Appendix G
Scoping Comment Summary

APPENDIX G
SCOPING COMMENT SUMMARY

On August 5, 2019, the U.S. Department of Energy (DOE) published a Notice of Intent (NOI) in the *Federal Register* (84 FR 38021) to prepare a *Versatile Test Reactor Environmental Impact Statement* (VTR EIS) to evaluate the potential environmental impacts of constructing and operating a VTR capability. Publication of the NOI initiated a 30-day public scoping period.

During the scoping period, DOE received 45 comment documents[1] in which 173 comments[2] were identified. DOE reviewed the individual comments and those providing similar input were grouped together and treated as a single comment, concern, or issue. Analysis of written and oral public comments provided during the scoping period helped DOE further identify concerns and potential issues considered in the Draft VTR EIS. The scoping comments and DOE's resolutions are summarized below.

This scoping comment summary reflects DOE's resolution of scoping comments at a particular time, that is, as the Draft EIS was developed following the scoping period. As additional information becomes available and as DOE considers and responds to comments received about the Draft EIS, the resolutions presented in this appendix may continue to evolve. Nonetheless, it is DOE's intent that this appendix reflects the resolution of the scoping comments at the time the Draft EIS was prepared; it will not be updated.

National Environmental Policy Act (NEPA) Process

Comment Summary: One commenter stated that the VTR project is a broad-scope program and is not well defined; thus DOE should first conduct a Programmatic EIS, followed by tiered, site-wide EISs. The NOI is vague about the source of the plutonium needed to support VTR operation, the quantity of which could be dozens of metric tons over its lifetime. The range of environmental, safety, health, security, and cost impacts will differ greatly, depending on what source is used. The options need to be described in detail before a project-level assessment can be conducted.

Another commenter suggested that the scope of the VTR EIS should be limited given that the environmental impacts of Idaho National Laboratory (INL) operations have been described and fully documented for decades. The commenter believes the VTR EIS should rely on the extensive environmental analysis that is available for nuclear activities, including reactor operations at the INL Site, rather than conducting new, environmental analyses. Another commenter stated that NEPA requires all related projects and impacts be included in the VTR EIS.

DOE Response: DOE determined that a Programmatic EIS is not required. The VTR EIS was prepared in accordance with applicable Council on Environmental Quality and DOE NEPA regulations. Chapter 4 of this VTR EIS describes and analyzes the environmental impacts of options for location of the reactor fuel production capability, the VTR, the post-irradiation examination capability, and spent fuel storage. As discussed in Chapter 2, this EIS considers different sources of plutonium (domestic and foreign) for the reactor driver fuel and evaluates the appropriate corresponding environmental impacts. Chapter 2 also describes alternatives that were considered and dismissed from further analysis.

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[1] A comment document is a communication in the form of a letter, an electronic communication (email), a transcription of a recorded phone message, or an individual's comments in the transcript from a public meeting that contains comments from a sovereign nation, government agency, organization, or member of the public regarding the VTR EIS.

[2] A comment is a statement or question regarding the EIS content that conveys approval or disapproval of proposed actions, recommends changes, or seeks additional information.

The full suite of applicable impact analyses was included in the VTR EIS. Where applicable, the VTR EIS incorporates existing NEPA documentation by reference and refers to existing NEPA documents and other studies and reports for more detailed information.

Comment Summary: The National Park Service (NPS) requested to be a cooperating agency for this VTR EIS because there are areas under NPS jurisdiction within the area of potential effect. Potential impacts and mitigations for these resources need to be fully addressed in the VTR EIS.

DOE Response: As described in Chapter 2, under the Oak Ridge National Laboratory (ORNL) VTR Alternative, DOE would locate the VTR and associated facilities at the Melton Valley Site. The Melton Valley Site is over 4 miles away from the Y-12 National Security Complex (Y-12) where Building 9731, Pilot Plant (9731), and Building 9204-3 (Beta-3) are located, and over 1 mile from the Graphite Reactor at ORNL. Under the INL VTR Alternative, DOE would locate the VTR and associated facilities at the Materials and Fuels Complex (MFC) at the INL Site. The MFC is about 45 miles from the Craters of the Moon National Monument and Preserve. Therefore, it is unlikely that construction and operation of the VTR and associated facilities would have an impact on NPS administered locations. Environmental consequences, including impacts on cultural resources, aesthetics, noise and wildlife, and any needed mitigation measures, are described in the VTR EIS.

Comment Summary: Commenters requested that all documents cited in the Draft VTR EIS be publicly available.

DOE Response: To the extent practical, reference documents are available in the public reading rooms as announced in the Notice of Availability (NOA) for the Draft VTR EIS and on the project website. Certain copyrighted materials and sensitive information that could not be provided publicly may be available for review through coordination with the point of contact identified in the NOA.

Public Outreach

Comment Summary: Commenters asked if public scoping meetings would be held in addition to the webcasts. The commenters also stated there was not enough time for the public scoping comment period.

DOE Response: There were no scoping meetings in addition to the two webcast public scoping meetings (August 27 and 28, 2019). For those individuals who could not attend one of the scoping meetings, DOE provided other methods for submitting comments: (1) a link to "regulations.gov"; (2) email; (3) a toll-free phone line; and (4) the U.S. mail. The four presentations made by DOE during the webcast scoping meetings were available on the DOE project website after the scoping meetings through the end of the public scoping period. The length of the scoping period was in accordance with NEPA regulations. In addition, as required by NEPA regulations, a public comment period is planned for review of the Draft VTR EIS. The NOA describes the locations and dates of public hearings on the Draft VTR EIS.

Purpose and Need

Comment Summary: Commenters stated that a VTR is important for the United States to allow for crucial advanced technology and materials testing under fast-spectrum irradiation in order to help design the reactors of the future.

DOE Response: Comment noted.

Comment Summary: Commenters stated that the DOE mission-need statement fails to make the case that the VTR is needed. Commenters stated there are ways to simulate the range of neutron flux typical of a fast reactor in already existing test reactors. The mission-need statement also claims that reactor developers need a facility that can achieve at least 30 displacements per atom per year, although the reference it cites, a 2017 user needs assessment, only calls for a minimum of 20.

DOE Response: A VTR would foster experiments with much higher neutron energy and flux compared to the 35-plus research reactors currently operating at U.S. universities and national laboratories. Creating a fast neutron test environment is essential to the development of the next generation of reactor designs, many of which rely on fast neutrons to create the sustained chain reaction that generates heat.

These advanced technologies are very different from those in the existing commercial fleet of nuclear reactors operating in the United States that use thermal or slow neutrons to create a chain reaction to produce the heat to make electricity. The high neutron flux of a VTR would also be capable of accelerated materials testing to support thermal reactor needs.

Today, there is no fast-spectrum irradiation capability in the United States to support the advanced reactor research and development occurring at national laboratories and in the private sector. Without it, the United States will not be able to regain and sustain its leadership role in the development of the next generation of nuclear power reactors. Many developing countries are investing in nuclear power plants to help provide low-carbon, reliable electricity to their citizens. U.S. technology leadership in the area of advanced reactors is critically important from both economics (market share) and national security perspectives.

DOE's Nuclear Energy Advisory Committee (NEAC)[3] studied the issue and released a report in February 2017, recommending, *"*that DOE-NE proceed immediately with preconceptual design planning activities to support a new test reactor.*"* Multiple advanced reactor developers, including TerraPower, LLC, Westinghouse Electric Company, and Oklo Inc., submitted letters in support of the NEAC report. It was noted that the rate of approximately 6 displacements per atom per year possible at the best current experiment location, is too low to attain damage doses exceeding 100 displacements per atom[4] in a reasonable irradiation time.

In addition to the NEAC report, researchers from INL, Argonne National Laboratory and ORNL interviewed multiple domestic reactor vendors in 2016 to assess overall industry test reactor needs, including General Atomics, TerraPower, and Westinghouse. The report, *Versatile Irradiation Test Reactor User Needs Assessment* (referred to by the commenter) issued in January 2017, states that, *"*all survey responders indicated they would utilize irradiation services that a fast-spectrum reactor can provide with rapid accumulation of displacements per atom under prototypical conditions for qualification of fuel, qualification of fuel manufacturing processes, extension of the useful lifetime of cladding and structural materials under irradiation, study of corrosion behavior of materials and advanced coatings under irradiation, and demonstration of fuel performance.*"* As the commenter noted, 20 displacements per atom per year was the <u>minimum</u> identified in the user survey (i.e., greater than 20 displacements per atom per year would be highly desirable). DOE determined that a higher rate (e.g., 30 displacements per atom per year, or 50 percent better than the minimum) was desirable and would be achievable in the VTR.

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[3] NEAC was established in 1998 to provide independent advice to DOE's Office of Nuclear Energy on complex science and technical issues that arise in the planning, managing, and implementing of the Federal nuclear energy program. Committee members include representatives from universities, industry, foreign nations, and national laboratories.

[4] Note that for many of the advanced reactor designs, 100 or greater displacements per atom is typically the desired damage resistance value for advanced structural materials evaluation.

Nonproliferation

Comment Summary: One commenter stated that DOE should conduct a nonproliferation and security impacts assessment for the VTR program that addresses the VTR and its entire fuel cycle. The effectiveness of material accountancy and control measures at all associated fuel cycle facilities should be realistically analyzed with regard to the potential for theft and diversion of weapon-usable materials.

DOE Response: The VTR and support facilities would meet all laws, regulations, and requirements for material accountability and security, including measures to deter the potential for theft and diversion of weapons-usable materials. A nonproliferation and security impacts assessment is outside the scope of the VTR EIS.

Alternatives

Comment Summary: Commenters requested that the No Action Alternative be analyzed in detail. They also requested DOE consider the use of existing facilities, in particular, the use of the Advanced Test Reactor (ATR) or the High Flux Isotope Reactor (HFIR) to generate an adequate flux of fast neutrons. Other commenters stated that DOE should not consider the "No Use Alternative" (understood to mean the No Action Alternative).

DOE Response: This VTR EIS includes a No Action Alternative (described in Chapter 2 and considered and discussed in Chapter 4) as required by NEPA regulations. Existing test reactors, like ATR at the INL Site and HFIR at ORNL, are thermal neutron reactors. Modifications can be made to simulate fast neutron conditions and limited boosting of fast neutron fluxes in thermal reactors, but irradiation conditions (in terms of neutron flux and energy spectrum) are not sufficient to create data required for a formal fuels and materials development and qualification program for fast reactor designs. In order for new improved materials and fuels to be qualified, they would need to be tested under prototypic conditions. The existence and capabilities of these reactors were taken into consideration by the NEAC, which noted that although existing U.S. operational facilities "provide significant capability for testing fuels and materials in a thermal neutron spectrum, they provide only a very limited capacity for testing in a fast neutron spectrum." The absence of fast-neutron-spectrum testing capability was a key factor in DOE's decision to propose the VTR.

Comment Summary: Commenters stated that the NOI does not provide any indication as to why the INL Site and ORNL were the only reasonable alternative sites for the VTR. A commenter inquired if there is any possibility of the VTR being located at the Savannah River Site (SRS). They also asked what role the Savannah River National Laboratory (SRNL) could have in VTR reactor and/or fuel development. Another commenter suggested that non-DOE sites must also be considered, such as areas in New Mexico.

DOE Response: Through its internal scoping, DOE identified the INL Site and the Oak Ridge Reservation near ORNL as potential sites for the VTR based on such factors as existing supporting facilities (for post-irradiation examination), security requirements, experience, and work force. Alternatives considered and dismissed from detailed analysis are described in Chapter 2 of this EIS. SRS has been identified as a potential location for VTR reactor fuel production. SRNL is among the DOE national laboratories collaborating on the development of the VTR.

Comment Summary: A commenter stated that the VTR EIS should evaluate both thermal and fast reactor options. Another commenter stated that it would make more sense to build a new thermal neutron test reactor with the capability of generating fast neutrons, not the other way around.

DOE Response: DOE considered both thermal and fast reactor options. Modifications can be made to simulate fast neutron conditions and limited boosting of fast neutron fluxes in thermal reactors, but irradiation conditions (in terms of neutron flux and energy spectrum) are not sufficient to create data required for a formal fuels and materials development and qualification program for fast reactor designs. Therefore, the use of thermal reactors was considered and dismissed from detailed analysis.

Comment Summary: One commenter suggested the VTR EIS include an alternative for a lead-cooled fast reactor (LFR).

DOE Response: Other fast reactor designs, including restart of Fast Flux Test Facility (FFTF) and molten salt fast reactors, were included in the Analysis of Alternatives studies that led DOE to propose use of a sodium-cooled fast reactor technology-based VTR to meet the DOE mission needs. The sodium-cooled fast reactor concept for the VTR was chosen over other concepts because of the maturity of its technology. The VTR includes the flexibility (thus, the "versatile" in its name) to test materials and concepts for reactors besides sodium-cooled reactors. The VTR test capabilities include cartridge (closed) loops that would contain fuels or test materials isolated from the primary coolant and would be able to perform tests on different coolant types that include sodium, gas, molten salt, lead, and lead-bismuth eutectic. DOE plans to partner with universities and industry partners to develop a full range of test capabilities that include testing other fast reactor options. The other types of reactors considered by DOE are discussed in Chapter 2 of this EIS.

Comment Summary: Commenters stated that all the requirements for a new test reactor would be met by restarting FFTF at the DOE Hanford Site.

DOE Response: Construction of FFTF was completed in 1978, over 40 years ago, and FFTF operated successfully from 1982 to 1992. In a January 26, 2001 Record of Decision (ROD) (66 FR 7877), DOE decided to permanently deactivate FFTF. In a December 13, 2013 (78 FR 75913) ROD, DOE decided to decommission, dismantle, and entomb FFTF. The sodium coolant was drained from the FFTF reactor, although little additional progress on decommissioning has been made due to budget constraints and priorities. Restarting FFTF was considered, and included a walkdown of the facility by the VTR Project team and several former FFTF engineers and managers. FFTF was dismissed from detailed analysis, in part because FFTF had operated for 10 of its projected 20-year design life, and due to the technical uncertainty associated with a reactor and associated systems that have not operated in over 25 years (see Chapter 2).

Comment Summary: One commenter stated the VTR EIS must evaluate a reasonable range of reactor sizes because environmental impacts could be significantly different based on this fundamental issue. An amended NOI must be prepared and scoping extended so the public can provide input on the reactor size alternatives.

DOE Response: As described in the NOI, the initial evaluation of alternatives during the pre-conceptual design planning activity recommended the development of a sodium-cooled, fast neutron spectrum test reactor in the 300 megawatt thermal power level range. This design would provide a flexible environment for known and anticipated testing. The evaluation of alternatives in this VTR EIS is consistent with the conclusions of the test reactor options study (INL 2017) and the NEAC's February 2017 (NEAC 2017) recommendation.

Support and Opposition

Comment Summary: Some commenters expressed support and others expressed opposition to various aspects of the VTR project. Some commenters expressed support for the VTR to be located at the INL Site and others supported ORNL. Some commenters supported the No Action Alternative and strongly opposed locating the VTR at the INL Site.

DOE Response: As discussed in Chapter 2, DOE evaluated alternative locations for the VTR, including the INL Site and the Oak Ridge Reservation (near ORNL). In addition, this EIS includes consideration of a No Action Alternative. DOE intends to proceed with the NEPA process, consider all viable alternatives objectively, and announce its decision regarding a new VTR in a ROD issued no sooner than 30 days after the Final EIS is issued.

Technology

Comment Summary: One commenter stated that the VTR EIS should consider not only metal but also oxide and nitride fuels. New accident-tolerant fuels that can increase electricity output and have no chance of contributing to a design-basis, loss-of-coolant accident need to be fully supported in order to keep our existing commercial reactor fleet operational. Another commenter asked that DOE consider loop-type reactor designs.

DOE Response: Metallic fuel is planned for initial operation of VTR. Future operations could include other fuel forms and isotopic compositions. Operation of VTR with different fuel forms and compositions may require additional NEPA documentation.

DOE has considered both pool- and loop-type reactors. For a test reactor, pool-type designs offer several advantages over loop-type designs:

- Generally a smaller reactor for the same power level (better use of space);
- A simplified coolant boundary operating at low pressure (eliminates potential leak paths);
- Large thermal inertia (more tolerant of coolant transients);
- Improved ability to use passive, natural-circulation heat removal systems (better safety and more efficient); and
- Opportunity to store spent fuel in the primary vessel (improved safety).

DOE proposes to use the GE Hitachi PRISM reactor, a pool-type reactor, as the basis for VTR's design: that design will require several modifications, notably the elimination of electricity production and the accommodation for experimental locations within the core. Utilization of a well-developed reactor design that has undergone substantial review, including by the U.S. Nuclear Regulatory Commission (NRC) (NRC 1994), presents major advantages both in terms of technology readiness and the time required for detailed reactor development and implementation.

Comment Summary: A commenter asked under what conditions the VTR could be operated as a breeder reactor. They also inquired about how spent nuclear fuel (SNF) would be reprocessed, and if the SNF were not to be reprocessed, what methods of "conditioning the SNF for disposal" would be used, and where would it be disposed.

DOE Response: As indicated in the NOI and as stated in this VTR EIS (Chapters 1 and 2), there are no plans to operate VTR as a breeder reactor or reprocess SNF. The SNF would be treated to remove the sodium and safely stored on site until a repository becomes available.

Comment Summary: A commenter stated that DOE should consider how to use the energy produced by the reactor for additional research.

DOE Response: The VTR is proposed as a test reactor to provide a fast-neutron-spectrum testing capability to test advanced nuclear fuels and materials, including those for next-generation nuclear reactors. Making use of the energy produced is beyond VTR's current scope and purpose.

Reactor Driver Fuel and Control Rods

Comment Summary: Commenters expressed concerns regarding the lack of information about the VTR fuel. They asked if there is a difference between "start-up fuel" and fuel used for post start-up operation. They stated that the VTR EIS must include details of VTR fuel, including if it is to be made from reactor-grade plutonium, surplus weapons-usable plutonium, Zero Power Physics Reactor (ZPPR) fuel, high-assay low-enriched uranium (HALEU), thorium, or other materials. Where would the materials come from? Would U-233 be separated from irradiated fuel?

DOE Response: Metallic uranium-plutonium-zirconium driver fuel is planned for initial operation of VTR. DOE continues to evaluate the source of the plutonium to be used in driver fuel fabrication, which could include ZPPR fuel, reactor-grade plutonium, and surplus weapons-usable plutonium. The known potential fuel forms and compositions are described in this VTR EIS as is the potential plutonium transport from domestic locations. While HALEU may be used as a possible future driver fuel, DOE would use existing stores of enriched uranium as a source for this material. Future operations could include other fuel forms and isotopic compositions. Operation of VTR with different fuel forms and compositions may require additional NEPA analysis.

Comment Summary: Commenters expressed concerns regarding the lack of information about where the VTR fuel would be manufactured and noted that environmental impacts associated with fuel production and fabrication must be discussed. One commenter stated that the NOI mentions that the INL Site and SRS are where the reactor fuel could be fabricated. What facilities at the INL Site would be used? Can existing facilities at SRS, including the abandoned Mixed Oxide (MOX) Fuel Fabrication Facility, be used for fuel fabrication? If DOE is considering new facilities at SRS, would they be located in the K Area or elsewhere? Would the aging H-Canyon at SRS be considered for HALEU production, and if so, what are the associated risks and waste streams, and how would they be managed? If new facilities would be needed, please give details, including cost and construction and operation schedules. A commenter stated that an amended NOI must be prepared and scoping extended so the public can provide input on fuel fabrication alternatives in the VTR EIS.

DOE Response: The facilities that could be used for reactor fuel production are described in this VTR EIS in Chapter 2 and Appendix B. Reactor fuel production operations would be established in existing facilities/structures; new buildings would not be constructed. The impacts of modification and operation of these facilities are evaluated in this VTR EIS. SRS is being considered because it has a long history of fuel fabrication, has some of the feed materials onsite, and has facilities and personnel that can safely handle the materials. Because the National Nuclear Security Administration has another mission planned for the MOX Fuel Fabrication Facility, it is not considered a reasonable location for VTR reactor fuel production. The VTR EIS does not evaluate newly proposed means of producing HALEU, such as processing in H-Canyon.

Comment Summary: Commenters questioned how many staff would be employed for fuel fabrication and how the staff would be trained. How this expertise would be developed must be discussed in the VTR EIS.

DOE Response: This VTR EIS includes an estimate of staff needed to construct and operate each capability, including reactor fuel production. Whereas prior site experience and a knowledgeable and experienced workforce are factors considered in identifying reasonable alternatives and ultimately in making a decision on a location for the VTR, staff hiring, development, and training are administrative aspects of the activity that are outside the scope of the environmental impacts evaluated in the VTR EIS.

Comment Summary: A commenter was concerned that DOE asserted that the fabrication process for metal fuel is relatively simple. The commenter believed it should be compared to the major and costly effort that would be required for the dilute-and-dispose plutonium disposition program at SRS, which is arguably a far simpler process that also relies on existing facilities. Also, uranium-plutonium-zirconium fuel fabrication scale-up from EBR-II to VTR fuel dimensions and production rates must be demonstrated to reduce uncertainties.

DOE Response: This VTR EIS describes the VTR reactor fuel production process in Appendix B and evaluates the potential environmental impacts in Chapter 4. As indicated in the NOI, reactor fuel production at the INL Site or SRS are options evaluated in this EIS. As necessary to support deployment of the reactor fuel production process and to manage uncertainties, DOE would conduct proof-of-principal testing, demonstration, and scale-up activities. The dilute-and-dispose capability for surplus plutonium has a different end point and would not result in the production of reactor fuel.

Comment Summary: One commenter asked what type of control rods would be used and where they would be fabricated.

DOE Response: The preliminary design anticipates using clad boron-carbide absorber rods. DOE expects to be able to purchase control rods from a vendor as a commercial item, and as such, they do not require analysis in the EIS.

Spent Fuel Management and Disposition

Comment Summary: A commenter stated that no decisions have occurred regarding long-term SNF management and asked if the sites under consideration for this project would be capable of managing SNF long into the future. Another commenter requested the VTR EIS evaluate the impacts of managing the additional inventory of SNF on the ongoing sodium-bonded SNF pyroprocessing program at INL.

DOE Response: This VTR EIS addresses the environmental impacts associated with the treatment and temporary storage of the VTR SNF under all alternatives. This assessment includes the impacts associated with operation of existing facilities and the impacts associated with construction and operation of any new facilities. The SNF assemblies would be stored within the VTR reactor vessel until decay heat generation is reduced to a level allowing fuel transfer and treatment. When the decay heat reaches manageable levels, the SNF would be transferred to a fuel treatment facility (at the INL Site, it would be the Fuel Conditioning Facility), where the SNF would be treated using a simple melt-distill process. Use of this process would require the installation of a new distillation furnace. The intent is to prepare the VTR SNF for ultimate disposal only, the more complex electrometallurgical treatment used for EBR-II fuel (which recovers HALEU) is not required or planned. Because the treatment of VTR SNF would not utilize the same process/equipment used for EBR-II SNF, there should be no impact on that program. Following treatment, the SNF would be placed in dry storage casks and stored until shipment to a permanent repository. Dry cask storage of SNF until another facility (storage or disposal) becomes available could be accomplished at the sites considered for the VTR.

Comment Summary: Commenters requested the development of a permanent Federal repository for high-level radioactive waste (HLW), and stated that continuing to point to Yucca Mountain as the disposal solution is unacceptable. Commenters stated that safe permanent storage of the existing waste inventories should be the highest priority, and that DOE should evaluate the impact of orphaned HLW. A commenter requested an analysis of disposal of the SNF that the VTR would generate, and that all reasonable SNF disposition alternatives, including direct disposal, be evaluated.

DOE Response: The program for a geologic repository for SNF and HLW at Yucca Mountain, Nevada has been terminated. Notwithstanding the decision to terminate the Yucca Mountain Nuclear Waste Repository Program, DOE remains committed to meeting its obligations to manage and, ultimately, dispose of SNF and HLW. However, this commitment is beyond the scope of the VTR EIS. Existing SNF inventories are safely stored on site at operating and shut down nuclear facilities. The VTR SNF would be processed to remove sodium and stored on site until a consolidated storage facility or repository becomes available. The disposal of VTR SNF would be analyzed in the supplementary NEPA documentation prepared for the repository.

Comment Summary: A commenter stated the best way to dispose of SNF is to use it in generating new fuel in a fast breeder reactor, or to recycle it. One commenter questioned whether the VTR would be used to help develop reprocessing techniques.

DOE Response: If SNF is reprocessed and material recovered to send back to the reactor as nuclear fuel, it is referred to as a closed fuel cycle. If the fuel is used "once through" and not reprocessed, it is referred to as an open fuel cycle. VTR would not be operated as a breeder reactor and there are no plans to reprocess and/or "recycle" the VTR fuel in a closed fuel cycle. VTR will be operated with a "once through" fuel cycle and no reprocessing to recover and reuse uranium or plutonium would occur. VTR is being designed for the purpose of performing fuels and materials irradiation experiments that could yield information supporting evaluations of closed fuel cycles.

Environmental Impacts

Commenter Summary: One commenter believes that the project's potential effects on archaeological resources will need to be addressed through consultation with the State Historic Preservation Office and the Section 106 compliance process. One commenter stated that the VTR EIS needs to address visitor access to Manhattan Project National Historical Park facilities, including Building 9731, Pilot Plant (9731), and Building 9204-3 (Beta-3). Building 9731 is being considered for listing on the National Register of Historic Places. Building 9204-3 is currently inaccessible by park visitors due to significant mitigation and maintenance needs, as well as its location within a high security area.

DOE Response: The VTR EIS analyzes potential impacts on cultural resources, including archaeological and historic resources. Consistent with the National Historic Preservation Act and established relationships between DOE and the State Historic Preservation Offices, consultations would occur, as appropriate. It should be noted that the location being considered for the VTR near ORNL is not in the immediate vicinity of the two identified buildings, which are located over 4 miles away at Y-12.

Comment Summary: A commenter stated that the VTR EIS needs to address impacts on the night sky (dark sky), natural sounds, and wildlife at Craters of the Moon National Monument and Preserve.

DOE Response: Chapter 4 of this VTR EIS analyzes potential impacts on the night sky (aesthetics), natural sounds (noise), and wildlife (ecological resources). The VTR EIS also considers the impacts on nearby national parks and monuments within the region of influence (ROI).

Comment Summary: Commenters asked that the VTR EIS clearly describe the geology, depth to groundwater, direction of flow and speed of flow for the Snake River Plain Aquifer beneath the proposed facility and any storage site. They also recommend the VTR EIS include information on whether construction of the project would disturb a land area of one or more acres, contaminants of concern, impacted waters, and water bodies on the U.S. Environmental Protection Agency-approved 303(d) list that could be affected. Also included are how anti-degradation provisions of the Clean Water Act would be met, potential contamination of drinking water sources and measures that would be taken to protect drinking water, cumulative effects from this and other projects on hydrologic conditions, and whether specific permits would be needed.

DOE Response: Chapter 3 of this EIS describes water resources, and Chapter 4 analyzes potential impacts on surface and groundwater resources, including cumulative impacts, commensurate with the potential for impacts. This EIS also describes applicable environmental laws, regulations, permits, and agreements.

Comment Summary: One commenter stated the VTR EIS should describe the possible impact on the customs and culture for those living downstream of the VTR, and the impacts on habitat types, values, and functions associated with those waters.

DOE Response: This VTR EIS analyzes the potential for VTR and support facilities to impact downstream waters, as appropriate. Impacts on human health, ecological resources, and cultural practices are considered and any potential impacts identified in Chapter 4.

Comment Summary: A commenter stated that the VTR EIS should identify projected types and volumes of hazardous waste and expected management plans. Commenters recommended that the VTR EIS address potential direct, indirect, and cumulative impacts of both hazardous materials and wastes.

DOE Response: Chapter 4 of this VTR EIS identifies projected waste types (including radioactive and hazardous wastes) and their volumes. It also describes expected waste management processes (including storage and disposal). The VTR EIS addresses potential direct, indirect, and cumulative impacts of the management of hazardous materials and waste.

Comment Summary: One commenter recommended that the VTR EIS include the following items related to air quality impacts: a detailed discussion of ambient air conditions, data on emissions of criteria pollutants, pollutant data from mobile and stationary sources, an equipment emissions mitigation plan, health effects from air pollutants, and discussion of applicable Federal and State regulations. They also requested a discussion of mitigation measures to minimize impacts on air quality.

DOE Response: Chapter 3 of this VTR EIS describes existing ambient air quality within the applicable ROIs. Chapter 4 of this EIS analyzes potential impacts on air quality from mobile and stationary air emissions. Potential impacts from nonradiological air emissions are evaluated in relation to established regulatory standards. In addition, the potential health effects of radiological emissions are analyzed. The VTR EIS describes applicable environmental laws, regulations, permits, and agreements. Mitigation of impacts, if needed, is discussed.

Comment Summary: A commenter stated the proposed project may impact threatened, endangered, or candidate species listed under the Endangered Species Act (ESA), their habitats, as well as State-sensitive species. They recommend the VTR EIS identify potentially impacted species under ESA, and other sensitive species within the project area.

DOE Response: Potential impacts on ecological resources are analyzed in Chapter 4. The VTR EIS identifies threatened, endangered, candidate, and other sensitive species and their habitats within the ROI and evaluates potential impacts.

Comment Summary: One commenter requested the VTR EIS discuss the potential for seismic risk and approaches to evaluate, monitor, and manage this risk. This would include a seismic map, information on seismic design and construction standards and practices, and measures to avoid and mitigate the risks.

DOE Response: The VTR EIS includes a description of geology and soils, including seismicity and seismic risk. The human health effects from seismically induced accidents are discussed. Mitigation of impacts is discussed.

Comment Summary: A commenter recommended the VTR EIS include a discussion of reasonably foreseeable effects that changes in the climate may have on the proposed program. This could help inform the development of measures to improve the resilience of the program. If projected climate changes could notably exacerbate the environmental impacts of the program, commenters recommended these impacts be considered in the VTR EIS.

DOE Response: The VTR EIS considers climate change impacts in Chapter 4. The design and engineering of the VTR and support facilities considers operating under a range of extreme climate conditions.

Comment Summary: A commenter recommended the project be designed to include a mitigation monitoring program to ensure compliance with all mitigation measures and assess their effectiveness.

DOE Response: Mitigation of impacts is discussed. DOE would prepare a mitigation action plan (MAP) for any impacts requiring mitigation. The MAP would include mitigation monitoring.

Human Health and Safety

Comment Summary: Commenters stated that because radioactive materials may affect workers and the public, they recommend that the VTR EIS include information regarding hazardous materials releases, potential pathways of exposure, periods of exposure, and probable impacts from exposure. Commenters requested analysis of VTR emissions potential impacts on human health, including cancers; pulmonary, cardiovascular, and autoimmune diseases; and birth defects. The VTR EIS should also address whether radionuclide emissions would change substantially under any of the alternatives.

DOE Response: The potential impacts on human health of releases of radioactive materials from both routine emissions and accidents are evaluated in Chapter 4 of this VTR EIS. It includes information on facility emissions and potential pathways of exposure for workers and the public. The potential health effects of VTR emissions were analyzed using standard approaches for evaluation of the impacts of exposure to radiological materials. This EIS addresses emissions and associated health effects and compares them to identify substantial differences between the alternatives.

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

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

Accidents and Intentional Destructive Acts

Comment Summary: Commenters requested the VTR EIS consider the full range of accident scenarios that could result in large radiological releases, even if DOE considers the accidents incredible. Commenters requested the VTR EIS analyze core disassembly accidents and the risks of a sodium leak or sodium fire. They requested DOE fully evaluate the environmental impacts of these events. They recommend that the EIS describe measures that would be taken to ensure that the chances of an accident would be kept to a minimum and measures that would ensure that the workers would be protected. A commenter also requested that economic consequences be considered for severe reactor accidents.

DOE Response: In Chapter 4 and Appendix D, this VTR EIS describes and analyzes a suite of design-basis and beyond-design-basis accidents. The accident analysis for the EIS is based on the most current safety analysis contained in the safety basis documents, including the safety design report. The accidents consider applicable natural phenomena initiators, such as earthquakes, tornados, wildfires, flooding, volcanoes, and human initiators. Accident scenarios considered include core disassembly accidents and sodium leaks or fires. The EIS also analyzes the impacts of potential accidents on workers and public health and safety. A description of emergency response and post response cleanup in the event of an accident was included.

Comment Summary: One commenter stated that the VTR EIS should examine containment behavior and whether a leakage failure would lead to a catastrophic failure. They stated the behavior of the containment under elevated temperature and pressure, including the effect of aerosols within the containment atmosphere, has not been thoroughly investigated. They also mention that liner-anchorage-concrete interaction is significant in determining how liners tear in concrete containments.

DOE Response: The VTR is a pool-type test reactor that operates at relatively low pressures and is not subject to the types of accidents described by the commenter, which are typical of large light water reactors.

Comment Summary: Commenters stated the VTR and related facilities are subject to security breaches or terrorism from disgruntled employees, including cyber hacking. Commenters stated the VTR EIS must consider the full range of sabotage scenarios for the VTR that could result in radiological releases to the environment and the environmental impacts of the releases and must include an analysis of defenses against cyber-attacks.

DOE Response: The consequences of intentional destructive acts (IDAs) are described in the VTR EIS. The analysis of IDAs considers terrorism from disgruntled employees and cyber hacking. An analysis of physical or cyber vulnerabilities and defenses is a security function that would be performed independent of this EIS. Details of the IDA analysis are not available to the public for security reasons.

Environmental Justice and Native American Issues

Comment Summary: Commenters stated there should be coordination with Tribal Governments and communities, and recommended the VTR EIS describe the process and outcome of Government-to-Government consultation between DOE and each of the Tribal Governments and communities that could be affected by the project. A commenter also stated that the VTR EIS needs to address the potential for disproportionate adverse impacts on environmental justice populations near the VTR facilities.

DOE Response: DOE maintains Tribal outreach programs with the Native American Tribes surrounding applicable sites and routinely meets with interested Tribal Governments to discuss issues of mutual concern. In support of this VTR EIS, DOE will continue to hold discussions with Native American communities and Tribal governments.

The VTR EIS includes descriptions of minority and low-income populations near the candidate sites in Chapter 3. Consistent with environmental justice requirements, the potential for disproportionately high and adverse impacts on minority and/or low-income populations is addressed in Chapter 4.

Cumulative Impacts

Comment Summary: Commenters recommended the VTR EIS cumulative impact assessment consider the following: resources that are cumulatively impacted; appropriate geographic area and the time over which the effects have occurred and will occur; all past, present, and reasonably foreseeable future actions that have affected, are affecting, or would affect resources of concern, including those outside of DOE's jurisdiction; a benchmark or baseline; and scientifically defensible threshold levels.

DOE Response: This VTR EIS includes an analysis of cumulative impacts in Chapter 5, including the effects of the proposed action when added to other past, present, and reasonably foreseeable future projects in the ROI, including those outside of DOE’s jurisdiction.

Decontamination and Decommissioning

Comment Summary: Commenters requested the VTR EIS include discussion about ultimate decontamination and decommissioning of the facility after its useful life, including disposition of the fission products, SNF, and sodium coolant.

DOE Response: Chapter 4 of this VTR EIS includes a discussion of decontamination, decommissioning, and demolition of the VTR after its useful life.

Laws and Regulations

Comment Summary: Commenters requested that the Draft VTR EIS describe the framework under which a VTR would be regulated and recommended the VTR EIS include a list of all permits and authorizations that the project facilities already have and would need, including modification to any existing permit or authorization. They asked: Would the VTR be licensed by the NRC? If the NRC would not provide oversight of the reactor's design and operation, how would such oversight be accomplished? Would the DNFSB have an oversight role? Another commenter stated the VTR EIS should discuss ramifications of the 1995 Idaho Settlement Agreement.

DOE Response: DOE would authorize the VTR and provide oversight of construction and operations, like previous test reactors (e.g., ATR, HFIR, and Transient Reactor Test Facility [TREAT]). The VTR would not be licensed by NRC. Under the Atomic Energy Act (AEA) of 1954 and its amendments, and the AEA Energy Reauthorization Act of 1974, DOE has the authority to develop, construct, and operate its own reactors. Under this authority, DOE plans to conduct the safety review for the VTR and authorize its construction and operation. DOE facilities, such as the VTR, are generally exempt from NRC licensing in accordance with Section 110 of the Energy Reauthorization Act and Title 10, Code of Federal Regulations 50.11, Exceptions and Exemptions from Licensing Requirements. The VTR would not be a defense nuclear facility, and therefore, the DNFSB would not have an oversight role.

In Chapter 7, the VTR EIS addresses environmental laws, regulations, permits, and agreements. The 1995 Idaho Settlement Agreement is acknowledged in that chapter.

Comment Summary: A commenter stated that any nonradioactive wastes associated with construction and operation of the facilities must be handled in accordance with Federal and State solid and hazardous waste rules and regulations. A commenter recommended the Draft VTR EIS include discussion of specific hazardous and mixed waste management and monitoring practices, treatment methods, storage areas, and utilization of landfills for attaining compliance with State regulations.

DOE Response: Chapter 7 of this VTR EIS identifies applicable environmental laws, regulations, permits, and agreements related to waste management. Chapters 3 and 4 include descriptions of radioactive, hazardous, mixed, and nonhazardous waste management practices, including treatment, storage, and disposal.

Comment Summary: A commenter inquired whether there are any legal or regulatory constraints prohibiting the use of the VTR as a breeder reactor.

DOE Response: The VTR would be a test reactor. There is no legal constraint against using the VTR as a breeder reactor; however, there are no plans to use VTR as such. The VTR mission is to be a test reactor with its core configured so that it operates as a “burner” reactor, i.e., it would consume more fissile material than it would create. Accordingly, the DOE-approved safety basis would be developed based on configuring the VTR as a test reactor that does not include the capability to use it as a breeder reactor. Any proposal to reconfigure the reactor as a breeder would require a reanalysis of the design and safety basis, and would also include a re-evaluation of environmental impacts.

Cost and Schedule

Comment Summary: One commenter requested an estimate of the cost for the VTR’s construction and startup. Another commenter stated that the schedule established for completion of the VTR is unrealistic, and the Draft VTR EIS must address the impacts of delay to the cost and schedule for the project. Would MOX "lessons learned" be applied to the VTR program?

DOE Response: Detailed cost estimates are not yet available. However, based on the current conceptual design and documentation submitted for Critical Decision 1 (CD-1, Approve Alternative Selection and Cost Range) (DOE 2020), the estimated cost range is between $2.6 and $5.8 billion. The range for completion of construction is estimated to be from fiscal year 2026 to fiscal year 2031. Based on the near-term schedule, the EIS should capture the likely environmental impacts of the alternatives for construction and operation of the VTR and supporting facilities. DOE does not plan to present cost and schedule information in the VTR EIS.

DOE always strives to learn from its past projects as well as those from the private sector. Specifically, VTR will begin construction after the appropriate level of final design has been completed as well as development of the supply chain, prototype testing of critical components, and completion of labor analysis studies.

Comment Summary: One commenter asked which private entities would use the VTR and how much would they pay toward construction and operation and management of waste? Would private entities be liable for negligence in using the VTR?

DOE Response: Once operational, the VTR will be designated as an Office of Nuclear Energy, Nuclear Science User Facilities (NSUF) partner facility. Through NSUF, access will be available to universities, DOE national laboratories, and industry through competitive peer-reviewed processes. In addition to access through NSUF, users can also gain access to the VTR on a pay-for-access basis. There is the potential for cost sharing with industry and other governments, but at this time, no such arrangements have been made. DOE would be the owner and operator of the VTR and would assume all risks and responsibilities associated with its operation. Requests for access will be evaluated for technical feasibility, safety, and capability of resources requested to perform the proposed work.

Out of Scope

Comment Summary: Commenters asked about renewable energy technologies and cost comparisons of those alternative energy sources. One commenter stated that buried waste at the INL Site must be addressed. A commenter requested that the VTR EIS consider employee expertise and whether sufficient human resources are available to support this project. One commenter stated the VTR EIS should describe any possible change to the psyche of people who live downstream and what impact it could have on local and regional economies.

DOE Response: The impacts and costs of alternative energy technologies, including renewable energy, is outside the scope of this VTR EIS. The impacts of existing buried waste at the INL Site and the cleanup of existing contaminated sites are outside the scope of this VTR EIS, although these activities will be considered as part of cumulative impacts. The availability of trained personnel, including personnel education and training, and the availability of funding for training, are administrative concerns that are outside the scope of this VTR EIS. DOE's analyses presented in this VTR EIS identify potential impacts that could occur as a result of the proposed action and alternatives on resource areas consistent with NEPA regulations. The results of the analyses provide decision-makers and the public, including people living downstream of the site, conservative estimates of potential impacts that could occur as a result of implementation of the proposed action and alternatives.

G.1 References

DOE (U.S. Department of Energy), 2020, Memorandum from M. W. Menezes, Chief Executive of Project Management, to R. Baranwal, Assistant Secretary for Nuclear Energy, Re: Approval of Critical Decision-1, *Approve Alternative Selection and Cost Range*, for the Versatile Test Reactor Project, Washington, DC, September 11.

INL (Idaho National Laboratory), 2017, *Advanced Demonstration and Test Reactor Options Study,* INL/EXT-16-37867, Rev. 3, ART Program, Idaho Falls, Idaho, January.

NEAC (Nuclear Energy Advisory Committee), 2017, *Assessment of Missions and Requirements for a New U.S. Test Reactor*, February.

NRC (U.S. Nuclear Regulatory Commission), 1994, *Preapplication Safety Evaluation Report for the Power Reactor Innovative Small Module (PRISM) Liquid-Metal Reactor*, NUREG-1368, Washington, DC, February.