U.S. Department of Energy
Office of Nuclear Energy
National Environmental Policy Act
Determination

NEPA Identification.: DOE-ID-26-005

Proposed Action Title: Valar Ward250 Research Reactor

Location(s) (City/County/State): Utah San Rafael Energy Research Center in Orangeville, Emery County, Utah

Proposed Action Description:

Valar Atomics, Inc. proposes to construct and operate the Ward250 research reactor at the Utah San Rafael Energy Research Center (USREL). Ward250 is a 250 kilowatt thermal (kWth) high temperature gas-cooled reactor (HTGR) research facility and will utilize tristructural-isotropic (TRISO) coated particle fuel, helium coolant, and graphite moderator and reflector. The facility will operate under U.S. Department of Energy (DOE) authorization. The facility will be located at USREL, a state-operated energy research facility on a 20.6-acre site in a rural area of central Utah. The Ward250 facility comprises the Reactor Complex and Fuel Laboratory enclosed within a security-fenced area occupying approximately 2 acres.

The facility supports a 24-month research program, consisting of approximately 12 months of reactor operation followed by 6 months of in-vessel cooldown and 6 months of decommissioning. The program will demonstrate HTGR technology performance, validate design codes and methodologies, generate operational data, and demonstrate fuel fission product break detection and remediation capabilities. Following completion of the research mission, the facility will be decommissioned in accordance with DOE requirements.

Environmental resource requirements are minimal. Land disturbance is confined to the existing USREL site. Water consumption is less than 1000 gallons/day for domestic use. Electrical power is provided by USREL infrastructure. The reactor and support systems are housed in modular structures on engineered foundations with connections to existing USREL utilities only.

Construction was confined to the existing USREL site with minimally invasive excavation. Temporary traffic increase occurs during equipment delivery. No wetlands, floodplains, or sensitive habitats are affected.

Operational impacts are negligible. Radiological impacts are not significant under normal or accident conditions. Gaseous effluents are negligible. Routine discharge of liquid radioactive effluent is prohibited. Infrequent batch releases are permitted only when verified below the release limits in NE Order 458.1 and in accordance with local utility permits. No process water discharges occur. Sanitary waste is managed through USREL infrastructure. Facility operations produce negligible noise beyond site boundary. Minimal staffing generates negligible traffic. No combustion processes occur. No impact to surface water or groundwater occurs. Elevated site position eliminates hydraulic connection to Cottonwood Creek.

Post-operational impacts are minimal. Spent fuel will be transferred to dry storage for transport to a DOE-approved facility. Decommissioning will return site to unrestricted use.

Mitigation measures include inherent safety features with passive safety systems and fuel form providing fission product retention. Elevated site position eliminates flood risk. Conservative seismic and wind design exceeds regional requirements. Radiation monitoring and controlled access are maintained during operations.

Environmental Aspects/Impacts:

Land Use

Ward250 occupies approximately 2 acres within the existing 20.6-acre USREL site. No expansion of site boundaries occurs. The USREL site is designated for energy research. Surrounding area is predominantly undeveloped rangeland with dispersed rural residential properties. Nearest town (Orangeville, population 1,224) is more than 1 mile southeast. Agricultural use includes livestock grazing and irrigated crops along valley bottomlands.

Site access is via paved Utah State Route 10 connecting to U.S. Route 6 approximately 35 miles north. No rail access exists at site. No major pipelines cross the site. Electrical power and other utilities are provided through existing USREL infrastructure.

Land use impacts are minimal. Construction and operations occurred entirely within existing USREL boundaries. No settling ponds are required. Solid waste disposal occurs at licensed off-site facilities.

Air Quality

Ward250 is located in the Central Utah Intrastate Air Quality Control Region, designated as attainment for all National Ambient Air Quality Standards criteria pollutants. The local climate is semi-arid continental. Mean annual temperature is approximately 50°F with winter lows to -20°F and record summer highs to approximately 105°F (41°C). Safety systems are designed for a temperature envelope of -20°F to 115°F (-29°C to 46°C). Mean annual precipitation is approximately 10 inches with 19 inches average snowfall.

Existing air quality is excellent due to rural location and low population density. No major emission sources exist within 10 miles. No significant air emissions occur during construction or operations. No criteria air pollutant emissions occur. No combustion processes occur. Heating, ventilation, and air conditioning systems maintain negative pressure with High-Efficiency Particulate Air filtration. No Clean Air Act permits are required.

Hydrologic Conditions and Water Quality

The site is located in the Cottonwood Creek watershed, tributary to the San Rafael River system. Cottonwood Creek provides irrigation water for local agriculture. No industrial discharges exist in the vicinity. The site is located in the Colorado Plateau groundwater region with aquifers in Cretaceous sandstone formations. Depth to groundwater is typically 15–61 m (50–200 ft) below ground level based on regional data. Groundwater quality is suitable for domestic and agricultural use.

The Adobe Wash Regulating Reservoir, an agricultural irrigation storage facility operated by the Cottonwood Creek Consolidated Irrigation Company, is located approximately 0.4 km (0.25 miles) southwest of the USREL site. Regional surface water flow in the Castle Valley area is generally eastward, following topographic gradient from the Wasatch Plateau toward Cottonwood Creek and the San Rafael River system. Surface drainage from the Ward250 site flows northeastward toward Cottonwood Creek. The Adobe Wash Reservoir drains eastward through a separate drainage (Adobe Wash) that does not intersect the USREL site drainage. The site's elevated mesa position, absence of liquid radioactive effluent discharge pathways, and prohibition on routine liquid radioactive releases ensure that Ward250 operations have no impact on the reservoir or on regional surface water or groundwater quality.

The site is not located within Federal Emergency Management Agency-mapped flood hazard areas. Elevated position approximately 100 feet above Cottonwood Creek eliminates flood risk. The nearest public water system serves Orangeville and Castle Dale. No public water supply intakes exist downstream of Ward250 site. No unique aquatic habitats, recreational areas, or water use constraints from treaties or legal decrees affect the site.

Water resource impacts are minimal. Water consumption is minimal (less than 1000 gallons/day domestic use). No process water discharges occur. Sanitary waste is managed through USREL infrastructure. No impact to surface water or groundwater quality occurs. No stream diversion, runoff from storage piles, or leachates from waste disposal sites occur.

Geologic and Soil Conditions

The site is located on an elevated mesa in high desert terrain with pinyon-juniper vegetation. Site elevation is approximately 5,980 feet, about 100 feet above Cottonwood Creek valley floor. Geology consists of Cretaceous sedimentary formations with competent bedrock at shallow depth. Depth to groundwater is typically 15–61 m (50–200 ft) below ground level based on regional data. Climate is semi-arid with annual precipitation approximately 10 inches. The site is located on a stable mesa with competent Cretaceous sedimentary bedrock at shallow depth. No active faults, landslides, or geologic hazards exist at or adjacent to site per Utah Geological Survey mapping. The site is located in moderate seismic hazard region. The Wasatch Fault Zone is located approximately 150 km (95 miles) northwest of the site. Seismic design exceeds regional requirements.

Soil consists of thin alluvial cover over competent bedrock. Low settlement potential exists. Moderate erosion susceptibility exists under natural cover. Soil productivity is low due to arid climate. No unique soil species exist. No karst formations exist at site. Regional geology consists of sandstone and shale without carbonate dissolution features.

Geologic and soil impacts are minimal. Minimal excavation occurs in competent material. No subsidence risk exists. Elevated site eliminates floodplain impacts. Standard erosion control is applied during construction. Post-construction revegetation stabilizes disturbed areas. No increases or decreases in soil permeability or infiltration occur.

Vegetation Resources

The site is located in the Colorado Plateau Shrubland biome. Site elevation (approximately 5,980 feet) is in pinyon-juniper woodland ecological zone. Common high desert vegetation includes pinyon pine, Utah juniper, big sagebrush, shadscale, and native grasses. This is a typical undisturbed rangeland assemblage.

One federally listed plant species, San Rafael cactus (Pediocactus despainii, endangered), is identified by IPaC as potentially occurring in the project area. Known populations of this species are restricted to the San Rafael Swell, approximately 32 km (20 mi) east of the USREL site. Construction is confined to previously developed areas within USREL. The site is not located in wetlands, floodplains, or other sensitive plant habitats. No riparian vegetation exists due to distance from Cottonwood Creek.

Vegetation impacts are minimal. Disturbance affects approximately 1-2 acres of common rangeland vegetation. No rare or endangered species are affected. Post-construction revegetation with native species occurs.

Wildlife Resources

Common high desert wildlife includes mule deer, coyote, jackrabbit, small mammals, raptors (golden eagle, red-tailed hawk), songbirds, and reptiles. This is typical of Utah high desert ecosystems.

No federally listed threatened or endangered species have designated critical habitat at the site. One listed plant species (San Rafael cactus) has potential range overlap; known populations are restricted to the San Rafael Swell, approximately

32 km east. Greater sage-grouse leks are not present within 5 miles. The site does not contain wetlands, riparian corridors, caves, or unique habitat features. Common pinyon-juniper woodland provides typical wildlife habitat. Wildlife impacts are minimal. Small footprint (1-2 acres) affects common habitat. Localized wildlife displacement occurs during construction. No federally listed species are affected. Post-decommissioning site restoration occurs.

Visual Resources

Castle Valley region contains scenic resources including views of San Rafael Swell (approximately 20 miles east), Wasatch Plateau, and high desert landscapes. The site is located within existing developed USREL facility. Existing site features include buildings, roads, utilities, and industrial equipment.

Visual resource impacts are minimal. Ward250 structures are low-profile modular buildings consistent with existing USREL industrial character. Reactor Complex is approximately 55 feet high, similar to industrial buildings. Site location within USREL and distance from public viewpoints (State Route 10 over 1 mile distant) minimize visual impact. No scenic vistas are obstructed.

Historic and Cultural Resources

No documented historic buildings, structures, or sites exist at Ward250 location per Utah State Historic Preservation Office records. Site was previously disturbed through USREL development. Site was previously surveyed. No documented archaeological sites exist within Ward250 footprint.

The Utah State Historical Preservation Office concurs that no historic properties will be affected by the project. Cultural resource impacts are minimal. Construction is confined to previously disturbed areas. No historic structures are demolished. No archaeological sites are disturbed. Standard cultural resource discovery protocols apply during construction.

Waste Generation

Minimal low-level radioactive waste is generated during 12-month operations. Solid radioactive waste includes HEPA filters, protective clothing, and small equipment, estimated at less than 1 cubic meter annually. This waste is transported to a licensed disposal facility. No radioactive waste will be left on site after decommissioning. Routine liquid radioactive discharge is prohibited. If infrequent batch releases are required, liquid waste is characterized, verified below NE O 458.1 Derived Concentration Standards, and either solidified for disposal or discharged in accordance with authorized limits. Gaseous waste consists of short-lived isotopes with negligible off-site impact. Spent fuel is a single core loading in dry storage casks for transport to DOE-approved facility.

Non-radioactive hazardous waste includes used oil and laboratory chemicals, less than 50 gallons annually. This is managed per Environmental Protection Agency (EPA)/Utah DEQ requirements. Conditionally exempt small quantity generator status applies. Non-hazardous solid waste includes office and cafeteria waste, less than 5 cubic yards weekly. Commercial collection and disposal occurs.

An EPA ID number as small quantity generator is required. No Resource Conservation and Recovery Act permit is required.

Health and Safety Aspects

Natural background radiation in central Utah is approximately 100-120 mrem/year. Minimal existing air emissions exist in rural area. Low ambient noise levels exist.

Facility radiological emissions are negligible with off-site doses well below regulatory limits. Valar Atomics implements the Ward 250 Radiation Protection Program (RPP) in accordance with 10 CFR 835. The RPP establishes the operational framework to ensure that:

- Occupational doses to general employees do not exceed 5 rem (0.05 Sv) in a year.
- Doses to members of the public do not exceed 100 mrem (1 mSv) in a year (per NE Order 458.1).
- Planned special exposures and emergency exposures are strictly controlled in accordance with the RPP.

The following project attributes demonstrate that Ward250 reduces sufficiently the risk of adverse offsite consequences from the release of radioactive or hazardous materials:

Reactor Design. Ward250 is a low-power high temperature gas-cooled reactor using inert helium coolant and graphite moderator. The design relies on passive safety features that function without operator action, external power, or active engineered systems. The reactor exhibits a strong negative temperature coefficient of reactivity, providing inherent power limitation under all conditions. Multiple independent gravity-driven control rods provide shutdown capability with margin exceeding regulatory requirements. The passive decay heat removal system maintains fuel temperatures below safety limits indefinitely without operator action or external power, eliminating credible scenarios for thermally induced fuel damage.

Fuel Type. Ward250 employs TRISO-coated particle fuel, a ceramic-coated fuel form that provides multiple independent barriers to fission product release. TRISO fuel retains fission products under both normal and accident conditions at temperatures well above those achievable in the Ward250 core. The facility adopts a functional containment approach where the fuel itself serves as the primary barrier to radionuclide release, eliminating reliance on conventional pressure-retaining containment structures.

Fission Product Inventory. The very low thermal power and short operational period result in a fission product inventory orders of magnitude below that of commercial power reactors and comparable to or less than inventories at existing DOE and NRC-licensed research reactors. Less than 1% of the initial fissile material is consumed during the operational mission. After a post-operational cooldown period, short-lived fission products fully decay, and the small quantities of longer-lived fission products remain confined within the TRISO fuel coatings.

Operational Plans. The facility operates for a single limited-duration research mission followed by a cooldown period and decommissioning, after which the site is returned to unrestricted use. No refueling occurs during the operational mission. Continuous fission product monitoring provides real-time indication of fuel performance, with automatic reactor shutdown on detection of elevated primary coolant activity. Routine liquid radioactive effluent discharge is prohibited; infrequent batch releases are permitted only when verified below applicable Derived Concentration Standards per NE O 458.1. No liquid radioactive effluent discharge pathway exists by design.

Accident Analysis. The Documented Safety Analysis demonstrates that under bounding maximum hypothetical accident conditions, no credit for engineered barriers beyond the fuel, and adverse meteorological conditions, calculated offsite doses remain well below DOE evaluation guidelines and EPA Protective Action Guide thresholds. The analysis confirms substantial margin exists between calculated consequences and regulatory limits, supporting the determination that no Safety Class structures, systems, or components are required beyond the fuel itself. All credible design basis accidents are bounded by the maximum hypothetical accident, and passive safety features provide adequate protection without reliance on active systems or operator action.

Worker exposure is monitored and maintained as low as reasonably achievable. Negligible noise beyond the site boundary occurs. These attributes collectively demonstrate that the project does not individually or cumulatively result in significant environmental impacts.

Ward250 contributes negligible incremental impact to regional conditions. Off-site radiological doses are insignificant compared to natural background. No impact on air or water quality occurs. Minimal traffic from small staff occurs. Limited operational period further reduces cumulative impacts.

References: B5.26 "Advanced Nuclear Reactors"

B5.26: Authorization, siting, construction, operation, reauthorization, and decommissioning of advanced nuclear reactors, provided the DOE determines: 1) the project's attributes, including potential fission product inventory, fuel type, reactor design, and operational plans, reduce sufficiently the risk of adverse offsite consequences from the release of radioactive or hazardous materials, and 2) the project demonstrates that any hazardous waste, radioactive waste, or spent nuclear fuel generated by the project can be managed in accordance with the applicable requirements. For the purposes of this category, a project may include multiple reactors within a nuclear facility.

For Categorical Exclusion Determinations

The proposal fits within the classes of actions listed in Appendix B to 10 CFR Part 1021 or Appendix B and C of DOE's NEPA Implementing Procedures and satisfies the conditions that are integral elements of the classes of actions therein. The proposal does not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, or similar requirements of DOE or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities (including incinerators), but the proposal may include categorically excluded waste storage, disposal, recovery, or treatment actions or facilities; (3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that preexist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources, including, but not limited to, those listed in paragraph B(4) of 10 CFR Part 1021, Appendix B; (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements, such as those listed in paragraph B(5) of 10 CFR Part 1021, Appendix B.

There is no extraordinary circumstance related to the proposal that is likely to cause a reasonably foreseeable significant adverse effect or for which DOE does not know the environmental effect. Extraordinary circumstances are unique situations presented by specific proposals, including, but not limited to, scientific controversy about the environmental effects of the proposal; uncertain effects or effects involving unique or unknown risks; and unresolved conflicts concerning alternative uses of available resources.

The proposal has not been segmented to meet the definition of a categorical exclusion. Segmentation can occur when a proposal is broken down into small parts in order to avoid the appearance of significance of the total action. However, segmentation does not include proposals that are developed and potentially implemented over multiple phases where each phase results in a decision whether to proceed to the subsequent phase.

Based on my review of the proposed action, I have determined that the proposed action fits within the specified class(es) of action, the other regulatory requirements set forth above are met, and the proposed action is hereby categorically excluded from further NEPA review.

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NEPA Identification.: DOE-ID-26-005

NEPA Compliance Officer:

JASON ANDERSON

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