6450-01-P

DEPARTMENT OF ENERGY

Notice of Availability of Draft Versatile Test Reactor Environmental Impact Statement

AGENCY: Office of Nuclear Energy, Department of Energy.

ACTION: Notice of availability and public hearings.

SUMMARY: The U.S. Department of Energy (DOE) announces the availability of the *Draft Versatile Test Reactor Environmental Impact Statement* (VTR EIS) (DOE/EIS-0542). DOE is also announcing a public comment period and public hearings to receive comments on the Draft VTR EIS. DOE prepared the Draft VTR EIS to evaluate the potential environmental impacts of alternatives for constructing and operating a versatile test reactor (VTR), and the associated facilities for post-irradiation examination of test and experimental fuels and materials. The Draft VTR EIS also evaluates the potential environmental impacts of options for VTR driver fuel (the fuel that powers the reactor) fabrication and the management of spent nuclear fuel from the VTR.

DATES: Comments will be accepted during the comment period that will extend for 45 days after the date that the U.S. Environmental Protection Agency publishes its Notice of Availability in the *Federal Register* (expected to be December 31, 2020). DOE plans to hold two public hearings on the Draft VTR EIS. In light of ongoing public health concerns, DOE will host internet-based, virtual public hearings in place of in-person hearings. The dates of the hearing will be provided in a future notice posted on the following website: *https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor*. DOE will hold the hearings no earlier than 15 days from the posting of the notice.

ADDRESSES: DOE invites Federal and state agencies, state and local governments, Native American tribes, industry, other organizations, and members of the public to review and submit comments on the Draft VTR EIS. Written comments on the Draft VTR EIS should be sent to Mr. James Lovejoy, Document Manager, by mail at: U.S. Department of Energy, Idaho

Operations Office, 1955 Fremont Avenue, MS 1235, Idaho Falls, Idaho 83415; or by e-mail to *VTR.EIS@nuclear.energy.gov*. The Draft VTR EIS is available for viewing or download at *https://www.energy.gov/nepa* or *https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor*.

FOR FURTHER INFORMATION CONTACT: For information regarding the VTR Project or the Draft VTR EIS, *visit https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor;* or contact Mr. James Lovejoy at the mailing address listed in **ADDRESSESS**; or via email at *VTR.EIS@nuclear.energy.gov;* or call (208) 526-6805. For general information on DOE's NEPA process, contact Mr. Jason Sturm at the mailing address listed in **ADDRESSES;** or via email at *VTR.EIS@nuclear.energy.gov;* or call (208) 526-6805.

SUPPLEMENTARY INFORMATION:

Background

Part of the DOE mission is to ensure America's security and prosperity by addressing its energy, environmental and nuclear challenges through transformative science and technology solutions. Many commercial organizations and universities are pursuing advanced nuclear energy fuels, materials, and reactor designs that complement the efforts of DOE and its laboratories in advancing nuclear energy. These designs include thermal and fast-spectrum[1] reactors targeting improved fuel resource utilization and waste management, and utilizing materials other than water for cooling. Their development requires an adequate infrastructure for experimentation, testing, design evolution, and component qualification. Existing irradiation test capabilities are aging, and some are over 50 years old. The existing capabilities are focused on testing of materials, fuels, and components in the thermal neutron spectrum and do not have the ability to

[1] Fast neutrons are highly energetic neutrons (ranging from 0.1 to 10 million electron volts [MeV] and travelling at speeds of thousands to tens of thousands kilometers per second) emitted during fission. The fast-neutron spectrum refers to the range of energies associated with fast neutrons. By contrast, thermal neutrons, such as those typically associated in a commercial light-water reactor, are neutrons that are less energetic than fast neutrons (more than a million times less energetic [about 0.25eV] and travelling at speeds of less than 5 kilometers per second), having been slowed by collisions with other materials such as water. The thermal neutron spectrum refers to the range of energies associated with thermal neutrons.

support the testing needs for fast reactors. Only limited fast-neutron-spectrum-testing capabilities, with restricted availability, exist outside the United States. To meet its obligation to support advanced reactor technology development, DOE needs to develop the capability for large-scale testing, accelerated testing, and qualification of advanced nuclear fuels, materials, instrumentation and sensors. This testing capability is essential for the United States to modernize its nuclear energy infrastructure and for developing transformational nuclear energy technologies that re-establish the U.S. as a world leader in nuclear technology commercialization.

Recognizing that the United States does not have a dedicated fast-neutron-spectrum testing capability, DOE performed a mission needs assessment to assess current testing capabilities (domestic and foreign) against the required testing capabilities to support the development of advanced nuclear technologies. This needs assessment was consistent with the Nuclear Energy Innovation Capabilities Act (NEICA) (Pub. L. 115-248) passed in 2018, which directed DOE to assess the mission need for, and cost of, a versatile reactor-based fast-neutron source with a high neutron flux, irradiation flexibility, multiple experimental environment (e.g., coolant) capabilities, and volume for many concurrent users. The needs assessment identified a gap between required testing needs and existing capabilities. That is, there currently is an inability to effectively test advanced nuclear fuels and materials in a fast-neutron spectrum irradiation environment at high neutron fluxes. Specifically, the DOE Office of Nuclear Energy (NE), Nuclear Energy Advisory Committee (NEAC) report, Assessment of Missions and Requirements for a New U.S. Test Reactor, confirmed that there was a need in the U.S. for fast-neutron testing capabilities, but that there is no facility that is readily available domestically or internationally. The NEAC study confirmed the conclusions of an earlier study, the Advanced Demonstration and Test Reactor Options Study. That study established the strategic objective that DOE "provide an irradiation test reactor to support development and qualification of fuels, materials, and other important components/items (e.g., control rods, instrumentation) of both thermal and fast neutron-based advanced reactor systems."

Following establishment of the mission need described above, the VTR Project was formally launched in February 2019 as a part of the effort called for by Congress to modernize the nuclear energy research and development user facility infrastructure in the United States.

Alternatives

In addition to a No Action Alternative, the Draft VTR EIS evaluates potential environmental impacts of alternatives for constructing and operating a VTR. Under the action alternatives, the VTR would be a small (approximately 300 megawatt thermal) sodium-cooled, pool-type, metal-fueled reactor. DOE has completed a conceptual design of a fast-neutron-spectrum reactor based on the Power Reactor Innovative Small Module (PRISM) design from GE-Hitachi. In addition to constructing and operating the VTR, the action alternatives include the activities necessary to perform post-irradiation examination of test specimens and for the management of driver fuel from the VTR. After irradiation in the VTR, test specimens/experimental cartridges would be transferred to post-irradiation examination facilities where they would be disassembled so that the specimens can undergo detailed evaluation. To the extent practical, DOE would make use of existing facilities to perform post-irradiation examination. Spent driver fuel would be removed from the VTR each year over its 60-year operating life. The fuel would be treated (to remove sodium that is used as a bonding material in fabrication of the fuel) and packaged in containers that are ready for transport to an offsite storage facility or repository. Pending shipment offsite, the packaged spent fuel would be stored at a facility provided by the VTR project. These activities would be part of each action alternative. The alternatives evaluated include establishing the VTR and support activities at Idaho National Laboratory (INL) or Oak Ridge National Laboratory (ORNL).

Idaho National Laboratory Versatile Test Reactor Alternative

Under the INL VTR Alternative, DOE would site the VTR adjacent to the Materials and Fuels Complex (MFC) at INL and use existing hot cell and other facilities at the MFC for post-irradiation examination. The MFC is the location of the Hot Fuel Examination Facility (HFEF), the Irradiated Materials Characterization Laboratory (IMCL), the Experimental Fuels Facility (EFF), and other laboratory facilities. Spent driver fuel would be treated at the Fuel Conditioning Facility (FCF) and stored at a facility constructed as part of the VTR project.

Oak Ridge National Laboratory Versatile Test Reactor Alternative

Under the ORNL VTR Alternative, the VTR would be sited at ORNL at a location about three quarters of a mile northeast of the High Flux Isotope Reactor. In addition to constructing the VTR and a facility to store spent driver fuel, DOE would also construct a new hot cell facility at this location. The hot cell facility would include capability and capacity for the initial post-irradiation disassembly and examination of test specimens and for the treatment of spent VTR driver fuel. Several existing facilities at ORNL would be used to provide additional post-irradiation examination capabilities. Hot cells in the Irradiated Fuels Examination Laboratory and the Irradiated Materials Examination and Testing Facility would augment the capabilities in the new hot cell facility. In addition, the Low Activation Materials Design and Analysis Laboratory would be used for testing low-dose samples that do not require the use of hot cells.

Reactor Fuel Production

The driver fuel for the VTR would be a metal alloy composed of uranium, plutonium, and zirconium. Activities to produce reactor fuel may include feedstock preparation and well as fuel fabrication. The Draft VTR EIS evaluates the potential environmental impacts of the feedstock preparation activities that would be used to remove contaminants from the plutonium (called polishing) and to convert plutonium oxides to metal that can be used in fuel fabrication. The fabrication steps include creating the alloy; casting the alloy to create fuel slugs; fabricating fuel pins, including establishing a sodium bond between the fuel slugs and the encasing tube; and assembling the tube bundles that would be placed in the reactor. DOE evaluates two options for each phase of reactor fuel production. The feedstock preparation could be performed at either INL or the Savanah River Site (SRS). Similarly, fuel fabrication activities could be performed at INL or SRS.

Under the options to perform feedstock preparation and fuel fabrication at INL, new and existing gloveboxes and equipment would be used in the Fuel Manufacturing Facility and the building that previously housed the Zero Power Physics Reactor. Under the options to perform feedstock preparation and fuel fabrication at SRS, new gloveboxes and equipment would be installed in a building that previously housed one of the SRS production reactors.

Preferred Alternative

DOE's Preferred Alternative is the INL VTR Alternative. DOE would build and operate the VTR at the INL Site adjacent to the existing MFC. Existing facilities within the MFC would be used for post-irradiation examination of test specimens. Post-irradiation examination would be performed in HFEF, IMCL, and other MFC facilities. Spent nuclear fuel (spent VTR driver fuel) would be treated to remove the sodium-bonded material at FCF (modifications to FCF may be required). The intent of this treatment is to condition and transform the spent nuclear fuel into a form that would meet the acceptance criteria for a future permanent repository. This treated fuel would be temporarily stored at a new VTR spent fuel pad at MFC.

DOE has no preferred options at this time for where it would perform driver fuel production (i.e., feedstock preparation and driver fuel fabrication) for the VTR. DOE evaluated options for both processes at the INL Site and at SRS. DOE could choose to use either site or a combination of both sites to implement either option. DOE will state its preferred options for feedstock preparation and driver fuel fabrication in the Final VTR EIS, if preferred options are identified before issuance.

Webcast Public Hearings

DOE will host two interactive webcast public hearings during the public comment period. During the webcast public hearings, DOE will give a brief presentation on the Draft VTR EIS, followed by a period during which DOE will accept oral comments on the Draft VTR EIS. The comments will be transcribed. There will also be a phone line available to allow people who do not have an internet connection the opportunity to participate. Note that those desiring to provide oral comments will need to call in on the phone line. Written comments on the Draft VTR EIS may also be submitted during the public comment period as indicated under **ADDRESSES**. All comments, whether oral or written, will be considered by DOE as the VTR EIS is finalized. DOE will post information regarding the public hearings on the VTR Draft EIS website at *https://www.energy.gov/ne/nuclear-reactor-technologies/versatile-test-reactor*. The hearings will also be announced in newspapers near INL, ORNL, and SRS.

Signing Authority

This document of the Department of Energy was signed on December 15, 2020, by Robert Boston, DOE Idaho Operations Office Manager, Office of Nuclear Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on December 15, 2020.

Treena V. Garrett,

Federal Register Liaison Officer,

U.S. Department of Energy.

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