DOE-ID NEPA CX DETERMINATION
Idaho National Laboratory

CX Posting No.: DOE-ID-INL-19-052-R1

SECTION A. Project Title: VTR Fuel Fabrication

SECTION B. Project Description and Purpose:

Revision 1

This additional scope is to be added to EC INL-19-112 as a revision.

INL intends to install a prototype casting glovebox in the Experimental Fuel Facility (EFF). This box will be similar in design to the casting gloveboxes being developed for casting the U-Pu-Zr fuel alloy needed for VTR. The glovebox, with its associated casting furnace, will be used in EFF to melt and cast only uranium-based alloys (primarily U-Zr). Typically, these alloys will be composed of depleted uranium-zirconium, however, the system will be capable of casting enriched uranium alloys up to the facility quantity limits. Casting batches up to 22 kg Du-Zr (0-15% Zr) and U-Zr (with U enriched to that allowed by the facility (and within the 700 g limit) will be cast, to simulate the casting process being developed for FMF.

This furnace represents an expansion of the scope for EC INL-19-112. In the original EC, all of the prototyping work would have been done in FMF. The additional glovebox and casting furnace in EFF will allow the project to develop and test the casting furnace components before installing any equipment in FMF. It will allow for easier access by supporting vendors who may need to conduct training and assist in any maintenance/modifications we may need to make to the design. Once tested, the system can be used for procedure development and training of staffs who will ultimately operate the equipment in FMF.

The glovebox installation in EFF will include tie-ins to the ventilation, argon, regen gas, and instrument air. Electrically, the glovebox will tie in a gas purification system and the furnace power supply. An illustration of the glovebox and casting furnace is shown below.

Original Version

The research and development (R&D) of advanced nuclear fuels and materials is essential for developing and improving advanced reactor technologies. Since shutdown of the Fast Flux Test Facility (FFTF) and the Experimental Breeder Reactor-II (EBR-II), foreign nuclear research reactors have been used to support fast neutron irradiation capabilities. About 48 North American organizations have been developing about 9 different advanced reactor designs since 2015. Because the United States lacks a domestic fast nuclear research reactor, Congress allocated $35 million to the U.S. Department of Energy's (DOE) Office of Nuclear Energy (NE) to start a conceptual design, cost estimate, and schedule for a fast spectrum test reactor to support advanced nuclear reactor research and development (R&D) in fiscal year (FY) 2018.

Idaho National Laboratory (INL), in conjunction with other national laboratories and institutions, is researching and developing a potential design for an irradiation-testing facility capable of meeting future experimental needs for advanced reactor technologies. This potential research facility, known as the Versatile Test Reactor (VTR), will give research institutions access to fast-neutron technologies for developing advanced nuclear concepts. An objective

of the current effort is to incorporate well-known technologies into the test reactor, contributing to the highest possible reactor reliability and uncertainty reduction. One of the technology options being considered is the design of the startup driver fuel. U.S. fast reactor fuel experience is overwhelmingly with metal alloy fuel and mixed oxide or (U,Pu)O2, although many other fuel forms have been investigated in varying degrees.

The proposed action uses existing INL facilities to research and develop methods for manufacturing fuel for the VTR conceptual design efforts. This effort is directed at developing prototype casting technology, fuel pin fabrication, and technologies for putting together fuel subassemblies. Initial efforts will be to design and construct gloveboxes for fuel batching and casting, mold processing and fuel slug marking and cutting, scrap processing, quality assurance verification, individual fuel pin assembly, and putting together fuel subassemblies. Gloveboxes and ancillary equipment will be procured, assembled, and mocked up in a non-radiological space for verification purposes, then the equipment will be transferred to the Fuel Manufacturing Facility (FMF) at MFC and installed in the south workroom. Fuel pins will be assembled in FMF or the Zero Power Physics Reactor (ZPPR) reactor cell room. Fuel subassemblies will be put together in the ZPPR reactor cell room.

The proposed demonstration involves about 10 casting batches per year and casts alloys in quantities up to 30 kg and will be completed in 2023 for a total of 900 kg U-Pu-Zr alloys. The proposed action seeks only to demonstrate a successful fuel fabrication process. Irradiation testing and post irradiation examination (PIE) of fuels is not proposed. If irradiation testing and PIE is proposed in the future, this EC will be revised.

Nearly all plutonium at MFC was supplied by defense programs. MFC involvement with defense-related programs and materials has been continuous since the earliest days of operation. MFC facilities that are qualified for plutonium handling, including FMF and ZPPR, are contaminated with transuranics from these programs.

Waste associated with project activities is eligible for disposal at the Waste Isolation Pilot Plant (WIPP). National Environmental Policy Act (NEPA) coverage for the transportation and disposal of waste to WIPP are found in Final Waste Management Programmatic Environmental Impact Statement [WM PEIS] (DOE/EIS-0200-F, May 1997) and Waste Isolation Plant Disposal Phase Supplemental EIS (SEIS-II) (DOE/EIS-0026-S-2, Sept. 1997), respectively. The 1990 ROD also stated that a more detailed analysis of the impacts of processing and handling transuranic (TRU) waste at the

generator-storage facilities would be conducted. The Department has analyzed TRU waste management activities in the Final Waste Management Programmatic Environmental Impact Statement (WM PEIS) (DOE/EIS-200-F, May 1997). The WM PEIS analyzes environmental impacts at the potential locations of treatment and storage sites for TRU waste; SEIS-II addresses impacts associated with alternative treatment methods, the disposal of TRU waste at WIPP and alternatives to that disposal, and the transportation to WIPP.

There is the potential to generate low level waste (LLW). The environmental impacts of transferring low level waste from the INL to the Nevada National Security Site were analyzed in the 1996 Nevada Test Site (NTS) EIS (DOE/EIS-0243) and supplemental analysis (SA) (DOE/EIS-0243-SA-01) and DOE's Waste Management Programmatic EIS (DOE/EIS-200). The fourth Record of Decision (ROD) (65 FR 10061, February 25, 2000) for DOE's Waste Management Programmatic EIS established the Nevada National Security Site as one of two regional LLW and mixed low-level waste (MLLW) disposal sites. The SA considers additional waste streams, beyond those considered in the 1996 NTS EIS, which may be generated at or sent to the Nevada National Security Site for management.

Onsite disposal of RH-LLW was analyzed in the Final Environmental Assessment for the Replacement Capability for Disposal of Remote-Handled Low-Level Radioactive Waste Generated at the Department of Energy's Idaho Site (DOE/EA-1793, 2011).

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

1 Air Emissions (Describe Impact): New, inert atmosphere gloveboxes will be attached to the FMF suspect exhaust ventilation system. Project activities could result in radioactive air emissions from the gloveboxes to the facility exhaust system. The facility suspect exhaust system is equipped with filtration and monitoring systems to prevent releasing these materials into the atmosphere. However, modifications to the radiological air handling system in FMF associated with installing and operating the new gloveboxes may require modification of the air permit for FMF. The proposed action has the potential to increase material throughput and hours of operation (materials may need to be left in gloveboxes overnight when processing, which is not presently done in FMF). The proposed action requires an Air Permitting Applicability Determination (APAD).

All radionuclide release data will be recorded as part of the FMF continuous stack monitor. Radiological emissions will be required to be analyzed in EFF.

Discharging to Surface-, Storm-, or Ground Water

N/A

Disturbing Cultural or Biological Resources

ZPPR and EFF are both eligible for listing on the National Register of Historic Places. Project activities have the potential to impact ZPPR and EFF.

Generating and Managing Waste

The proposed action will generate low-level waste (LLW), mixed LLW, and potentially contact-handled TRU and mixed TRU waste. In addition, the proposed action has the potential to generate about 10 m3 of transuranic (TRU) waste (Pu-bearing waste). If the project anticipates exceeding this amount of TRU waste, this EC will be revised.

Releasing Contaminants

As described in the air emissions section above, radioactive air emissions are anticipated.

Clad cleaning and passivation fluids are general purpose industrial cleaners that would be generated and disposed in accordance with INL procedures.

Chemical use has the potential to release contaminants. All chemicals and associated Safety Data Sheets (SDS's) must be submitted in the vendor data system for approval. The Chemical Coordinator would track these chemicals in the INL Comply Plus Chemical Management System. Chemical use has a potential for small air emissions and spills. In the event of a spill, notify facility Environmental Staff. If Environmental Staff cannot be contacted, report the release to the Spill Notification Team (208-241-6400). Clean up the spill and turn over spill cleanup materials to WGS.

Using, Reusing, and Conserving Natural Resources

All materials will be reused and recycled where economically practicable. All applicable waste will be diverted from disposal in the landfill where conditions allow.

SECTION D. Determine Recommended Level of Environmental Review, Identify Reference(s), and State Justification: Identify the applicable categorical exclusion from 10 Code of Federal Regulation (CFR) 1021, Appendix B, give the appropriate justification, and the approval date.

For Categorical Exclusions (CXs), the proposed action must not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, or similar requirements of Department of Energy (DOE) or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or facilities; (3) disturb hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021). In addition, no extraordinary circumstances related to the proposal exist that would affect the significance of the action. In addition, the action is not "connected" to other action actions (40 CFR 1508.25(a)(1) and is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1608.27(b)(7)).

References:
10 CFR 1021, Appendix B to subpart D, items B3.6, "Small-scale research and development, laboratory operations, and pilot projects"
Final Environmental Impact Statement for the Waste Isolation Pilot Plant (DOE/EIS-0026, October 1980) and Final Supplement Environmental Impact Statement for the Waste Isolation Pilot Plant (SEIS-I) (DOE/EIS-0026-FS, January 1990)

Final Waste Management Programmatic Environmental Impact Statement [WM PEIS] (DOE/EIS-0200-F, May 1997) and Waste Isolation Plant Disposal Phase Supplemental EIS (SEIS-II) (DOE/EIS-0026-S-2, September 1997)

Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (DOE/EIS-0243) and supplemental analysis (SA) (DOE/EIS-0243-SA-01)

Justification:
The proposed R&D activities are consistent with CX B3.6 "Siting, construction, modification, operation, and decommissioning of facilities for small-scale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment."

EPA coverage for the transportation and disposal of waste to WIPP are found in Final Waste Management Programmatic Environmental Impact Statement [WM PEIS] (DOE/EIS-0200-F, May 1997) and Waste Isolation Plant Disposal Phase Supplemental EIS (SEIS-II) (DOE/EIS-0026-S-2, Sept. 1997), respectively. The 1990 ROD also stated that a more detailed analysis of the impacts of processing and handling TRU waste at the generator-storage facilities would be conducted. The Department has analyzed TRU waste management activities in the Final Waste Management Programmatic Environmental Impact Statement (WM PEIS) (DOE /EIS-200-F, May 1997). The WM PEIS analyzes environmental impacts at the potential locations of treatment and storage sites for TRU waste; SEIS-II addresses impacts associated with alternative treatment methods, the disposal of TRU waste at WIPP and alternatives to that disposal, and the transportation to WIPP.

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Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act) ☐ Yes ☒ No

Approved by Jason Sturm, DOE-ID NEPA Compliance Officer on:12/3/2020