - DOE Independent UF_6 Cylinder Assessment Team"; DOE draft; 25 Mar 1992.
2. "Integrity of Uranium Hexafluoride Cylinders" DNFSB Technical Report; 5 May 1995.
3. "Affordable Cleanup? - Opportunities for Cost Reduction in the Decontamination and Decommissioning of the Nation's Uranium Enrichment Facilities"; National Research Council; 1996.

Why weren't these studies used as a basis for addressing this problem and its solutions? **40-1**

The above-ground cylinder storage is risky. There are many styles of containers of varying wall thicknesses. Rust, both visible and under the paint, has weakened many. Improper storage — too close to the ground, too close together to be inspected all around, stacking incompatible styles, damage to cylinders in transport all add to the danger. Leaky or degraded valves and cylinder ID tags missing or unreadable are a problem. **40-2**

How full the cylinders are presents another problem. Many were filled before the current limits were **40-3**

COMMENTOR NO. 40: DORTCH, JOTILLEY (CONT'D.) PADUCAH, KENTUCKY

- 2 -

established.

The geology of the area at PGDP includes high risk earthquake zones. It is not a stabe place to store or reprocess UF_6. It is not a good place to store the produce until a market opens up or a use is discovered". 40-4

A viable long-term solution is to convert the cylinder contents to U_3O_8, a more stable oxide that can be reconverted if the need arises. France does this very thing. 40-5

The problems that have surfaced since we have come off the "production-at-all-cost" mentality do not need bandaids. They need real and permanent solutions based on sound technology and upon sound geologic grounds. 40-6

Sincerely,
jotilley dortch
4205 Buckner Lane
Paducah, Ky 42001

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

BNFL

British Nuclear Fuels plc

Risley
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Charles E Bradley, Jnr.,
Program Manager,
Depleted Uranium Hexafluoride Management Program,
Office of Facilities (NE-40),
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19901 Germantown Road,
Germantown MD 20874-1290

Direct tel: 01925 834204
Direct fax: 01925 832026

Your ref: ☐———
Our ref: peis1.doc

14th April 1998

Dear Ched,

Please find enclosed the BNFL response to the draft PEIS. The response document is an amalgamation of expert opinion within the Company from those with experience of various aspects of depleted hex tails processing, storage and disposition . The responses are presented as general comments or specific to the appendices of the PEIS.

You will note that one of the main concerns that we have is the omission of an option for depleted uranium metal as a medium for long-term storage/disposal. As you are aware the technology BNFL is currently developing to process our own tails has as products, uranium metal and fluorine gas. BNFL's view is that uranium metal is feasible for long-term storage and disposal and could have clear cost and environmental advantages. This has not been adequately recognised or assessed in the report. 41-1

If you have any queries about the BNFL comments, please contact me or Marilyn Meigs at BNFL Inc.

Yours sincerely

A J Lorimer

Assistant Director International Development

cc: Ms M F Meigs
Mr P R Gregson

Registered in England no.1002607
Registered office:
Risley Warrington Cheshire WA3 6AS

Commentor No. 41: British Nuclear Fuels plc (Cont'd.)
Risley Warrington Cheshire, United Kingdom

COMMENTS ON THE DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR ALTERNATIVE STRATEGIES FOR THE LONG TERM MANAGEMENT AND USE OF DEPLETED URANIUM HEXAFLUORIDE

A Note by BNFL plc

GENERAL COMMENTS

1. BNFL supports the strategy of safe storage as UF_6 pending the development of suitable uses. These uses would be most likely within the nuclear fuel cycle. *41-2*

2. The Engineering Analysis has several significant omissions and inaccuracies which although unlikely to affect the overall environmental impact, could weaken the conclusions of the PEIS and the Cost Analysis. *41-3*

3. The approach taken for the assessment of the environmental impacts arising from the various management options is good and the methodologies are suitably transparent to scrutiny. However, there are a number of general areas where the assessment methodologies could be improved and these are detailed below. *41-4*

4. The methodologies used in the Cost Analysis are considered to be sound. However the report is based on the Engineering Analysis and the comments made for that report will also have cost implications and might alter the conclusions of the Cost Analysis. In particular, the basis for the revenues or credits for the sale of AHF, CaF_2 and radiation shields require robust justification. *41-5*

5. Long-term storage as uranium metal has not been analysed even though it was a feasible recommendation in the Technology Assessment Report and there are significant volume and cost benefits which might make the economics of this route more attractive than U_3O_8 or UO_2. *41-6*

6. Disposal as uranium metal has not been analysed even though it was a feasible recommendation in the Technology Assessment Report and there are significant volume and cost benefits which might make the economics of this route more attractive than U_3O_8 or UO_2. The PEIS shows that reducing the volume of the material disposed significantly reduces the impacts on the environment, suggesting that uranium metal, which has the minimum volume, would minimise the environmental impacts. Although current DOE Orders restrict such disposal, there is no equivalent restriction at the commercial disposal sites. *41-7*

7. The environmental impacts of disposing of, or recycling, the products containing uranium metal or oxide at the end of their useful life should be analysed.

Detailed comments are presented below. *41-8*

COMMENTS ON THE ENGINEERING ANALYSIS

General

The Engineering Analysis uses conservative assumptions resulting in excessive rather than realistic costs and tending to preclude meaningful comparison of the options. Examples are: taking 7 years to build a facility, not considering use of several existing facilities in the USA, and the high projected manning levels. *41-3 (Con't.)*

Transportation Module

Cylinder Preparation for Shipment

The suggestions for the Pre-transport Preparations of UF_6 Cylinders appear to be compliant with the recommendations in IAEA Safety Series 6, 7, 8, 37 and 80.

An overcontainer used for a cylinder which does not meet DOT requirements would need to contain any leakage from the cylinder. To achieve this, the overcontainer would need to meet the requirements of a Type A Package, as defined by the IAEA. An overcontainer "slightly bigger than the cylinder" which meets DOT regulations may not achieve this. It would be more prudent to plan for the transfer of the UF_6 to a new cylinder to cater for the instance of an over-pressure and damaged cylinder which could not be transported even in an overcontainer. *41-9*

The engineering required to deal with some of the severely degraded cylinders has been underestimated. It is not reasonable to assume that these cylinders can be placed into overcontainers nor that their contents can be transferred in the manner described. *41-10*

Accidents considered for the Cylinder Preparation Options involving cylinders of solid UF_6 assume releases of UF_6 in dry conditions and HF in wet conditions (rain). Accidents involving UF_6 vapour assume releases of UO_2F_2 and HF. Releases of any physical form of UF_6 result in reaction with water vapour in the air, producing UO_2F_2 and HF vapour. The PEIS therefore has underestimated the impacts of such accidents. *41-11*

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.) RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

Emptied Cylinder Treatment

The residue remaining after the cylinder has been washed out and the water has evaporated will be UO_2F_2, rather than a "mixture of uranium and fluorine".

The cleaned cylinders could be cleaned further and monitored for free-release, or could be recycled to fabricate other containers for use in the nuclear industry. 41-12

Conversion Module

The vast majority of process and other buildings use reinforced concrete in their construction. The use of reinforced concrete for the conversion process buildings cannot in itself be considered a safety feature. 41-13

Control of HF vapour by limiting the temperature of the building will not work. The vapour pressure of HF at 32°F is nearly half an atmosphere so even at this low temperature HF will vaporise quite quickly. Control of vapour in the manner described is analogous to saying that a cup of coffee does not give off water vapour because it is below the boiling point of water. 41-14

Upgrading the concentrated HF as described in both the U_3O_8 and UO_2 options will produce approximately equal quantities of azeotropic HF, a highly corrosive liquid, and AHF. The azeotropic HF has relatively little value, and no disposal or use route is described. However, the reduction of UF_6 to UF_4 with hydrogen or cracked ammonia to produce metal does indeed produce just anhydrous HF as a by-product. 41-15

U_3O_8 Option

A dry conversion process could produce dense U_3O_8 41-16

UO_2 Option

UO_2 is a metastable oxide which could react with oxygen or air to form U_3O_8, with an increase in volume. 41-17

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.) RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

Sintering in a hydrogenous atmosphere is required to achieve the densities quoted (9 gm/cc). The hazards associated with hydrogen have not been addressed. 41-17 (Con't.)

Uranium Metal Option

A continuous metallothermic reduction process produces a uranium/iron compound with a lower melting point than that of pure uranium, allowing the operating temperature of the process to be lower. This is necessary to control the magnesium evaporation rate since magnesium has a significant vapour pressure at temperatures well below the melting point of pure uranium. The uranium/iron compound is much less dense than uranium metal and would be a relatively inefficient gamma radiation shielding material. The two metallothermic reduction processes are not therefore equivalent for the production of metal for use and should not be compared. 41-18

The Unlikely Accident during Conversion to Metal "Uranium metal fire" would be better described as a conventional fire causing some oxidation of the adjacent uranium derbies. The large size of the uranium derbies would prevent them from catching fire. 41-19

Pressurisation of the metallothermic reduction vessel caused by vaporisation of excessive magnesium has not been considered. This should be a "Likely Accident". 41-20

The estimated quantity of uranium released to atmosphere from the conversion facility is very small given the throughput of the facility. 41-21

Use Module

For shielding gamma radiation, it is not only the material's density which makes it an effective shield, but, as in the case of uranium, a high atomic number is also significant. There are alternative dense metals such as tungsten for applications which need solely high density and mass: in such applications, uranium is usually preferred only when particular mechanical properties are required in addition to density.

The number of UO_2 shielded casks and the number of uranium metal shielded casks seem to be derived by dividing the weight of uranium in the tails UF_6 by the weight of uranium in each cask. This number should be compared with the number of casks needed by the US nuclear power program for the storage/disposal of irradiated fuel. 41-22

Uranium metal is a much more effective gamma shield than UO_2, and so more spent fuel could be loaded into each metal-shielded cask, thereby reducing the transport and final disposal costs of the spent fuel. 41-23

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.) RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

The proposed method of fabricating the casks with uranium metal shielding is not practicable and is hazardous. Molten uranium forms low melting point eutectics with Fe, Cr and Ni, therefore the molten uranium will dissolve the steel shells, liberating large quantities of heat and resulting in a major spillage of uranium. There are, however, other, methods available to fabricate casks from depleted uranium that do not have these safety problems **41-24**

No reason is given why solidified ash waste from the facility producing uranium metal shielding components should require disposal in a special cell or mine. **41-25**

The estimated quantity of uranium released to atmosphere from the manufacturing facility is very small given the throughput of the facility. **41-26**

The release from accidental mishandling/drop of drum/billet inside the plant should be more for the oxide case than the metal case since the oxide is at this stage a loose and powdery material and the metal is in massive billet form. **41-27**

The chemical form of a release due to failure of a uranium metal furnace should be U_3O_8 and not UO_2.

One factor which limits the useful market for uranium is its radioactivity which means that at the end of life it cannot be disposed of by the user in a straightforward manner. The Engineering Analysis considers the manufacture and use of the depleted uranium in both oxide and metal forms for the shielding of spent nuclear fuel. However there is only a disposal route defined for the oxide form since uranium metal is not considered suitable for disposal. The environmental impacts of disposing of, or recycling, the products containing uranium metal or oxide at the end of their useful life should be analysed, including impacts from disposal of the shielding with the spent fuel still in it. **41-28**

Long-Term Storage Module

Recommendations from the Technology Assessment Report to store the uranium as metal have not been analysed even though they were considered feasible. Storage of bulk metal does not produce metal flakes so the pyrophoricity issue is not relevant. Corrosion of uranium metal by moisture can produce hydrides in the metal, but these are only a hazard if oxygen (or air) are excluded. The possibility of an explosion if the hydrogen from corrosion is collected in closed containers only arises when the containers are opened and air is admitted. Storage of bulk uranium metal in a building in air, as opposed to closed containers, is entirely practicable and safe. Should the consequent slow corrosion be **41-29**

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.) RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

unacceptable, it is feasible to consider development and application of a protective coating.

In a response to a comment on the storage of uranium in forms other than oxide, received during the scoping process for the PEIS, it was stated that "the rationale for the selection of these chemical forms for analysis will be presented in the PEIS". The same response questions the suitability of uranium metal, as opposed to uranium oxide, for storage on the grounds of "higher conversion cost, lower stability and uncertainty of the suitability of the metal form for eventual disposal". The Engineering Analysis, Cost Analysis and PEIS fail to justify any of these assertions. No account is taken of the introduction of new technologies which would produce uranium metal at significantly lower cost. **41-30**

Disposal Module

Using 30 gal drums for UO_2 disposal is not an optimum solution. There are no real reasons why 55 gal drums (about 2,000kg weight) cannot be used and handled efficiently. This would reduce the number of drums to be disposed with consequential lower environmental impacts. **41-31**

Recommendations from the Technology Assessment Report to dispose of the uranium as metal have not been analysed even though they were considered feasible. Uranium metal is accepted at commercial disposal sites in the USA, and there are no NRC regulations which would prevent such disposal. The DOE Orders which specifically exclude fluorides and metal from the Nevada Test Site and Hanford should be comprehensively reviewed to identify the adverse consequences/impacts, if any, which lead to the dismissal of U metal as a suitable form for disposal. **41-32**

The U oxides are stated to be the preferred forms for disposal because of their stability and slow dissolution rates in water. Uranium metal is slow to dissolve in water, and therefore should be considered for disposal especially when the much smaller volume of metal is taken into consideration. **41-33**

The reduced volume of the uranium metal would significantly reduce the impacts on the environment as the PEIS shows that most environmental impacts tend to be proportional to volume. The observations that impacts for the denser UO_2 are less than for U_3O_8, and the impacts for ungrouted wasteforms are less than for grouted wasteforms because the volumes are lower (about 50%) should enhance the case for disposal as U metal because metal volumes will be even lower. Disposal as U metal blocks would not involve grouting and would therefore also have lower environmental impacts through the avoidance of the long term effects of grouting. **41-34**

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.) RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

It is not correct to describe surface oxidation of U metal as "similar" to HF formation from reaction of uranium fluorides with water. The consequences of the two are very different. 41-35

COMMENTS ON THE PEIS METHODOLOGY

Areas where the Assessment Methodologies could be improved

The treatment of uncertainty in any kind of assessment methodology is a vital issue, especially where generic (non site specific) settings have been used. The uncertainties in the input parameters and assumptions in conceptual models, and their effect on the predicted consequences, need to be determined, usually by a sensitivity analysis technique. Measures can then be taken to reduce the uncertainties.

Uncertainty has been recognised as important in the PEIS but little has been done to analyse the issue. Instead, assumptions have been made with the intention that the various anticipated environmental impacts result in conservative rather than realistic estimates. As it turns out, in most cases (except groundwater contamination in the disposal option) the impacts are still low enough to be acceptable. However, this approach tends to obscure meaningful comparison between the alternatives and is not always appropriate. When a management option and suitable site are chosen, the environmental impacts for that site should be assessed on a realistic basis. 41-4

One exception to this conservative approach is the assumption that manufacture of shielded containers would bound any impacts associated with other products. In this case, the shielded containers are as large a product as can be reasonably imagined. Smaller products would require more operators per unit weight of uranium processed, and would be less self-shielded, giving much larger total involved worker doses.

Radiation and chemical effects are analysed by considering the maximally exposed individual (MEI) in three groups, "involved workers", "noninvolved workers" and "members of the general public". However, no account seems to have been taken for cumulative exposures between groups (the MEI in the involved worker group could also be the MEI in the general public group if he/she lives near the site). This approach has resulted in some anomalies, such as in the case of the manufacturing facility where the MEI radiation dose and hazard index of a member of the general public are predicted to 41-36

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COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.) RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

be greater than those for a noninvolved worker, under normal operating and certain accident conditions. A preferable approach would be to use a larger number of critical exposed groups, chosen to be mutually exclusive.

The chemical and radiation risk to the MEI for the involved worker group during normal operations has not been quantified. The reason given is that worker activities are uncertain at this stage. However, uncertainties such as this have not stopped the authors from making conservative assumptions in order to quantify environmental impacts in many other areas of the PEIS. The PEIS approach must be consistent. 41-36 (Con't.)

The impacts to the involved workers of clearing up from the assumed accidents have not been considered. The amount of material released inside the plant which the involved workers would have to clean up is likely to be significantly more than the amounts quoted in the PEIS, which are presumably the amounts released to the environment outside the process buildings. 41-37

The environmental impacts due to human intervention (deliberate and inadvertent) do not appear to have been addressed. While human intervention is most applicable for the disposal option (post-closure phase), where mining and construction activities could bring material back to the surface, there are also human intervention scenarios plausible for all of the other options. No mention is made of any institutional controls likely to be in place to help prevent such occurrences. Assessment of the risks resulting from human intervention is usually carried out by an expert elicitation process to determine the probability and consequences of various human actions. 41-38

The environmental impacts due to the disposal of secondary wastes such as MgF_2 from the conversion options have not been fully addressed. The only impact addressed is the extra burden on the capacity of the disposal sites and the environmental impacts due to the construction of new disposal sites to cope with the increase in demand. The post-closure impacts of such sites are not addressed in the PEIS. 41-39

The prediction of groundwater contamination is highly site specific. Most of the calculations in the PEIS connected with this issue have to make large assumptions over the geochemical and hydrological characteristics of generic sites and the value of environmental impacts calculated in this way is questionable. Only site-specific data should be used when calculating risks from a groundwater pathway. 41-40

Specific Comments on the Storage Option

8

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

Cylinder yard doses do not seem consistent with a strict care, maintenance and inspection regime. Portsmouth at 2mSv (196mRem/yr) is most realistic. (probably plausible if a large number of personnel are used, and/or remote inspection equipment or shielding is implemented) **41-41**

Assumption of 0.0041 breaches per cylinder move (Appendix B Section B3) would result in 2 x(28351+13388+4683)X0.0041 = 380 breaches if all containers were moved for painting. This does not seem consistent with number of breaches quoted in Table B1. **41-42**

Comprehensive wall thickness testing at time of refurbishment would aid future decision making. However corrosion rates will be difficult to estimate if initial wall thickness is unknown. **41-43**

Thorough inspection, testing and painting will result in high doses potentially. **41-44**

In the event of aircraft crash on any of the UF_6 storage areas, the environmental impact would be far greater than for any storage option e.g. UO_2. **41-45**

Uranic oxide powders stored in 200 litre drums expose operators to higher dose rates than UF6 cylinders. Thin drums are stored indoors to prevent corrosion but periodic inspection is required. **41-46**

Specific Comments on the Disposal Option

There is no description of the methodology used for estimating post-closure risks for the UF_6 disposal option in the PEIS. **41-47**

The term "indefinite period" needs to be defined in the context of monitoring and maintaining a disposal facility post-closure. Monitoring and maintenance in perpetuity is not a realistic scenario. **41-48**

The impact of post-closure peak doses from uranium daughters at 1,000 years is not sufficiently long since peak doses from uranium daughters occur much later. A more reasonable assumption would be 10^8 years. **41-49**

The PEIS finds that groundwater contamination in the post-closure phase of a disposal site in a wet location could lead to both the radiation dose to the public exceeding **41-50**

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COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

regulatory limits and the concentration of uranium causing adverse health effects. These effects are dismissed by stating that the water could be treated or an alternative source used. Given that this is one of the few instances in the PEIS that such limits are exceeded, this is neither a scientific nor a publicly-reassuring stance and does not fit in well with the general environmental impact assessment approach used in the PEIS. This is an example where the PEIS would have benefited from utilising a full treatment of uncertainty/sensitivity analysis to give realistic rather than conservative estimates. **41-50 (Con't.)**

Vaults appear to perform less well than shallow trenches in terms of human health impacts. Does this imply that vaults should be dismissed in favour of shallow earthen structures? Some clarification is needed as to the reasons why "...the concentrations from the vault would be greater than those from shallow earthen structure by a factor of 1.2". **41-51**

BNFL

April 1998

10

COMMENTOR NO. 42: KARPIN, TIMOTHY L., CHMM DAVIS, CALIFORNIA

Comments

Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride

The Depleted UF_6 Management Program

To: Mr. Charles E. Bradley, Jr.
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290
Fax: 301-428-0145

From: Timothy L. Karpin, CHMM
2640 Portage Bay Avenue, #19
Davis, California 95616
Phone/Fax: 530-757-6840
E-mail: tkarpin@mother.com

Date: April 20, 1998

General Comments

In summary, I agree with the DOE's position that depleted UF_6 can and should be reprocessed into either a uranium oxide or uranium metal form for use in commercial or industrial settings. The American public, whether they cared to or not, has spent significant funds during the last 50 years on the mining, milling, processing, and enrichment of uranium. It would be economically negligent to reprocess and dispose of depleted UF_6 into a form and location, respectively, that can no longer be of use or benefit to American citizens or industry. Such a process would also be in contrast with America's recognition of the value of recycling valuable raw materials. *42-1*

The Draft PEIS is relatively complete and informative. I do have several specific comments as noted below:

Comments related to Volume II, Appendix E

1. Why not ship all casks in clamshell cases?

   A. No UF_6 transfer facility would be needed, which would reduce potential environmental impact and permitting activities.
   B. The use of clamshell cases could possibly reduce the number and cost of ultra-sonic wall thickness tests.
   C. Clamshell case costs would not go up if a local facility is used to process UF_6 (i.e. it may be more economical to build 2 or 3 facilities near each gaseous diffusion plant.)
   D. Public perception would be more favorable toward the DOE if the DOE shows demonstrated caution by using clamshell cases. The DOE's decision tree would be reduced by one layer, and one area of judgment/opinion would be eliminated.
   E. Accident scenarios would decrease with regard to potential environmental and health impacts.

42-2

COMMENTOR NO. 42: KARPIN, TIMOTHY L., CHMM (CONT'D.) DAVIS, CALIFORNIA

Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride

To: Mr. Charles E. Bradley, Jr.
From: Timothy L. Karpin, CHMM
Date: April 20, 1998
Page 2

   F. Consider modifying nearby runways and flying MD-17s in and out with clamshell cases (MD-17s are civilian versions of the new C-17 military transport). Of course, an economic study would be required to validate this concept.
   G. The costs and energy/resource consumption of a transfer facility would be very high in comparison to clamshell case use.
   H. One important issue was not directly discussed. You would need a separate facility or partitioned area at the UF_6 processing facility to decontaminate the clamshell cases (if necessary).

42-2 (Con't.)

Thank you for allowing me the opportunity to comment on this document. Good luck on the final version.

Sincerely,

Timothy L. Karpin

Timothy L. Karpin, CHMM

COMMENTOR NO. 43: VERSGROVE, TOM
POMONA, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. 43-1

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 43-2

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. 43-3

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. 43-4

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 43-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 43-6

Thank you for considering these comments.

Sincerely,

Tom Versgrove

Tom Versgrove
Box 44
Pomona, Il 62975

COMMENTOR NO. 44: THOMPSON, THOMAS
SIMPSON, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. 44-1

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 44-2

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. 44-3

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. 44-4

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 44-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 44-6

Thank you for considering these comments.

Sincerely,

Thomas Thompson
Rt 1 Box 278
Simpson, IL
62985

COMMENTOR NO. 45: DONHAM, MARK & HANSON, KRISTI BROOKPORT, ILLINOIS

.harles Bradley
Office of Facilities (NE-40)
US Dept. Of Energy
19901 Germantown Rd.
Germantown, MD 20874

April 5, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted UF6 Draft PEIS.

(1) We are concerned about the failure of DOE to reference or mention the 3 studies and/or reports which specifically address the cylinder problem. These are "Draft Preliminary Report - DOE Independent UF6 Cylinder Assessment Team", from the Oak Ridge Field Office, Mark 25, 1992; "Integrity of Uranium Hexafluoride Cylinders" and "Affordable Cleanup? - Opportunities for Cost Reduction in the Decontamination and Decommissioning of the Nation's Uranium Enrichment Facilities", National Research Council, National Academy Press, 1996. **45-1**

(2) One of the first key issues which must be addressed is the earthquake risk at Paducah from the New Madrid fault/rift zone. Any strategy for dealing with the cylinders has to address this problem, as well over half the cylinders are in Paducah. Most of these cylinders are stored on soils with liquefaction potential. Due to the close stacking of the cylinders, and the configuration of the stacks, breach of cylinders due to puncturing from other cylinders in the event of a seismic event strong enough to move he cylinders is probable. Any punctures in the cylinders would result in .he slow release of hydrogen fluoride and uranium and other radionuclides, which would then accelerate the further corrosion of the cylinders. **45-2**

Because the tens of thousands of cylinders are stacked in a configuration which makes it virtually impossible to access cylinders in the center of the stacks in a timely fashion. These factors are why the seismic risk at Paducah has to be considered in any long term strategy to deal with the cylinders.

(3) In considering the long term seismic risk at Paducah and its effect on cylinder management, the first question to ask is, will any future conversion/storage take place at Paducah. If the answer is yes, and if the plans are to bring cylinders in from Portsmouth and Oak Ridge, then these facilities have to be built to highest earthquake standards available. In addition, transportation risks from Portsmouth and Oak Ridge to Paducah must be considered.

If the answer is yes, but only for the Paducah cylinders, then either three conversion facilities will have to built or the facility will have to be mobile, which means it will have to be transported contaminated or will have to be completely decontaminated. None of these alternatives is looked at in the PEIS. **45-3**

If the answer is no, there will not be conversion/storage at Paducah, then the massive transportation burden to get the 40,000 cylinders at Paducah, some of which it is doubtful could be moved, from Paducah to wherever the onversion/storage would take place. This is not considered properly in the .EIS.

Connected Actions/Cumulative effects

(4) To determine the scope of environmental impact statements, agencies shall consider 3 types of actions, 3 types of alternatives, and 3 types of **45-4**

COMMENTOR NO. 45: DONHAM, MARK & HANSON, KRISTI (CONT'D.) BROOKPORT, ILLINOIS

impacts. They include: (a) Actions (other than unconnected single ctions) which may be: (1) Connected actions, which means that they are closely related and therefore should be discussed in the same impact statement. Actions are connected if they: (i) Automatically trigger other act ns which ay require environmental impact statements. (ii) Cannot or will .otproceed unless other actions are taken previously or simultaneously. (iii) re interdependent parts of a larger action and depend on the larger action for their justification. (2) Cumulative actions, which when viewed wit other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement. (3) Similar actions, wh h when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography An agency may wish to analyze these actions in the same impact statement. It should do SO when the best way to assess adequately the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single impact statement.

It is clear that the UF6 DPEIS is inadequate in both its scope and its cumulative effects analysis, and that this flaw is serious.

Certain alternatives for dealing with the DUF6 cylinders are provided in the DEIS. Those alternatives include conversion to Uranium oxide, conversion to uranium metal, and long term storage.

In order to convert to either uranium metal or uranium oxide, several unavoidable, connected steps must be undertaken. These include (1) building the facilities which will empty the cylinders and convert the DUF6; (2) the ylinders will have to be moved to the facility; (3) the material will have to be defluorinated; (4) the emptied cylinders will have to be washed and dealt with, and a wastewater treatment plant will need to be built to treat the effluent, which will contain small amounts of transuranics; (5) the hydrogen fluoride will have to be placed into cylinders and stored or disposed, which will require facilities; (6) the empty DUF6 cylinders will have to be dealt with; (7) the converted material will have to be disposed or stored. **45-4 (Con't.)**

If one of the conversion alternatives is chosen as the preferred alternatives, there is no avoiding any of the above steps. These are all clearly "connected actions" as described above. Yet, the DEIS defers analysis of the effects of the conversion process until a future NEPA document. This future NEPA analysis would come at a time when a decision has already been made committing to one of these alternatives. NEPA requires that information be made available to decision makers and the public before decisions are made and actions taken.

In addition, at all of the facilities involved (Paducah, Portsmouth, and Oak Ridge) there are other cleanup activities ongoing, either under the WM or ER programs of DOE. These activities are clearly "proposals" and could have cumulative effects in regard to releases of radionuclides and other hazardous substances. The cumulative effects analysis of this DEIS (and the segmented NEPA analysis of the other cleanup projects ongoing at the sites) needs to be looked at in combination. The DEIS fails to make this important analysis.

Incorporation by Reference

(5) As is true is most DOE NEPA documents, there are sweeping impact ssumptions based upon referenced material, mostly internal DOE information. .EPA requires that agencies which incorporate by reference material in an EIS make that material readily available to the public for review. Yet there is no mention where such referenced material (such as the GENII model) could be reviewed or obtained. This is a serious and blatant flaw in the **45-5**

Commentor No. 45: Donham, Mark & Hanson, Kristi (Cont'd.) Brookport, Illinois

DEIS.
(6) NEPA does not allow conclusory assertions of no impact to suffice for a hard look. Assumptions in an EIS must be supported by objective or empirical data. By DOE making sweeping, conclusory statements of no impact (for example, of the environmental impact of the release of radiation from the activities associated with DEIS) based upon internal studies, which are not explained or described and which are not readily available to the public, DOE is violating one of the main tenants of NEPA - to inform the public of their proposed actions. 45-6

Thank you for considering these comments.

Sincerely

Mark Donham
Kristi Hanson
RR # 1, Box 308
Brookport, IL 62910

Commentor No. 46: Barnwell, Carlene Goreville, Illinois

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. 46-1

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 46-2

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. 46-3

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. 46-4

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 46-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 46-6

Thank you for considering these comments.

Sincerely,

Carlene Barnwell
3485 Goreville Rd.
Goreville, Il.
62939

Commentor No. 47: Westerman Jones, Carol & Jones, Anthony E. Carbondale, Illinois

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 47-2

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. 47-3

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. 47-4

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 47-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 47-6

Thank you for considering these comments.

Sincerely,

Carol Westerman-Jones + Anthony E. Jones
3310 HWY 127
Carbondale, IL
62901

Commentor No. 48: Klueter, Karla Carbondale, Illinois

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 48-2

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. 48-3

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. 48-4

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 48-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 48-6

Thank you for considering these comments.

Sincerely,

Karla Klueter
6829 Sparrow LN
Carbondale IL
62901

Commentor No. 49: Mobley, E.V. Idaho Falls, Idaho

File A:\uf-6..wpd UF-6 Comments Rev 1, 03-26-98

I have reviewed DOE/EIS-0269, PEIS for UF-6 Management, 12/97. I have the following comments:

1. I agree with and support the DOE preferred alternative i.e, use rather than disposal of the UF-6. **49-1**

2. Vol. 1, S.5.1, contains an informative summary of possible uses for converted UF-6 in addition to cask shielding, but its location in the document makes it a surprise. I suggest that other possible uses be mentioned in paragraph S.2. **49-2**

3. The radiation effects calculations are based on the linear-no-threshold (LNT) hypothesis (Vol 1, S.4.3.1.1.2 and Vol.2, C.4.2.2). A number of studies, for example those cited in The Scientist, March 3, 1997 and in Nuclear News, June 1997, indicate the LNT hypothesis is excessively conservative and in some cases is detrimental. I suggest an improved analysis practice that includes evaluating the magnitude of the conservatism instead of merely stating that the result is conservative. Data are available for derivation of best-estimate or most-probable health effects. A more realistic presentation in the UF-6 PEIS would result if there were a comparison of best-estimate and conservative health effects. **49-3**

4. In Volume 2, paragraphs C.4.1.5, C.4.2.2, and C.4.2.3, it appears that four different dose to health effects conversion standards were used. I suggest some additional explanation to avoid the appearance of confusion. **49-4**

E V Mobley

Commentor No. 50: Wheeler, Norma S. Marion, Illinois

Note: As a longtime environmental activist, I'm accustomed to writing my own opinions. My schedule today forces me to use this form letter, but I assure you that I feel very strongly about the issue & hope that the DOE, after decades of irresponsibility, will take realistic steps to control these grave hazards.

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **50-2**

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. **50-3**

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Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. **50-5**

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. **50-6**

Thank you for considering these comments.

Sincerely,

Norma S. Wheeler
13250 Griffith Ln
Marion IL
62959-6163

COMMENTOR NO. 51: WHAYNE, SUE; ROBERTS, MARY LEE & RAY, BETTY CLINTON, KENTUCKY

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 51-2

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. 51-3

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. 51-4

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 51-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 51-6

Thank you for considering these comments.

Sincerely,

Sue Whayne 992 St. Rt. 1826 Clinton, Ky
Mary Lee Roberts 378 St Rt. 1037 " 42031
Betty Ray 31 St. Rt. " "

COMMENTOR NO. 52: RHODES, CRAIG & BROWN, CHARLENE BROOKPORT, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 52-2

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If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. 52-4

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 52-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 52-6

Thank you for considering these comments.

Sincerely,

Craig Rhodes / Charlene Brown
Craig Rhodes & Charlene Brown
3883 Mt. Pleasant Rd.
Brookport, IL 62910

Commentor No. 53: Hoffman, Eugene
Knoxville, Tennessee

Depleted Uranium Hexafluoride Management Program

Comment Form

The Department of Energy is interested in your comments on the *Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride.*

There are several ways to provide comments on this document and these include:

- ✓ attending public hearings and giving your comments directly to DOE officials
- ✓ returning this comment form to the registration desk at the hearing
- ✓ returning this comment form or other written comments to the address on the back
- ✓ faxing your comments to 301/428-0145
- ✓ commenting via the Depleted UF_6 World Wide Web site: http://www.ead.anl.gov/uranium.html
- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Apr. 14, 1998

Comments My comments (4 pages, 9 comments) are given in the attachment. If any of my comments or questions are not clear, I would appreciate being contacted. How will comments on the draft PEIS be documented by DOE? 53-1

What is the status of the sale of the enrichment plants to USEC? Please call me at your convenience. 53-2

Sincerely,
Gene Hoffman

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name EUGENE E. HOFFMAN (optional)
Organization DOE-Retired
Address 10504 Sandpiper Lane (optional)
City Knoxville State TN Zip 37922-5518
Phone number (423) 966-3964 (optional)
E-mail address ______ (optional)
FAX (423) 966-3964
(must call first)

☑ Please add my name to the Depleted UF_6 mailing list.
☐ Please take my name off the Depleted UF_6 mailing list.

Depleted Uranium Hexafluoride Management Program • Charles E. Bradley, Jr.
Department of Energy • Office of Nuclear Energy, Science and Technology • Office of Facilities
19901 Germantown Road • Germantown, MD 20874 • 301/903-4781

Commentor No. 53: Hoffman, Eugene (Cont'd.)
Knoxville, Tennessee

COMMENTS BY EUGENE E. HOFFMAN (DOE-RETIRED) TO THE U.S. DEPARTMENT OF ENERGY ON THE DRAFT PEIS ON MANAGEMENT AND USE OF DEPLETED URANIUM HEXAFLUORIDE,DOE/EIS-0269, DECEMBER, 1997

1. The DOE "preferred alternative" (see PEIS, pp. S-42, -44) is to "use the entire inventory of material" based on market demand for uranium oxide (UO2), uranium metal and fluorine products. "Safe management of the cylinder inventory would continue until 100% of the inventory had been converted for use." - - - This DOE preferred alternative would be supported by everyone if the DOE assumed use potential had any basis in fact. Every documented evaluation of potential use of the DUF6 by independent investigators, DOE contractors, and commercial firms in the uranium business during the past ten years has concluded that future use of only a small fraction of the 1,200,000,000 plus pounds of the depleted UF6 can be projected. 53-3

In the PEIS, DOE evaluated six alternative management strategies (see page S-6). However, an option to continue storage of a reasonable (small) fraction of the DUF6 (only the best cylinders, under shelter) for future use and begin conversion of the most degraded cylinders to the safe, stable form (U3O8) was not considered. WHY?? 53-4

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Comments by E. E. Hoffman (cont'd) - 2 -

2. The 1100-page draft PEIS did not cite or reference the three independent reports that directly relate to the subject of the PEIS. These are listed below:
   a) *"Draft Preliminary Report - DOE Independent UF6 Cylinder Assessment Team", DOE Oak Ridge Field Office, dated March 25, 1992 (never published).*
   b) *"Integrity of Uranium Hexafluoride Cylinders", Defense Nuclear Facilities Safety Board Technical Report DNFSB/TECH-4, May 5, 1995.*
   c) *"Affordable Cleanup? - Opportunities For Cost Reduction in the Decontamination and Decommissioning of the Nation's Uranium Enrichment Facilities", National Research Council, National Academy Press, 1996*
      Chapter 7. Disposition of the DUF6

53-5

3. The draft PEIS presents brief and totally inaccurate statements regarding the New Madrid earthquake safety issue, which is of particular importance to the Paducah plant site which has in excess of 28,000 of the DUF6 cylinders. (PEIS reference - page 3 -7)

53-6

4. The French have been converting hundreds of millions of pounds of their depleted UF6 to the safe, stable oxide and stored it in steel containers in metal framed, earthquake resistant buildings since 1977 to avoid the hazards associated with storing UF6.

53-7

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Comments by E. E. Hoffman (cont'd) - 3 -

5. At least 17,475 of the DUF6 cylinders exhibit accelerated corrosion (Reference: DOE/ORO Work Agreement document, dated 10/30/96). The current DOE schedule for cleaning, inspecting, and re-painting of the cylinders will require at least 30 years, especially when the fact is considered that many of the cylinders will have to be re-cleaned and re-painted at least three times during that period. Each handling operation risks rupture. (Reference: Letter, S. J. Pawel to M. S. Taylor, Feb. 10, 1997, ORNL/CST-SP-021097-05, *Update on Development Activities, page 4, "The life of the paint system presently in use is not analytically known, but current estimates suggests that a 12-year life (on average) prior to significant maintenance or re-painting is reasonable".*

53-8

6. The DUF6 safety and accident concerns presented in the Defense Nuclear Facilities Safety Board report (DNFSB/TECH-4, May 5, 1995) are not cited in the draft PEIS.

53-9

7. On February 18, 1998 a USAF B-1 supersonic bomber weighing in excess of 200,000 pounds crashed and burned approximately 40 miles from the Paducah cylinder storage yards. The Barkely Regional Airport is located approximately 2 miles from these storage yards. Has the accident scenario of a large plane crash into the cylinder yards on a rainy day been analyzed? Under such circumstances a number of cylinders would be ruptured and large quanties of hydroflorie acid gas would be generated which could caused additional ruptures and make control of the accident very difficult.

53-10

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

EUGENE E. HOFFMAN

10504 Sandpiper Lane
Knoxville, TN 37922-5518
(423) 966-3964

Education: BS in Metallurgy, University of Notre Dame, 1951
MS in Metallurgy, University of Tennessee, 1959

Work Experience:

(1996) Retired from the U.S. Department of Energy-Oak Ridge Operations (DOE-ORO)

(1981-1996) DOE-ORO) ORO Manager of DOE National Materials Programs for the Breeder Reactor Program, the Space Nuclear Reactor Program (SP-100), the Radio-isotope Thermoelectric Generator (RTG) Program and the Advanced Gas Turbine Materials Program. Served as a member and chairman of DOE-ORO formal investigations related to material problems at Doe facilities.

(1979-1981) DOE-ORO) Manager, Fossil Energy Materials Branch

(1972-1979) DOE Headquarters, Germantown, MD Chief, Materials and Chemisty Branch, Breeder Reactor Program

(1963-1972) General Electric Company, Nuclear Systems Programs, Cincinnati, OH Manager,
Systems Materials Technology (35 professionals and technicians)

(1951-1963) Oak Ridge National Laboratory, Metallurgy Division , Manager and Research Metallurgist, Materials Compatibility Group

Expertise: High-temperature materials technology directed at energy production for space and terrestrial applications. Authored over 30 open literature papers and topical reports in the high-temperature materials research and development field.

Honors: 1960 Chairman, Oak Ridge Chapter, American Society for Metals (ASM)
1976 Deputy Team Leader, Breeder Reactor Team visit to USSR
1982 Elected Fellow, ASM
1990 Selected as DOE-Oak Ridge High-Tech Federal Employee of the Year
1992 Designated Life Member, ASM International
1995 Named Tennessee Colonel by Governor Don Sunquist

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpt from "Integrity of Uranium Hexafluoride Cylinders", Defense Nuclear Facilities Board (DNFSB) Report DNFSB/TECH-4, May 5, 1995

page 6. The review conducted by the DOE Independent UF6 Cylinder Assessment Team (***Reference: "Draft Preliminary Report: DOE Independent UF6 Cylinder Assessment Team", DOE Oak Ridge Field Office, March 25, 1992)*** **was a comprehensive assessment of the entire cylinder program. The team reviewed the design, fabrication, transportation, filling, storage, handling, inspection, legal considerations, safety and health considerations, environmental considerations and ultimate disposition of the cylinders**

Unfortunately, this report is still considered "draft" after three years.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Reports on DUF6 Cylinders by Independent Investigating Teams

"Draft Preliminary Report - DOE Independent UF6 Cylinder Assessment Team", DOE Oak Ridge Field Office, dated March 25, 1992

This report resulted from a DOE Memorandum "Uranium Hexafluoride Feed and Tails Cylinder Program Review" dated January 29, 1992 to P.Gross, et al., from Joe LaGrone, Manager, DOE Oak Ridge Field Office. The charter to the review team included the following statement:

You should assess the design, fabrication, transportation, filling, storing, handling, inspection, legal considerations, safety and health considerations, environmental considerations, and ultimate disposition of the cylinders.

Status of this report: Contrary to normal investigations of this type by DOE, this report was never formally issued and made available to the public.

"Integrity of Uranium Hexafluoride Cylinders", Defense Nuclear Facilities Safety Board Technical Report DNFSB/TECH-4, May 5, 1995.

Status of this report: This comprehensive report was issued and made available to DOE/HQ and the public and resulted in DNFSB Recommendation 95-1 to DOE/HQ. (Not cited in the Draft PEIS on DUF6, December, 1997)

"Affordable Cleanup? - Opportunities For Cost Reduction in the Decontamination and Decommissioning of the Nation's Uranium Enrichment Facilities", National Research Council, National Academy Press, 1996.

Status of this report: Available to the public. Contains much information on the depleted uranium hexafluoride situation in the U.S., including recommendations. (Not cited in the Draft PEIS on DUF6, December, 1997)

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Seismic Risk-Paducah Site

Depleted UF6 Draft PEIS, December, 1997, Vol. 1 - Page 3-7

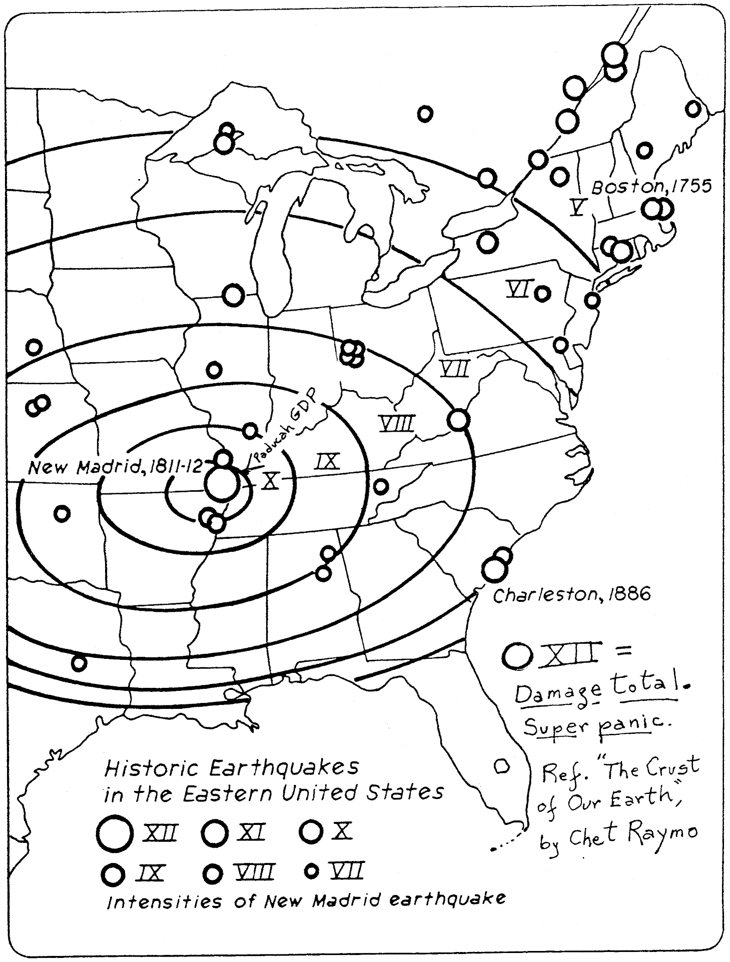
The largest recorded earthquake in the region occurred in 1812 and was centered in the New Madrid fault zone. This earthquake had a magnitude of 7.3 on the Richter scale, and the epicenter was 60 miles (96 km) southwest of the site (ANL) 1991 a). The estimated 1,000-year return period peak ground acceleration is 0.45 of the acceleration of gravity (DOE 1995c).

"The Coming Quake" by T. A. Heppenheimer, Times Books,1988 - References to the New Madrid Earthquake

p.238 The December 16, 1811 quake had been of magnitude 8.5 or 8.6 making it up to twice as powerful as the worst in California. Its largest aftershock had rated at 8.2, very close to the 8.3 of California's earthquakes of 1857 and 1906. The shock of January 23, 1812, had been less powerful, at 8.4. But the main quake of February 7 went all the way up to 8.7 or 8.8-- as much as three times the force of the California shakings.

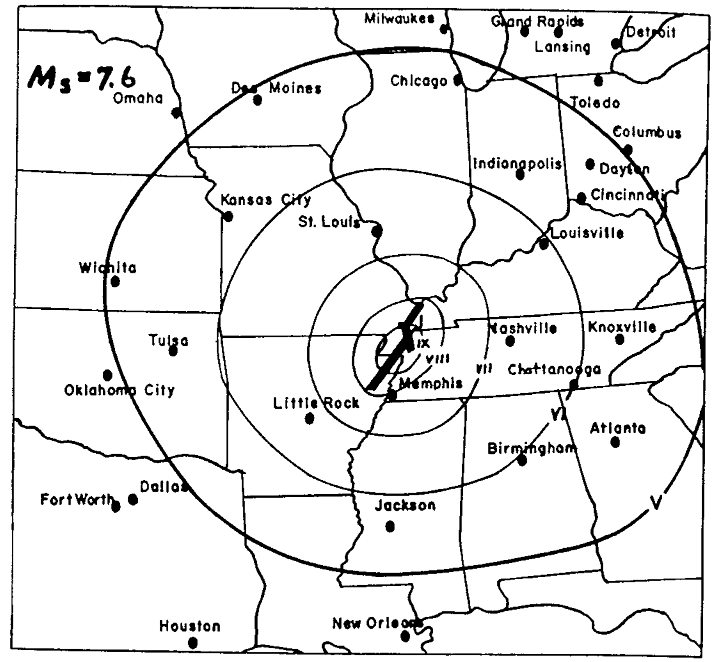
p.244 Nuttli (Otto) estimates that at present (1973), enough stress has built up along the faults to produce a quake of magnitude 7.6. That is the tremor worth fearing; and it has the potential to strike this very day.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.)
KNOXVILLE, TENNESSEE



37

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.)
KNOXVILLE, TENNESSEE



Map by Otto Nuttli showing damage areas, as indicated by zones of various Modified Mercalli intensity, that must be expected from a magnitude-7.6 earthquake on the New Madrid faults. Such a quake could occur today. The zigzag mark at the center is the trace of the New Madrid faults. (Courtesy U.S. Geological Survey)

"The Coming Quake," T.A. Heppenheimer, 1988, p 246

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

THE CRUST OF THE EARTH
Chapter 13 - The Greatest Quake
by Chet Raymo

The New Madrid earthquake was rated XII on the modified Mercalli scale of intensity. XII is the highest rating on that scale. The scale describes a level XII quake in this way; "Super panic. Damage total. Waves seen on ground surfaces. Lines of sight distorted. Objects thrown upward into the air."

It was the greatest earthquake to shake the United States in historic times, and possibly one of the greatest ever to rock the crust of the earth.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Inventory of Thin-wall UF6 Cylinders at Three DOE Sites

o May 3, 1990 Inventory List Given to DOE-ORO Investigating Team by Martin-Maretta staff in February, 1992

10-Ton Cylinders	4,230	Model T
14-Ton Cylinders	1,000	Model 48 HX
	3,640	Model 48 H
	6,602	Model O
	16,602	Model OM* (*4450 not codeable)
	23,806	Model 48 G

Total 14-Ton Cylinders 51,419
Total Thin-wall Cylinders 55,649

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o Number of UF6 Cylinders in Long-Term Storage in Table given to DOE/ORO Investigating Team by D.L.Mason (Martin-Marietta, 1/92)
54,000

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o Number in DOE/ORO Report, March 25, 1992 - 54, 768

o Number in DNFSB Report, May 5, 1995 - 55, 649

o Number in Draft PEIS, December, 1997 - 46,422

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Ref., "UF_6 Long-Term Storage Cylinder Integrity Management Plan," M.S. Taylor, et al., K/ETO-114, September, 1992

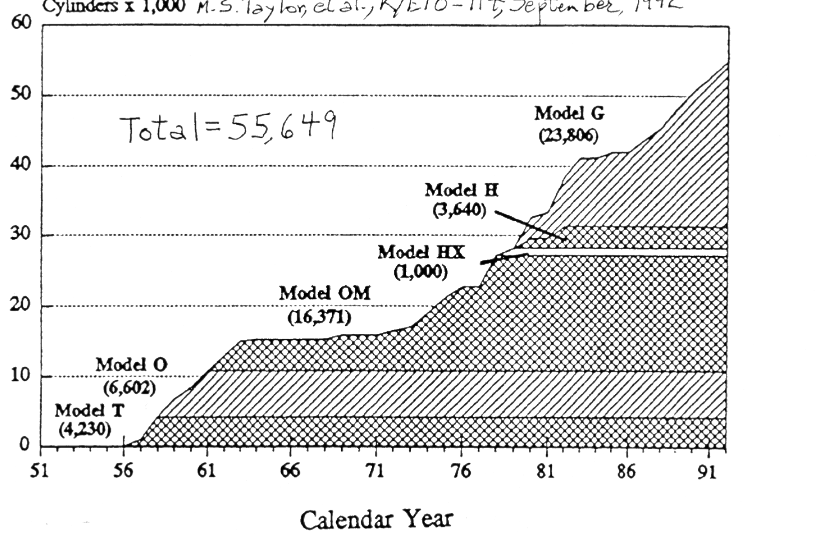

Figure 1. Cumulative "thinwall" cylinder purchases.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

DOE INDEPENDENT UF_6 CYLINDER ASSESSMENT TEAM

DRAFT PRELIMINARY REPORT

DOE OAK RIDGE FIELD OFFICE

March 25, 1992

TABLE 2
POTENTIAL DEFICIENCIES IDENTIFIED WITH LONG-TERM STORAGE UF_6 CYLINDERS

CONDITION	PGDP	PORTS	K-25	TOTAL
Total in long-term storage	35,339	13,359	6,070	54,768
Channel type stiffener (Type O)	5,313	83	163	5,559
Thin-wall skirted (Types T, H, and HX)	2,576	3,282	2,397	8,255
Bottom longitudinal weld		2,095 (Type T)		
In/near ground contact	2,818	0	949	3,767
Inaccessible plug end	10,162	10,259	810	21,231
Improper support upper tier	1,620		390	2,010+
Stacking incompatible designs		83	166	249+
Shell to lug contact	3,644	352	450	4,446
Other handling damage		4	285	289+
Valve leakage	Assessing	2	Assessing	Assessing
In poor drainage yard	12,153	0	100	12,253
Deficient saddles	19,994	0	12	20,006
Substandard bonnet nut/port cap	60/3	526/17	47/36	633/56
Valve replaced with plug			5	5+

Commentor No. 53: Hoffman, Eugene (Cont'd.) Knoxville, Tennessee

UF_6 LONG-TERM STORAGE CYLINDER INTEGRITY MANAGEMENT PLAN K/ETO-114 September 1992

Table 2. Long-term storage inventory potential deficiencies

	Identified Potential Deficiency	Number of Cylinders
A.0	Direct Container Integrity Concerns	
A.1	breached cylinders- cylinders with holes in the cylinder shell	6
A.2	corroded cylinders- cylinders with visible pitting and/or scaling rust	15,000
A.3	leaking valves- valves and plugs that have recurring contamination	10*
B.0	Storage Facility Concerns	
B.1	substandard facilities- sinking or poorly drained load-bearing surfaces	12,000
B.2	improper support- upper tier cylinders supported by unsound points of contact	3,000
C.0	Uranium Control Issues	
C.1	non-depleted material- Normal or enriched material located in DU storage facilities	8
C.2	ID plates- loose or detached identification plates	200*
D.0	UF_6 Transfer Issues	
D.1	fill-limit consideration- cylinders without certified internal volumes or cylinders filled above the current maximum allowable limit established in ORO-651[13]	15,000
D.2	substandard valves- valves with missing or cracked parts, teflon tape on threads, bent stem, and/or improper engagement	3,000
D.3	plug replacing valves- plugs in place of valves	1,000*
D.4	defective cylinders- cylinders that do not pass the inspection criteria established in ORO-651 for liquid transfer	100*
D.5	non-conforming cylinders- cylinders that will not fit into currently designed autoclaves	140
E.0	Best Storage Practice Issues	
E.1	inaccessible cylinder- cylinders that cannot be accessed at both heads for a visual inspection	22,000
E.2	above internal vacuum- cylinders with internal pressure above the ideal vacuum conditions	1,000
E.3	uncoated cylinder- cylinders with no or little rust-protective coating	23,000*

* Improved estimates are to be determined from the baseline inspection.

Commentor No. 53: Hoffman, Eugene (Cont'd.) Knoxville, Tennessee

DELIVERABLES/MILESTONES/DATES OF COMPLETION (continued)

S. By September 30, 1996, remove all full depleted uranium cylinders from ground contact at Paducah.

T. Complete the required inspection of 12,340 cylinders as part of the triennial inspection program by September 30, 1996.

U. Complete annual inspection of 17,475 cylinders exhibiting accelerated corrosion and other problems (as defined in ETO-114) by September 30, 1996.

V. Continue the Biological Monitoring effort at Paducah and issue the annual report by April 30, 1996.

W. Complete the milestones and markers as defined in the FY 1996 baseline program plan.

WAD ISSUE DATE: October 1, 1995

SIGNATURES:

LOCKHEED MARTIN: L.E. Hall 10-26-95 Date

DOE CONTRACTING OFFICE REPRESENTATIVE: J.W. Parks 10/30/95 Date

DOE CONTRACTING OFFICER: Signature 10/31/95 Date

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpts from "Investigation of Breached Depleted UF6 Cylinders", POEF-2068, ORNL/TM-11988, E.J.Barber, et al., September, 1991

page 4. Because the green salt deposit closely matches the color of the paint covering the cylinder, very careful inspection was required to spot the hole when viewed from the front of the cylinder.

page 29. An additional design fault in the UF6 storage cylinders is the protective coating applied to these cylinders. The color of the paint is so similar to that of UF4 that it hinders visual identification of reaction products from a breached cylinder. When a patch of rust forms under the paint, it has the same appearance as UF4 concealing a breach. It should also be mentioned that the quality of paint is highly variable and, in many cases, it offers little long-term surface protection.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpts From Report KY/EM-187, "Lessons Learned From Paducah Site Pilot UF6 Cylinder Painting Project", R.I.Reynolds,et al. Nov.26,1996

page 1. "1231 cylinders have been painted with painting operations continuing."

page 2. "The cylinders are placed on their stiffening rings on wood timbers asnd chocks which supports the cylinder approximately 14 inches off the floor. The paint utilized is a one-coat system and consists of a Carboline inorganic zinc coating approximatelly three-to-five mils in thickness."

page 8. "Currently, the results indicate the following:

1. Most of the cylinders have relativelly loose and wispy rust but approximately 1,000 cylinders at Paducah have an underlayer of rust that is quite adherent and brittle. These cylinders are generally cylinders that have been in ground contact which accelerates rusting and pitting.
2. Although many cylinders manufactured after the late 1970's have some degree of painted surfaces, the paint is generally poorly adherent and brittle. Only the 6,000 DOE cylinders painted since 1990 have paint which provides some significant corrosion protection.
3. ---Bottom row cylinders vary according to storage conditions with most ground contact cylinders varying between 200 to 220 mils with the worst cylinder idenfied at about 177 mils. ---

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

<u>U.S. Department of Energy Memorandum, February 20, 1992, "Plans for Ultimate Disposition of Depleted Uranium", To: Leo P.Duffy, Director, Office of Environmental Restoration and Waste Management, EM-1, From: Philip S. Sewell, Deputy Assistant Secretary for Uranium Enrichment, Office of Nuclear Energy</u>

<u>page 4.</u> It is assumed that, beginning in 2020, 5,000 cylinders of depleted UF6 are emptied each year and the UF6 is converted to U3O8. Based on a schedule where conversion of UF6 begins in 2020, all the cylinders containing UF6 would be emptied by about 2065.

<u>page 7.</u> Summary. - - If alternate uses for the depleted uranium are not found to be feasible by approximately 2010, then steps will be taken to convert the UF6 to an oxide of uranium, U3O8, as the most appropriate form for ultimate storage and ultimate disposition. The U3O8 will be stored until it is determined that all or a portion of the depleted uranium is no longer needed. At that point, the U3O8 will be disposed as low-level waste.

Commentor No. 53: Hoffman, Eugene (Cont'd.) Knoxville, Tennessee

Excerpts from "Depleted Uranium Hexafluoride Management Program", UCRL-AR-120372, June 30, 1995

Information Package 1, page 4

In 1977, French officials determined that storage of depleted UF6 from enrichment operations should be limited in time and quantity. License conditions were established for the enrichment facilities, which resulted in Cogema implementing a project for converting the depleted UF6 inventory to U3O8 on an industrial scale. Currently, Cogema packs and stores the U3O8 in 3-cubic-meter metal containers. Each container has a capacity of 9 tons. The containers are placed on concrete pads and are housed in metal framed, seismic resistant modular sheds. Each shed can hold 2,600 containers. With 12 sheds located onsite, Cogema estimates a U3O8 storage capacity of roughly 20 years (Cogema 1989)

(Gene Hoffman Note: One of the principal potential long-term uses of DUF6 cited by DOE is for application in future U.S. breeder reactors. If the U.S. persues breeders ever this application is many decades away. In addition it should be noted that the French are far ahead of the U.S. in breeder reactor demonstration and yet they still chose to convert their DUF6 to U3O8 for storage over 20 years ago.)

Commentor No. 53: Hoffman, Eugene (Cont'd.) Knoxville, Tennessee

Excerpt from "An Integrated Solution For UF6 Tails Management", S. L. Rock, Allied Signal, Inc. and L. G. Davis, General Atomics, Proceedings of the Third International UF6 Conference, Paducah, Ky, November, 1995

"Storage in a Stable Form. Thirdly, the tails can be converted to a usable or uranium-retrieveable form such as metal or oxide. It should be noted that uranium metal cannot be stored simply, but must be protected from corrosion. U3O8 is the end product of all uranium decomposition. Also the production of metal from UF6 is relatively expensive compared to conversion to U3O8 and historically has created a significant hazardous material waste stream. - - Both the Department of Energy and the Nuaclear Regulatorly Commission have gone on record as favoring conversion to U3O8 as the most desirable and sensible approach."

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpts from letter Allied Signal, Inc (M.D. Kosmider, plant manager) to Martin Marietta (Joe Russell), Subject: Critique of ORNL Report Entitled "Investigation of Breached Depleted UF6 Cylinders", dated February 7, 1992

"The only thing that disturbed me about the report was the lack of any mention of the long-term solutions to this problem. - - There are already 40,000 tails cylinders in storage; many are already dented from contact with surrounding cylinders lifting lugs; the number of tails cylinders is increasing by several thousands per year; and the report indicated that even a cylinder which is not dented has a storage life which probably does not exceed 50 - 60 years. In other words there exists a large potential for future problems which will not be resolved by improving painting, handling, inspecting, and stacking practices. Improving these practices will probably only delay the inevitable. - - - it must at least be mentioned that de-conversion of the tails to a relatively non-hazardous oxide form is the only way to eventually solve the problem."

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Conversion of DUF6 To Safe (U-metal), Safer (UO2) and Safest (U3O8) Forms

--- 4,683 cylinders at Oak Ridge (oldest and most heavily corroded)

--- 13,388 cylinders at Portsmouth

--- 28,351 cylinders at Paducah

- o Transportation of degraded cylinders is a problem on-site and a much more challenging and expensive off-site transportation problem.
- o Conversion of Paducah cylinders on-site would eliminate off-site transportation problem.
- o Conversion of Oak Ridge and Portsmouth cylinders at a second conversion facility should be considered, this would -
  - expedite more timely conversion of the most hazardous cylinders and
  - provide technical and cost competion which would benefit the taxpayers

Commentor No. 53: Hoffman, Eugene (Cont'd.)
Knoxville, Tennessee

Excerpt from "Affordable Cleanup?", Report of the Committee on Decontamination and Decommissioning of Uranium Enrichment Facilities, National Research Council, D.F. Stein, Chairman, National Academy of Science, *National Academy Press, 1996*

Executive Summary - DUF6

A DOE study has found that past practices for storage of DUF6 have been inadequate in several respects (see reference below). There have been no serious consequences, however, and there is a vigorous program to correct past deficiencies.

There is general agreement, however, that DUF6 is an unsuitable chemical form for long-term storage; it is to reactive and volatile. Eventually it needs to be converted to the more suitable form of uranium oxide (U3O8). No large-scale uses have been identified, and the most promising potential uses do not preclude conversion to oxide.

Recommendation. The committee recommends that, if consistent with the prioritized cost-and risk-reduction process, the DUF6 should be converted to the more stable chemical form, U3O8, for storage or disposal.

Reference: DOE, 1992, U. S. Department of Energy Independent UF6 Cylinder Assessment Team Draft Preliminary Report. Oak Ridge, Tennessee: DOE Oak Ridge Field Office.

Commentor No. 53: Hoffman, Eugene (Cont'd.)
Knoxville, Tennessee

Excerpt from Draft PEIS, December, 1997

"In nearly 40 years of cylinder handling activities, no accidents involving releases from cylinders containing uranium hexafluoride have occurred that have caused diagnosed irreversible adverse effects among workers."

Excerpt from U. S. Nuclear Regulatory Report NUREG-1198, dated June, 1986, Executive Summary

"On January 4, 1986, at 11:30 a.m., a Model 48Y cylinder filled with uranium hexafluoride (UF6) ruptured while it was being heated in a steam chest at the Sequoyah Fuels Corporation facility near Gore, Oklahoma. The incident resulted in the death of one plant worker and injuries to several others as a result of exposure to hydrofluoric acid, a reaction product of UF6 and airborne moisture."

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpt from CONF-9110117, Second International Conference, Uranium Handling Conference, 1991, *"UF6 Overfilling Prevention at Uurodif Production, Georges Besse Plant, p.65*

" On January 4th, 1986, a 48 Y model cylinder of uranium hexafluoride opened up while it was being heated in an oven at the uranium fluorination plant located near Gore, Oklahoma (USA) and operated by the Sequoyah Fuels Corporation. This accident caused the death of a plant employee and intoxication of several other people subsequent to exposure to the vapors produced by the released uranium hexafluoride (UF6), especially the hydrogen fluoride. Emission of toxic vapors lasted roughly 40 minutes. Carried by winds blowing at 40 km/hr, the cloud was visible more the 1.5 km away from the site of the accident. " (Accident reported in NUREG-1179, Vol. 1, February, 1986)

"The accident is one of the most serious accidents known yet involving uranium hexafluoride (UF6), given both the human consequences as well as the amount of UF6 released: approximately 13 tons of natural UF6."

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

FILL LIMIT PROBLEM

Excerpts from "A Review of UF6 Cylinder Practices and Criteria", C. W. Walter, KY/L - 1522, March, 1989

page 3. The determination of a maximum fill limit involves concern for system safety and efficiency. During much of the past 40 years of filling Model - 48 cylinders, a uniform safety factor was not established and even today discussions and changes are being made as concerns are raised and evaluated. - The physical property of UF6 to expand in volume as much as 40 percent when heated from a solid state at ambient temperature to a liquid at working temperature can create substantial containment problems. A cylinder, when completely filled with liquid at 175 degrees F and then heated above that temperature, will rupture due to hydraulic forces generated by the expanding liquid, thereby spilling the contents of the cylinder.

page 5. However, there are cylinders in storage yards that are filled to earlier fill limits which assumed greater minimum volumes than presently assumed and based on 100 percent fill. These cylinders cannot be shipped unless the excess material is removed and the cylinder meets the current shipping limits.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Corroded DUF6 Cylinders (less than 0.25-in. wall thickneess) Unloaded By Improper Process

Reference: Occurrence Report No. ORO-MMES-PGDPOPERD-1992-0018, dated March 10, 1992

Excerpts from Item 15. Description of Occurrence:

Two cylinders of non-enriched uranium hexafluoride (normally called "feed") were not fed by the precautionary method (normally called "cold feed") because hold tags had not been attached to them. -- Information that these steel cylinders had thin areas in parts of their surfaces was not properly communicated nor responded to. The "cold feed" method eliminates the possibility of surface rupture of cylinders with thin surface areas. "Cold feeding" is a plant practice whereby cylinders with surface thickness less than .250 inches are fed at reduced temperature, keeping cylinder pressure below atmospheric pressure. - -The two cylinders in question had areas of .245 inches and .223 inches respectively.

Item 23. Evaluation : (By Facility Manager/Designee

There appears to be deficiencies in both clearly defined procedures and formality in communication in this area. The lack of clearly established roles and responsibilities led to this occurrence.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Bending of Cylinder Walls

Excerpt from Martin Marietta Internal Memorandum, "Fourteen Ton Cylinder Problems", Victor M. Perez, PORTS, Chairman of UF6 Safety Handling Committee, to Roger McDermott, dated June 21, 1990.

page 1. "It was reported that another cylinder was stepped on by a UMH supervisor, and he felt the wall give. The Committee agreed to investigate this situation further.

Additional Information on Bending of Cylinder Walls

There are undocumented accounts of transport drivers noting flexing of cylinder walls during tie-down of cylinders on trailers.

Commentor No. 53: Hoffman, Eugene (Cont'd.)
Knoxville, Tennessee

Table 7-3. Comparison of Management Options for UF6

Evaluation Factor	Conversion to Oxide	Continued Storage
Health and Safety	Reduces hazard by conversion to a more stable form. Potential for occupational exposure and injury during conversion.	Hazard from storage of very reactive UF6. Hazard greatest during periodic transfer into new containers and if exposed to fire.
Future Considerations	No legacy to future generations. Oxide can be used as feedstock or disposed of.	Decommissioning of GDP site cannot be completed with this option. DUF6 still requires ultimate disposition.

Reference: "Affordable Cleanup?", National Research Council, 1996, page 171

Commentor No. 53: Hoffman, Eugene (Cont'd.)
Knoxville, Tennessee

Excerpts from "Integrity of Uranium Hexafluoride Cylinders, Defense Nuclear Facilities Safety Board, DNFSB/TECH-4, May 5, 1995, p. 16

"A paper entitled *Investigation of Breached Depleted UF6 Cylinders*, presented at the Second Internaional Conference on Uraniulm Hexafluoride Handling, proposed experimental effort directed at examining the effect of a hole near the top of the cylinder that remains undetected. Scenarios had been proposed that could lead to a steam-driven expulsion of contaminmated liquid and HF from the cylinder due to the accumulation of water in the vapor space (due to rain and condensation) and subsequent chemical reactions. Further examination of this potential accident would appear warranted, based on the information available to-date."

"Consequences of seismic events in the storage yards are not addressed."

(Gene Hoffman Note: The hole-in- top of a cylinder safety concern cited above is justified by the possibility of cracks or holes resulting from transportation accidents or seismic events. The consequences of seismic events are very important when one considers that all options evaluated by DOE in the PEIS involve storage of degraded DUF6 cylinders for many, many years. This is especially true in view of the documents produced by many New Madrid experts, including Otto Nuttli. In 1973 Nuttli estimated that a 7.6 earthquake could occur in the Paducah region today.)

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.)
KNOXVILLE, TENNESSEE

Excerpts from "Integrity of Uranium Hexafluoride Cylinders" Defense Nuclear Facilities Board (DNFSB) Report DNFSB/TECH-4, May 5, 1995

page 5. The report (*The Ultimate Disposition of Depleted Uranium, T. R. Lemons, et al., K/ETO-44, December, 1990)* discussed possible options for ultimate disposition, such as transfer or sales to other government programs or to the private sector, but recognized that commercial and government sectors would use only a small fraction of the depleted uranium in the foreseeable future. The report recommended that: UF6 cylinders be inspected on a semi-annual basis; cylinder maintenance and storage yards be up-graded; and depleted uranium be converted to U3O8 for long-term storage or disposal. Contrary to the last recommendation, the present plan established by DOE provides for long-term storage of the depleted uranium stockpile as UF6 until conversion to uranium oxide begins in fiscal year 2020.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.)
KNOXVILLE, TENNESSEE

Excerpts from "UF6 Long-Term Storage Cylinder Integrity Management Plan, K/ETO-114, September, 1992

page 2. With the growing inventory of depleted UF6, a study of the ultimate disposition of DU was conducted by Energy Systems in 1990. This study reviewed the actual and potential used for DU and provided recommendations toward the ultimate disposition. The study concluded that there are currently **few alternative uses of this material.**

page 3. In the past two years, significant substandard conditions have been identified. For example, cylinders in and near ground contact have been observed with accelerated corrosion; accelerated corrosion at the skirt-to-head connection has been reported, and improper stacking of these cylinders has been idenfied. All of these conditions can affect the life expectancy of the conainment vessels.

Commentor No. 53: Hoffman, Eugene (Cont'd.) Knoxville, Tennessee

Uses for Deplelted Uranium (Reference: "Affordable Cleanup?", National Research Council, 1996, pp. 158-163.

Shielding Applications

" The UO2 suggested for Ducrete represents a very high density oxide but is not the thermodynamically stable form; U3O8 (uranium oxide) has a lower density but is the stable form and would probably be the preferred form for any Ducrete planned for long-term use. Consequently, proposals for the use of Ducrete would not conflict with a decision to convert DUF6 to a more stable oxide."

Use as a Fluorination Agent

"An inherent disadvantage of these fluorination schemes using UF6 is the need to introduce uranium into otherwise nonradioactive chemical plants, with the resulting complications of licensing, radiation protection,and low-level waste generation."

Re-enrichment or Dilution

DUF6 Enrichment by AVLIS - "AVLIS requires uranium metal feed, so the DUF6 must be converted to metal; this conversion is an expensive process. - - Final decisions on AVLIS, in praticular the use of DUF6 feed, are probably several years in the future. In the meantime, significant quantities of low 235U assay UF6 (less than 0.21 percent 235U) could be converted to U3O8 without affecting the potential use as AVLIS feed."

Blending Agent - "The volumes of material required for blending are not large. Thus a blending agent would have little effect on a decision to proceed with conversion of the DUF6 to U3O8."

Potential Energy Resource for Reactors - "The deployment of the breeder reactor in the United States is uncertain. Based on an economic analysis, a recent NRC report notes the advanced liquid-metal reactors may become competitive with advanced light-water reactors sometime in the latter part of the 21st century (NRC, 1996). Hence, the potential use of DUF6 as a resource for breeder reactors is relatively far in the future."

Commentor No. 54: Hanson, Kristi & Donham, Mark Brookport, Illinois

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874 April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. **54-1**

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **54-2**

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. **54-3**

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. **54-4**

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. **54-5**

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. **54-6**

Thank you for considering these comments.

Sincerely,

Kristi Hanson Kristi Hanson
Mark Donham Mark Donham
RR1
Brookport Il.62910

Commentor No. 55: Kentucky Radiation Health & Toxic Agents Branch Frankport, Kentucky

Depleted Uranium Hexafluoride Management Program

Comment Form

The Department of Energy is interested in your comments on the *Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride.*

There are several ways to provide comments on this document and these include:

- ✓ attending public hearings and giving your comments directly to DOE officials
- ✓ returning this comment form to the registration desk at the hearing
- ✓ returning this comment form or other written comments to the address on the back
- ✓ faxing your comments to 301/428-0145
- ✓ commenting via the Depleted UF_6 World Wide Web site: http://www.ead.anl.gov/uranium.html
- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Comments

① DOE must immediately move to convert the entire inventory of DU to the oxide for long term storage. 55-1

② Conversion can not wait for ten years or any period of time. 55-2

③ DOE must conduct the conversion to the oxide at its present storage location. No transportation of DU to a conversion facility 55-3

④ All cylinders must be checked for integrity prior to moving to the on-site conversion facility. All oxide must be stored on-site under cover. 55-4

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name John A. Volpe PhD (optional)
Organization Kentucky Radiation Health & Toxic Agents Branch
Address 275 E. Main St. MS HS2E-D (optional)
City Frankfort State KY Zip 40601
Phone number 502/564-3700 (optional)
E-mail address JVolpe@mail.State.Ky.us (optional)

☒ Please add my name to the Depleted UF_6 mailing list.
☐ Please take my name off the Depleted UF_6 mailing list.

DEPLETED UF6

Depleted Uranium Hexafluoride Management Program • Charles E. Bradley, Jr.
Department of Energy • Office of Nuclear Energy, Science and Technology • Office of Facilities
19901 Germantown Road • Germantown, MD 20874 • 301/903-4781

Commentor No. 56: Oak Ridge Reservation Local Oversight Committee Oak Ridge, Tennessee

LOC INC
Oak Ridge Reservation
Local Oversight Committee

April 22, 1998

Mr. Charles E. Bradley, Jr.
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Submitted Via Fax: (301) 428-0145

Subject: *Draft Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride (UF6)*

Dear Mr. Bradley:

The Citizens' Advisory Panel (CAP) of the Oak Ridge Reservation (ORR) Local Oversight Committee (LOC) submits the following comments on the subject document. Several members of the CAP attended the February 24, 1998, public hearing on the PEIS and reviewed the available documentation. The LOC Board has not had the opportunity to review and approve the comments and thus these comments should be considered submitted by the CAP only.

The LOC is a non-profit regional organization funded by the State of Tennessee and established to provide local government and citizen input into the environmental management and operation of the DOE ORR. The Board of Directors of the LOC is composed of the County Executives of Anderson, Knox, Loudon, Meigs, Morgan, Rhea, and Roane Counties; the Mayor of the City of Oak Ridge; and the Chairs of the Roane County Environmental Review Board (RCERB), the City of Oak Ridge Environmental Quality Review Board (EQAB), and the LOC Citizens Advisory Panel (CAP). The CAP currently has 19 members with diverse backgrounds representing the greater ORR region.

The CAP concurs that the alternatives considered in the PEIS are appropriate, but the assumptions which delay action to 2009 with completion in 2028 are not acceptable. We understand that the continued storage of the UF6 cylinders does not pose an immediate health or environmental threat. However, as time passes, the task of assuring safe storage will become more demanding, with increasing cost for surveillance and maintenance of the deteriorating cylinders. 56-1

The condition of the oldest cylinders at Oak Ridge and Paducah should be considered when planning for decontaminating and decommissioning (D&D). The toxicity of the fluorine component is the primary concern with regard to health risk, although release of depleted uranium to the environment could result in a costly public relations disaster. 56-2

Anderson • Meigs • Rhea • Roane • City of Oak Ridge • Knox • Loudon • Morgan

136 S. Illinois Ave., Suite 208 • Oak Ridge, TN 37830 • Phone (423) 483-1333 • Fax (423) 482-6572 • E-mail: locinc@aol.com

Commentor No. 56: Oak Ridge Reservation Local Oversight Committee (Cont'd.) Oak Ridge, Tennessee

C. E. Bradley, Jr.
April 22, 1998
Page 2

As you may know East Tennessee Technology Park (ETTP, formerly K-25) has an active reindustrialization program underway. The continued presence of the UF6 cylinders might negatively impact the site reuse activities from an aesthetic viewpoint or as a perceived risk to co-located workers, as well as by the loss of the storage yard land to new uses. **56-3**

DOE has a responsibility to begin reducing its stockpile of UF6. The CAP urges that an expedited conversion program be started immediately. We have reviewed the voluminous amount of information associated with this subject and the variety of suggestions on how to properly handle this situation. Our recommendations follow: **56-4**

1. Increase and expedite the current maintenance program to clean and paint all cylinders starting with the most needy.
2. Improve the storage conditions so that all cylinders are accessible and safe. **56-5**
3. Convert the UF6 to the more stable oxide (triuranium octaoxide) or metal form. There do not appear to be any technical barriers to beginning conversion. Begin the conversion process as soon as feasible.
4. Start conversion with the oldest cylinders and those in the worst physical condition. **56-6**
5. Place the conversion products in interim storage until a decision is made for permanent storage, use, or disposal.

The Energy Policy Act of 1992 provides for payment of the costs of remedial actions at gaseous diffusion facilities from the Uranium Enrichment & Decommissioning Fund. Appropriations received to date have lagged behind the available funds by an approximate factor of two. We urge that this money be made available in a timely manner for the UF6 processing that is needed. **56-7**

The LOC's CAP appreciates the opportunity to comment on the *Draft PEIS for Alternative Strategies for the Long-Term Management and Use of Depleted UF6*. If you have any questions, please call me at (423) 483-1333.

Sincerely,

Susan L. Gawarecki, Ph.D.
Executive Director

cc: LOC Board
LOC Citizens' Advisory Panel
Earl Leming, TDEC DOE-O
Bill Pardue, Chair, ORREMSSAB

Commentor No. 57: Lamb, Ronald Kevil, Kentucky

APRIL 22,1998

CHARLES E BRADLEY, JR.
OFFICE OF FACILITIES (NE-40)
OFFICE OF NUCLEAR ENERGY, SCIENCE AND TECHNOLOGY
U.S. DEPARTMENT OF ENERGY
19901 GERMANTOWN ROAD
GERMANTOWN, MD 20874-1290

COMMENTS: DEPLETED URANIUM HEXAFLUORIDE MANAGEMENT PROGRAM

THE CYLINDERS SHOULD CONTINUE TO BE STORED. THE OLDER OR COMPROMISED CYLINDERS SHOULD BE PLACED IN OVER PAKS LIKE THOSE USED TO PROTECT DRUMMED WASTE. ALL CYLINDERS SHOULD BE STORED IN AN EARTHQUAKE SECURE FACILITY. **57-1**

NO CONVERSION TO U308 SHOULD TAKE PLACE AT THE PADUCAH SITE DUE TO THE PROXIMITY OF THE NEW MADRID EARTHQUAKE FAULT AND THE CLOSE PROXIMITY OF THE PLANT NEIGHBORS. **57-2**

CONVERSION TO U308 WILL ADD TO THE WASTE INVENTORY BECAUSE OF THE LARGE VOLUME OF CYLINDERS. IF CONVERSION HAD BEEN CONSIDERED AT AN EARLIER TIME THE WASTE STREAMS COULD HAVE BEEN HANDLED EASIER. **57-3**

QUESTIONS:

IF CYLINDERS SHOULD BUMP INTO EACH OTHER DURING A SEISMIC EPISODE AND BREAK OFF NUMEROUS FILL VALVES, ARE THERE PROCEDURES IN PLACE TO HANDLE A LARGE NUMBER OF VALVE REPLACEMENTS ? **57-4**

HOW MANY BROKEN FILL VALVES IN THE 30,000 PLUS CYLINDERS WOULD CONSTITUTE A EMERGENCY ? **57-5**

WOULD STACKING THE CYLINDERS TWO HIGH IN CLOSE ROWS ADD TO THE DAMAGE OF MORE FILL VALVES BEING BROKEN DURING A SEISMIC EPISODE ? **57-6**

THANK YOU,

Ronald Lamb

RONALD LAMB
10990 OGDEN LANDING RD.
KEVIL, KY. 42053

COMMENTOR NO. 57: LAMB, RONALD (CONT'D.)
KEVIL, KENTUCKY


```
[elrond.ceri.memphis.edu]
Login name: quake                        In real life: Quake Informat
Directory: /ceri31/seis/quake            Shell: /usr/local/bin/tcsh
Last login Mon Oct  6, 1997 on ttyp6 from yavanna
Unread mail since Thu Apr  9 22:50:24 1998
Plan:
```

The following catalog is for earthquakes in the New Madrid seismic zo and is produced by the Cooperative New Madrid Seismograph Network (CN a member of the Council of the National Seismic System. CNMSN suppor comes from the United States Geological Survey and the State of Tenne

In the early 1800's, the New Madrid seismic zone was the site of what are considered to be the largest earthquakes to have occurred in the conterminous United States. During the winter of 1811-1812, a series of three earthquakes, estimated at magnitude 8 or larger, struck in a period of three months. There have been several magnitude 6-7 events since that time and there is a continuing activity of small earthquak that defines the present day seismic zone. The principal seismic act is found in western Tennessee, northeast Arkansas, and southeast Miss

Other catalogs for various regions of the United States can be obtain using the finger mechanism 'finger quake@machine'. The following lis gives the machine names for different regions.

```
    gldfs.cr.usgs.gov        (USGS NEIC/NEIS world-wide)
    andreas.wr.usgs.gov      (Northern California)
    scec.gps.caltech.edu     (Southern California)
    fm.gi.alaska.edu         (Alaska)
    seismo.unr.edu           (Nevada)
    mbmgsun.mtech.edu        (Montana)
    equinfo.seis.utah.edu    (Utah)
    sisyphus.idbsu.edu       (Idaho)
    quake.eas.slu.edu        (Central United States)
    tako.wr.usgs.gov         (Hawaii)
```

Additional catalogs and information are available on the World Wide W at the URL 'http://www.geophys.washington.edu/seismobig.html'.

The Date/Time is given in Universal Time Coordinates (UTC), which is 6 hours ahead of Central Standard Time (5 hours ahead of CDT).

Magnitudes are reported as Md (local duration magnitude) unless otherwise noted.

Q denotes the location quality: A = good, D = poor.

Updated on December 12 10:00 CDT 1997.

DATE-(UTC)-TIME		LAT	LON	DEP	MAG	Q	COMMENTS
yy/mm/dd	hh:mm:ss	deg.	deg.	km			
97/02/10	13:25:35	36.25N	89.45W	10.0	1.8	B	RIDGELY, TENNESSEE

COMMENTOR NO. 57: LAMB, RONALD (CONT'D.)
KEVIL, KENTUCKY

97/02/17	16:32:28	35.95N	90.60W	30.0	2.4	D	COOBERTOWN, ARKANSAS
97/02/19	15:38:44	35.75N	90.14W	0.3	1.4	B	LENNIE, ARKANSAS
97/02/24	01:48:10	35.76N	90.14W	4.5	2.0	D	MISSISSIPPI CO., ARK
97/03/05	21:11:32	36.05N	89.80W	7.3	2.3	D	COOTER, MISSOURI
97/03/06	12:40:51	36.24N	89.44W	5.6	2.3	B	RIDGELY, TENNESSEE
97/03/07	23:38:58	36.26N	89.51W	7.5	2.0	B	RIDGELY, TENNESSEE
97/03/09	06:38:10	36.23N	89.43W	8.8	1.9	A	BOGOTA, TENNESSEE
97/03/12	11:16:12	36.54N	89.62W	24.7	2.2	D	CONRAN, MISSOURI
97/03/16	16:59:56	36.54N	89.67W	25.0	2.2	D	PORTAGEVILLE, MISSOU
97/03/16	19:07:28	34.27N	93.49W	5.0	3.4	D	GLENWOOD, ARKANSAS
97/03/21	03:07:56	36.15N	89.70W	9.1	2.1	A	ACORN CORNER, MISSOU
97/03/21	17:39:13	36.81N	89.51W	2.0	2.5	D	DOGWOOD, MISSOURI
97/03/23	09:36:34	36.18N	89.41W	9.1	1.9	B	MILLSFIELD, TENNESSE
97/04/06	14:41:12	36.25N	89.46W	10.5	1.6	A	RIDGELY, TENNESSEE
97/04/06	16:48:34	36.24N	89.46W	10.6	1.2	A	RIDGELY, TENNESSEE
97/04/12	02:27:18	36.01N	89.83W	25.7	1.4	B	HERMONDALE, MISSOURI
97/04/18	09:40:03	36.07N	89.89W	10.0	2.0	D	DENTON, MISSOURI
97/04/20	15:50:56	36.12N	89.75W	13.5	2.1	A	ACORN CORNER, MISSOU
97/04/26	00:50:26	36.46N	89.58W	16.0	1.8	D	PLEASANT POINT, MISS
97/05/02	03:13:48	36.25N	89.42W	10.8	1.3	B	RIDGELY, TENNESSEE
97/05/14	20:40:21	37.74N	87.58W	10.0	2.3	D	HENDERSON CO., KENTU
97/05/18	20:50:40	35.24N	91.25W	13.5	2.6	D	PATTERSON, ARKANSAS
97/05/20	05:28:32	36.65N	89.59W	5.0	2.2	D	KEWANEE, MISSOURI
97/05/20	22:24:57	36.32N	89.57W	5.6	1.6	A	MOORING, TENNESSEE
97/05/22	14:58:01	36.32N	89.54W	6.9	1.7	A	MOORING, TENNESSEE
97/05/23	05:34:08	36.63N	89.57W	11.4	2.0	B	KEWANEE, MISSOURI
97/05/31	21:52:55	36.31N	89.53W	5.9	2.1	B	MOORING, TENNESSEE
97/06/02	19:09:52	36.29N	89.46W	7.9	1.9	A	MADIE, TENNESSEE
97/06/14	05:43:48	37.16N	89.32W	2.0	2.2	D	SANDUSKY, TENNESSEE
97/06/17	01:30:41	36.30N	89.53W	8.1	1.8	A	MOORING, TENNESSEE
97/06/17	06:44:40	36.28N	89.54W	8.9	2.1	A	MOORING, TENNESSEE
97/06/26	17:55:30	36.67N	89.60W	3.1	2.5	D	KEWANEE, MISSOURI
97/07/03	12:45:00	36.33N	89.53W	11.8	2.0	B	MOORING, TENNESSEE
97/07/10	02:25:32	35.43N	89.55W	10.0	2.2	D	MASON, TENNESSEE
97/07/13	02:18:20	36.11N	89.76W	10.0	2.1	B	ACORN CORNER, MISSOU
97/07/21	20:30:43	36.44N	89.56W	15.5	2.2	A	POINT PLEASANT, MISS
97/08/09	19:07:50	35.68N	90.51W	11.4	2.2	D	TRUMANN, ARKANSAS
97/08/21	19:29:35	35.99N	89.85W	13.6	2.3	B	BLYTHEVILLE,ARKANSAS
97/09/03	18:16:40	36.63N	89.57W	8.01	2.2	D	NEW MADRID, MISSOURI
97/09/17	18:16:32	35.66N	90.48W	5.0	3.4	D	TRUMANN, ARKANSAS
97/09/24	04:20:26	35.58N	89.88W	26.0	3.0	D	TALLAPOOSA, MISSOURI
97/09/20	05:55:57	36.91N	90.69W	10.9	2.5	D	66.21 km west of Dex
97/09/27	12:14:11	36.19N	89.42W	6.6	2.9	B	CLOVERDALE, TENNESSE
97/10/02	06:56:16	36.00N	88.99W	15.0	1.9	B	25km E of DYERSBURG,
97/10/06	03:13:29	36.32N	89.45W	5.0	1.5	D	RIDGELY, TENNESSEE
97/10/17	09:50:51	36.15N	89.03W	10.0	1.5	D	MARTIN, TENNESSEE (A
97/10/20	01:00:46	36.02N	89.21W	10.0	1.2	D	DYERSBURG, TENNESSEE
97/10/24	08:35:16	31.17N	87.25W	5.0	4.9		BREWTON, ALABAMA (NE
97/10/26	23:27:12	31.10N	87.30W	10.0	3.7Lg		BREWTON, ALABAMA (NE
97/10/28	09:00:10	31.10N	87.30W	10.0	3.0Lg		BREWTON, ALABAMA (NE
97/11/05	17:06:02	35.63N	90.39W		1.6	C	MARKED TREE, ARKANSA
97/11/09	20:40:57	36.37N	89.48W	8.7	1.4	D	RIDGELY, TENNESSEE (

COMMENTOR NO. 57: LAMB, RONALD (CONT'D.)
KEVIL, KENTUCKY

finger?quake@elrond.ceri.memphis.edu at samwi... Page 3 of 3

97/11/28	10:28:45	36.09N	89.73W	11.8	2.5	B	PEMISCOT CO, MISSOUR
97/12/02	23:41:15	36.57N	89.51W	7.9	2.7	B	FULTON CO. KENTUCKY
97/12/12	08:42:21	33.73N	87.20W	10.0	4.0Lg	A	WALKER CO. ALABAMA (
98/01/09	09:05:59	36.56N	89.52W	7.0	2.2	B	New Madrid, Missouri
98/01/17	19:40:07	36.59N	89.62W	6.5	2.2	B	New Madrid, Missouri
98/01/27	09:58.40	36.12N	89.57W	12.0	2.5	A	Dyersburg, Tennessee
98/01/28	22:05:12	36.10N	89.76W	11.4	2.7Lg	B	Caruthersville, Miss
98/02/12	09:37:49	36.14N	89.71W	9.6	3.0	A	Caruthersvi,lle Miss
98/02/19	14:05:27	36.54N	89.58W	8.9	2.7	A	New Madrid, Missouri
98/02/19	22:22:49	36.48N	89.56W	8.2	1.9	A	New Madrid, Missouri
98/02/26	02:10:25	36.49N	89.56W	5.2	2.5	B	New Madrid, Missouri
98/03/11	08:09:43	36.63N	89.32W	5.0	1.5	C	13.63 km northwest o
98/03/13	03:05:27	36.26N	89.61W	7.4	2,0	B	10.69 km north of Ca
98/03/15	06:56:46	36.43N	89.52W	5.3	2.5	B	6.63 km northwest of
98/03/21	06:52:23	36.15N	89.47W	15.8	1.6	B	12.51 km south of Ri
98/04/08	18:16:54	36.60N	89.02W	15.1	3.2Lg	D	16.16 km east of Hic
98/04/09	05:13:41	36.40N	89.50W	6.8	2.7Lg	B	3.48 km norwest of T

COMMENTOR NO. 58: INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH
TAKOMA PARK, MARYLAND

ieer

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Comments of the Institute for Energy and Environmental Research on the draft of the Department of Energy Programmatic Environmental Impact Assessment for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride, December 1997

by
Annie Makhijani and Arjun Makhijani
March 1998

The Department of Energy's Draft Programmatic Environmental Impact Statement (PEIS)for Alternative Strategies for the Long-Term Management of Depleted Uranium Hexafluoride purports to analyze the impacts of the storage, use and/or disposal of the 560,000 metric tons of depleted uranium hexafluoride currently stored in 46,422 cylinders at three sites located near Portsmouth, Ohio; Oak Ridge, Tennessee; and Paducah, Kentucky. This long term management is for the depleted uranium generated prior to 1993.

In this report the DOE examines six alternatives:

- The "no action" alternative which would be a continuation of the current management program, that is storage on site in cylinders of the depleted uranium hexafluoride.
- Two storage alternatives based on retrievability
  - in UF_6 form in yards, buildings or an underground mine
  - in oxide form in buildings, below-ground vaults or an underground mine
- Two use alternatives
  - radiation shielding for casks for storage of spent fuel or high level wastes after conversion to metal
  - radiation shielding for casks for storage of spent fuel or high level wastes after conversion to oxide
- Disposal as low-level waste in the oxide form in drums placed in
  -shallow earthen structures
  - vaults
  - mines

The Draft also makes mention of other possible uses of depleted uranium as part of the use alternatives (see below).

1

Commentor No. 58: Institute for Energy and Environmental Research (Cont'd.) Takoma Park, Maryland

One of these alternatives will be selected in the Record of Decision, which is scheduled for this year. DOE's preferred alternative is to use the entire inventory of depleted uranium after its conversion to a metal and/or oxide form.

The DOE's effort to address the long-term management of the country's depleted uranium hexafluoride, specifically the realization of the importance to convert this material into a stable form is long overdue. The draft PEIS is seriously deficient because it does not address the most environmentally appropriate option - specifically, the DOE did not include the alternative of disposing of depleted uranium according to the rules of 40 CFR 191 which govern the disposal of transuranic (TRU) wastes. IEER, in its comments (Mar 22, 1996) on DOE's Notice of Intent (Jan 25, 1996), had already noted that the proposed list of alternatives was incomplete since it did not include the option of disposal under 40 CFR 191. The DOE has rejected our comments without providing any technical or environmental explanation. Our comments of March 22, 1996 are attached . DOE should include this option in the Final PEIS. **58-1**

IEER agrees with DOE that the no action alternative is inappropriate and should be rejected because of the dangers of UF_6 storage. For the same reason, long-term UF_6 storage in new containers should also be rejected. Overall, conversion to oxide would reduce risks. While conversion poses risks to workers and the off-site population, continued storage also poses serious risks. **58-2**

However, the various alternatives the DOE has considered have not been properly assessed in this PEIS.

A. Conversion of uranium hexafluoride

Most of the alternatives considered involve the conversion of uranium hexafluoride. Three alternatives would convert uranium hexafluoride to an oxide and one alternative would convert uranium hexafluoride to a metal. This conversion would have the positive result of putting the depleted uranium in a more stable chemical form, therefore eliminating the chances of an hazardous releases of UF_6 and hydrofluoric acid from aging corroding cylinders. DOE's analysis is incomplete or deficient in regard to the **58-3**

- fate of the empty cylinders,
- commercial use of contaminated anhydrous hydrogen fluoride (produced during the conversion process),
- the radiological effects on workers.

1. Fate of the empty cylinders

DOE admits that ".. the ultimate disposition of the empty cylinders was not analyzed in detail as part as the alternative management strategies." The empty cylinders would become part of the DOE scrap metal inventory. The options for disposition are: recycling **58-4**

"... into LLW disposal containers, reuse as LLW containers, free release for re-melting, and disposal as LLW." However DOE has not analyzed the environmental and health impacts of these proposals. This lack of analysis is a serious problem since the volume of contaminated metal involved is large and doses to the public and to workers may be significant. **58-4 (Con't.)**

2. Commercial use of contaminated HF and CaF_2

The DOE has not properly assessed the management of both HF, a by-product of the conversion process, and calcium fluoride (CaF_2), a product of the neutralization of HF. Both these products will be slightly contaminated and in the Cost Analysis Report for the Long-Term Management of Depleted Uranium Hexafluoride concerns are expressed as to the public acceptance of the uranium contaminants. Regardless of this concern, the DOE, in its Draft PEIS, assumed that these products could be commercially sold for unrestricted use. It is unacceptable to release a non-labeled contaminated product which has not received public acceptance. The Cost Analysis Report also states that the demand for HF is "still very uncertain". An other option is to use the HF for the production of UF_6. For this option as well as the commercial use option, DOE has not addressed the fact that part of the UF_6 inventory is recycled UF_6 which is contaminated by radionuclides other than uranium-238, such as Tc-99 and U-236 which both have a long half life. **58-5**

3. Radiological effects on workers

In their calculation of radioactive dose assessment, DOE does not take into account internal radiation doses that would be received by involved workers during the conversion process. This is a serious deficiency since involved workers are the most at risk. DOE claims that measures taken to prevent inhalation and ingestion of radioactive material would effectively protect the involved workers. The emphasis on prevention measures is not enough without a monitoring program installed for health purposes. DOE also claims use of respirators will reduce workers doses. But routine reliance on respirators is unacceptable as a radiological control practice. Moreover, some of the depleted uranium comes from the enrichment of UF_6 from recycled uranium from spent fuel. This UF_6 contains some radionuclides of concern such as technitium-99, a long lived beta emitter and uranium-236, a long lived alpha emitter. DOE does not seem to have analyzed the radiological impacts. **58-6**

B. Uses of depleted uranium

1. *Uses analyzed*

DOE's preferred alternative is to use the entire inventory of depleted uranium after its conversion to a metal or an oxide form for radiation shielding in storage casks for spent fuel. However since these casks would have to be licensed by the NRC (6.11-9-1 Engineering analysis report) this choice is premature. Even if the licensing is approved cask fabrication creates more problems than solutions. The problems are that **58-7**

Commentor No. 58: Institute for Energy and Environmental Research (Cont'd.) Takoma Park, Maryland

- it is not a final solution since the casks envisioned do not meet the criteria for deep repository disposal. Hence this is not a solution but a stop-gap storage method that would create more contamination and radioactive waste in the form of used casks. The DOE has not done the preliminary work ascertaining the license ability of the casks. DOE's choice of preferred option is premature and inappropriate.
- DOE doesn't say what will happen to the DU in the casks. It only states that: "No assumptions were made regarding the fate of the oxide- and metal-shielded casks after use. The empty casks could be recycled, stored, or disposed of as LLW." (p. H-32). **58-7 (Con't.)**

For the manufacturing casks as with the conversion process, the contribution to the dose from internal radiation to involved workers has not been assessed.

2. *Other uses not analyzed in depth*

With the long-term storage options DOE preserves the possibility to pursue the use of depleted uranium in light water reactor fuel cycle, advanced reactor fuel cycles and, dense material applications. The light water reactor option has two sub-options: the re-enrichment of DU and the use of DU for MOX. Among these options, the fact that the use of depleted uranium in advanced reactors (that is fast neutron reactors, also known as breeder reactors) is at all considered is particularly disturbing. Depleted uranium being the raw material for plutonium production, by converting it into a material not only much more radioactive but also weapons usable would not only defeat the stated purpose of the PEIS which is to "achieve the safe and effective long-term management of depleted UF_6." It would also have serious proliferation consequences. **58-8**

3. *Uses not analyzed*
The feasibility of using depleted uranium hexafluoride for the blending down of surplus highly enriched uranium was not considered in this PEIS. Although it would utilize only a small portion of the stock, this use would have several advantages, among them: the contribution to non-proliferation, a minimum of handling, and incorporation of depleted uranium into spent fuel. This use option could be made part of any of the alternatives except UF_6 storage. **58-9**

C. IEER's recommendations

IEER recommends that:

- depleted uranium be classified as a waste equivalent to TRU waste for management purposes **58-1 (Con't.)**
- UF_6 be converted to an oxide form and declared a waste to be handled on a par with repository-designated TRU waste, with the possible exception of a relatively small quantity to be used for the blending down of highly enriched uranium. This should be the preferred option in the Final PEIS **58-2 (Con't.)**

4

Commentor No. 58: Institute for Energy and Environmental Research (Cont'd.) Takoma Park, Maryland

- The issue of internal radiation for involved workers during conversion and cask fabrication be addressed carefully along with an assessment of the effects of uranium-236 and technitium-99 **58-6 (Con't.)**
- the fate of the empty UF_6 cylinders and their proper disposition should be studied **58-4 (Con't.)**
- the fate of the anhydrous hydrogen fluoride and calcium fluoride should be properly studied
- radioactive materials such as HF from UF_6 processing and steel from empty UF_6 cylinders not be circulated in the civilian economy. **58-5 (Con't.)**

5

Commentor No. 59: Institute for Energy and Environmental Research
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Comments of the Institute for Energy and Environment on the Department of Energy Notice of Intent addressing the Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride, Federal Register, Thursday, January 25, 1996

by

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22 March 1996

The Department of Energy has announced its intent to prepare a programmatic environmental impact statement addressing the use and/or disposal of the 560,000 tonnes of depleted uranium hexafluoride currently stored in cylinders at three sites located near Portsmouth, Ohio; Oak Ridge, Tennessee; and Paducah, Kentucky.

The DOE plans to consider a set of six preliminary alternatives:

- The "no action" alternative which would be a continuation of the current management program, that is storage on site in cylinders of the depleted uranium hexafluoride.
- Two storage alternatives based on retrievability
  - in the UF_6 form
  - in the oxide form
- Two use alternatives
  - radiation shielding after conversion to metal
  - radiation shielding after conversion to oxide
- Disposal as low-level waste in the oxide form in drums placed in
  - engineered trenches
  - below-ground concrete vaults
  - mines

IEER welcomes the DOE's effort to address the long-term management of the country's depleted uranium hexafluoride. However the DOE list of alternatives does not include all reasonable alternatives. Specifically DOE should add another option to the above mentioned list. This option would be the disposal of depleted uranium according to the rules of 40 CFR 191 which govern the disposal of transuranic (TRU) wastes.

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Commentor No. 59: Institute for Energy and Environmental Research (Cont'd.)
Takoma Park, Maryland

Currently, uranium is still classified as a source material. In cases where it might be disposed of as a waste the Nuclear Regulatory Commission has put it by default into the category of class A low-level radioactive waste according to 10 CFR 61.55 (6). 10 CFR 61.55 allows near surface disposal. The inappropriateness of this default classification is demonstrated be the NRC's own assessment that shallow-land burial of depleted uranium could result in unacceptably high doses to future generations. [1] However in its notice of intent, the DOE has left the low-level category of depleted uranium ambiguous. In the three scenarios of the disposal alternative, the DOE does not specify in which low-level waste class it puts depleted uranium. The first one - disposal in engineered trenches - corresponds to a classification of depleted uranium as class A low-level radioactive waste. The last two - disposal below-ground in concrete vaults and disposal in mines - imply that the current classification is inadequate. DOE should clearly include waste classification as an issue as it relates to depleted uranium in its implementation plan and address it in detail in the PEIS.

We set forth below the scientific reasons why depleted uranium should be put in the same classification as transuranic wastes for the purpose of waste management and disposal. This would mean that depleted uranium would have to be placed in a deep geological repository.

The current definition of TRU waste according to 40 CFR 191.01 (i) is: ". . .waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes, with half-lives greater than twenty years, per gram of waste . . . ."

What matters to health and environmental considerations is the specific activity of the radioactive wastes, the nature of the radiation being emitted during the radioactive decay (alpha or beta and whether the decay is accompanied by gamma radiation) and, the energy per radioactive decay. Depleted uranium is, in these essential respects, the same as the transuranic constituents of TRU waste. The specific ways in which uranium or the transuranic radionuclides in TRU waste might affect people will, of course, depend on the chemical form of the waste, the packaging, and the disposal method.

There is one nominal difference between TRU waste and depleted uranium. TRU waste consists of elements with atomic numbers greater than or equal to 93 -- that is of elements with atomic numbers greater than uranium, whose atomic number is 92. But this is a difference of nomenclature; it has no bearing upon health and environmental issues.

A. Properties of depleted uranium

1. *Specific Activity*

The radioactivity per unit weight (called specific activity) of depleted uranium metal is dominated by its principal constituent, uranium-238. It also depends somewhat on the exact extent to which uranium-235, and hence also uranium-234, have been separated and

[1] Final Environmental Impact Statement for the Construction and Operation of the Claiborne Enrichment Center, Homer Louisiana, NUREG-1484, Vol. 1, August 1994.

Commentor No. 59: Institute for Energy and Environmental Research (Cont'd.) Takoma Park, Maryland

passed into the enriched uranium stream. It may vary from about 360 nanocuries/gram to about 450 nanocuries/gram. Even assuming that only uranium-238 remains, the specific activity would be still about 340 nanocuries/gram which is 3.4 times higher than that defining transuranic waste.

The specific activity of other chemical forms is somewhat lower than for uranium metal, because when radioactive uranium is chemically bound with non-radioactive isotopes of elements like oxygen and fluorine, its specific activity is correspondingly lower. Table 1 shows the specific activity of four forms of depleted uranium. For convenience we have assumed a single reference value of 360 nanocuries/gram for the specific activity of uranium metal which is the lowest practical value in the range cited above.

Table 1 also shows, for reference, the minimum specific activity of transuranic waste as defined by regulations and the radioactivity of ore containing 0.2 percent uranium.

Table 1
Specific Activities of various chemical forms of depleted uranium, TRU waste and 0.2% uranium ore

Chemical form	Specific activity, nCi/g
uranium metal (U)	360
uranium oxide (U_3O_8)	300
uranium tetrafluoride (UF_4)	270
uranium hexafluoride (UF_6)	240
transuranic activity in TRU waste	>100 (See note 2)
0.2 % uranium ore	4 (See note 3)

Notes for Table 1
1. Specific activities of the four forms of uranium have been rounded to two significant figures, and that of uranium ore to one significant figure.
2. The minimum limit of 100 nanocuries/gram of transuranic elements for waste to be classified as TRU waste includes only those isotopes of transuranic elements with half-lives greater than 20 years. The most common isotope in TRU waste that is eliminated from the counting in this way is plutonium-241, which has a half-life of 14.4 years. However the decay product of plutonium-241, americium-241 is included in TRU waste because it has a half-life of about 432 years. All these uranium isotopes we are dealing with in these comments have half-lives far longer than 20 years.
3. The specific activity of 0.2 percent uranium ore shown includes all decay products of uranium-238 up to and including radium-226, assuming they are in secular equilibrium with uranium-238. Radon-222, and its decay products are not included.

It is clear from Table 1 that depleted uranium is comparable in specific activity to transuranic waste. This conclusion is independent of the chemical form of the depleted uranium. Note that depleted uranium is far more radioactive than uranium ore because the ore is mixed with large quantities of non-radioactive materials. Thus, putting depleted uranium in mines is in no way like replacing the original material that was mined out of the ground. Rather it is analogous to putting TRU waste in the ground.

2. *Mode of decay, energy of decay, and half-life*

Commentor No. 59: Institute for Energy and Environmental Research (Cont'd.) Takoma Park, Maryland

The main radionuclide of concern in most TRU waste is plutonium-239. Other radionuclides that are present in significant quantities are plutonium-240, plutonium-238, neptunium-237, and americium-241. The predominant mode of decay of all of these radionuclides is alpha decay. That is also the case with all three uranium isotopes (uranium-238, uranium-234, and uranium-235) present in depleted uranium. In all these cases, the emitted alpha particles have energies between 4 and 6 MeV, so that the total energy deposited in tissue per picocurie of radioactive material in the body is the same. Thus, once a unit of radioactivity of TRU waste or of depleted uranium is in the body, the amount of radiation dose per unit of time is approximately the same.

Table 2 shows the principal characteristics of concern of the main radionuclides in TRU waste and in depleted uranium. Note that the decay products of uranium-238 build up over hundreds of thousands of years, and we have ignored these for the sake of argument in these comments.[3]

Table 2
Properties of Uranium Isotopes and Selected Transuranium Elements

Isotope	Main decay mode	Alpha particle energy, MeV	Half-life, years	Comments
uranium-238	alpha	4.1	4.46 billion	
uranium-234	alpha	4.8	245,000	
neptunium-237	alpha	4.8	2.14 million	
plutonium-238	alpha	5.5	87.7	
plutonium-239	alpha	5.1	24,110	
plutonium-240	alpha	5.1	6,537	
plutonium-241	beta	see note 2	14.4	not included in TRU waste definition
americium-241	alpha	5.5	432	strong gamma emitter

Notes
1. All energies rounded to two significant figures. The alpha emitting radionuclides emit alpha particles with more than one characteristic energy, with each energy level being produced with a known probability. The alpha particle energy shown is an approximate average of these particles energies, weighted by the emission probability.
2. Plutonium-241 is not included in the definition of TRU waste since it has a half-life of less than 20 years. Its beta particle energy is 0.021 MeV.

B. Chemical forms of depleted uranium

As has been shown, regardless of its chemical form, depleted uranium is always more radioactive than the lowest specific activity defining TRU waste. However, some chemical forms are more reactive than others. For example UF_6 is very reactive. In the

[3] In general, the specific activity of wastes containing mainly plutonium-239 will decline as time progresses, but that of wastes containing mainly uranium-238 will increase as time progresses, due to the differences in half-lives of the decay products of these two radionuclides