Project Title: Lightbridge Experiment R2

Project Description and Purpose:

Revision 2:

The Idaho National Laboratory (INL) will support the advanced testing of Lightbridge fuel. Lightbridge fuel is an alloy (U-Zr) that is co-extruded with a zircalloy cladding in a helical cruciform geometry. Lightbridge fuel is designed for use in light water reactors as it is postulated to improve performance and power uprating compared to conventional UO2 based fuels. The INL will conduct a variety of tasks associated with irradiation testing necessary to validate the performance of Lightbridge fuel by testing it within the Accident Tolerant Fuel 2 (ATF2) loop within the Advanced Test Reactor (ATR).

Task 1: Quality Implementation Plan:

The INL will develop, maintain, and implement a Quality Implementation Plan (QIP) in accordance with INL's Quality Assurance Program requirements. The QIP will document how quality requirements applicable to the project are met and will be submitted to Lightbridge for review and approval. Any identified gaps between INL procedures and participant quality expectations will be addressed through revisions to the QIP prior to execution of project activities.

Task 2: Experiment Design:

INL will perform the conceptual, preliminary, and final design of the Lightbridge fuel irradiation experiment for insertion into the ATF-2 loop in the Advanced Test Reactor. This task includes identification of functional and operational requirements; mechanical design of experiment components; thermal-hydraulic, mechanical, and neutronic analyses; reservation of reactor positions; preparation and revision of design drawings; and development of required experiment documentation, including the Functional and Operational Requirements document and the Experiment Data Package.

Task 3: Provision of Materials:

INL will provide DOE-owned enriched uranium required to support fuel fabrication activities. All material handling, accountability, storage, and disposition will be conducted in accordance with established INL procedures and regulatory requirements. Materials will be managed within existing authorized limits and capabilities.

Task 4: Fabrication, Assembly, and Irradiation:

INL will fabricate all required experiment hardware, including capsule and irradiation basket components, and assemble the experiment in accordance with the approved final design. INL will conduct steady-state irradiation operations in the Advanced Test Reactor consistent with approved experiment requirements and safety bases. Following irradiation, INL will transport the experiment to the Materials and Fuels Complex (MFC) and prepare documentation summarizing as-built conditions, irradiation history, and as-run operating data.

Task 5: Final Disposition of Materials:

INL will complete final disposition of experiment materials in accordance with standard INL waste management and material control procedures. Remaining enriched uranium will be returned to INL inventory for future use, and disposal activities will be performed only upon mutual agreement between INL and Lightbridge.

Waste generated during this project is expected to include approximately 1 lb of industrial waste consisting of metals and other solid materials and approximately 5 lbs of PPE and wipes. Experiment disassembly and post-irradiation examination (PIE) activities will create relatively small amounts of low-level radioactive waste (LLW) for disposal. Cutting, slicing, grinding, and polishing operations will generate small volumes of remote-handled LLW, and project transuranic (TRU) waste volume is projected to be less than 1 m^3. All waste streams, including industrial, LLW, remote-handled LLW, and TRU waste, will be characterized and managed in accordance with applicable DOE, INL, and facility-specific requirements, with assistance from Waste Generator Services. The waste will be generated at ATR, and the Engineering Fuels Facility and Advanced Fuel Facility at MFC.

The crystal grower vacuum induction furnace located in AFF will not be utilized for this effort, as the equipment is non-operational and scheduled for future removal from the facility.

Revision 1:

This revision addresses work proposed under a Cooperative Research and Development Agreement (CRADA) and Strategic Partnership Project (SPP) with Lightbridge and focuses on Phase 1 of the Lightbridge project and identifies additional actions that are planned for future phases. This ECP will be revised as the details of these phases are developed.

CRADA Phase 1: Fabricate, Assemble, and Irradiate Coupon Experiment in ATR: Fabricate, Assemble, and Irradiate Coupon Experiment in ATR: To complete the irradiation experiment for Lightbridge that was developed through a GAIN voucher, the experiment hardware will require fabrication and assembly. This process includes the development of a quality assurance plan required to be approved by Lightbridge, and pending completion of a QA Audit of INL by Lightbridge, fuel specification documents, supply of materials (including the enriched uranium needed for the experiment), facility/equipment modification (as needed), final assembly of experiment hardware and components, and the irradiation of the experiment within ATR.

Task 1: Create Quality Implementation Plan: Discussion. Lightbridge will provide the requirements necessary for their quality assurance needs. INL will perform all work under this SOW in accordance with applicable elements of the current version of the INL Quality Assurance Program Description Document PDD-13000 and develop a QIP that conforms to INL QA requirements IAW PDD-13000.

Task 2: Experiment Preparation

- Task 2.1: Experiment Design: Discussion. INL will perform any necessary analysis to confirm the original design for the execution of the experiment. This will consider actual, reserved reactor positions and anticipated lobe powers. Final enrichment will be determined in a revised neutronics analysis and confirmation of temperatures will be performed in a revised thermal-hydraulics analysis. All drawings will be confirmed and work orders placed.
- Task 2.2: Provision of Materials Discussion. INL/DOE will provide the necessary HEU, DU, and Zr feedstock to perform both mockup and final casting and extrusion work. Material handling, accountability, and disposal will be performed IAW standard laboratory practices and procedures.

Task 3: Pre-Irradiation Characterization of Coupons Discussion. Compositional and isotopic analysis will be used to confirm final enrichments. Each coupon will also undergo dimensional inspection. The details from the isotopic and dimensional inspections will be used in a final, confirmatory neutronic and thermal analysis.

Task 4: Fabricate, Assembly, and Irradiation of Experiment

- Task 4.1: Fabrication and Assembly. INL will fabricate test capsule materials and assemble the experiments using fuel coupons IAW the fuel spec and design from the GAIN voucher design work. A final as-built design and analysis report will be documented at the completion of this effort.
- Task 4.2: Irradiation Operation and Shipping. INL will conduct steady state irradiations in ATR IAW the original test matrix schedule. This will include at most two shipments of fuel to the Material Fuels Complex (MFC). Shipment includes as-run neutronics analysis. MFC will receive fuel tests for future post-irradiation examination (PIE) opportunities (PIE is not included as a part of this PTS).
- Task 4.3: Test History Summary Report. INL will summarize the irradiation history and compile a final report to support model evaluation and future PIE opportunities of the irradiation experiments. This will not include PIE data.

Task 5: Quality Assurance Confirmation of Work. Discussion. The final results of the fabrication and characterization will be compiled into a report for Lightbridge in accordance with the agreed upon QIP and other referenced material test standards.

Task 6: Final disposition of materials. INL will dispose of materials IAW standard procedures and methods. Remaining enriched U will be returned to INL inventory for future INL use. No disposal shall be performed unless the parties mutually agree that the materials are no longer needed.

Task 7: Financial and Project Performance Reporting. INL will provide monthly cost and schedule data outputs from INL standard project reporting tools to Lightbridge after each end of FY month processing.

CRADA Phase 2: Fabricate, Assemble, and Irradiate Lightbridge Fuel in ATR: To fully assess the Lightbridge fuel design, a steady state irradiation test of Lightbridge's fuel will need to be completed. This will be performed within an I-loop in the ATR. Unlike CRADA Phase 1 activities, no prior design effort has occurred and so a full design effort will need to be completed in addition to the experiment effort. Design includes thermal-hydraulic analysis, neutronic analysis, structural analysis, and design drawings as well as other INL standard experiment documents. The experiment execution process includes the development of a quality assurance plan required to be approved by Lightbridge, and pending completion of a QA Audit of INL by Lightbridge, fuel specification, supply of materials (including the enriched uranium needed for the experiment), facility/equipment modification (as needed), final assembly of experiment hardware and components, and the irradiation of the experiment within ATR.

CRADA Phase 3: Fabricate, Assemble, and Irradiate Lightbridge Fuel in TREAT: To fully assess the Lightbridge fuel design, a transient irradiation tests of Lightbridge's fuel will need to be completed. This will be performed within TREAT using, as much as possible, existing experiment capsule concepts (e.g., SERTTA). Unlike CRADA Phase 1 activities, no prior design effort has occurred and so a full design effort will need to be completed in addition to the experiment effort. Design includes thermal-hydraulic analysis, neutronic analysis, structural analysis, and design drawings as well as other INL standard experiment documents. The experiment execution process includes the development of a quality assurance plan required to be approved by Lightbridge, and pending completion of a QA Audit of INL by Lightbridge, fuel specification, supply of materials (including the enriched uranium needed for the experiment), facility/equipment modification (as needed), final assembly of experiment hardware and components, and the irradiation of the experiment within TREAT.

SPP Phase 1: Production of Coupons

INL, working at Lightbridge's direction and in accordance with task/work procedures and a Quality Assurance Plan approved by Lightbridge, will demonstrate the capacity to cast U-50Zr billets and extrude them for irradiation testing. Casting will initially be done using depleted uranium (DU) in a vacuum induction furnace and as needed, using a multiple stage arc-melting process. Cast DU ingots will then be used for demonstrating Lightbridge's proprietary fabrication processes at INL facilities. Microstructure, chemical analysis, and thermal-mechanical property assessment will be performed on the resulting materials for validation of alloying and extrusion. Lightbridge will provide confirmation of adequate processes. INL will then perform casting and extrusion of enriched uranium for irradiation testing.

SPP Tasks Overview

The fabrication and characterization of specimens is an important component of any irradiation experiment. The development of a casting and extrusion process to create the desired fuel form for this experiment is substantial. The work will include developing a casting process, heat

treating billets from the casting process, machining them into a shape suitable for extrusion, developing an extrusion process, heat treating extruded slugs, and microstructural and compositional features of the final extruded product. Any necessary development work will be done with depleted uranium (DU). After the process is proven successful, it will be repeated with enriched uranium to produce fuel slugs for the related irradiation experiment.

SPP Task 1: Create Specification to Support Casting: INL will work with Lightbridge to develop the fuel specification document necessary to support fuel experiment fabrication and assembly efforts at INL. Casting will be performed on the vacuum induction furnace used by the crystal grower in the Advanced Fuels Facility (AFF, MFC-784). Lightbridge will provide INL details regarding the objective alloy such that INL can perform the necessary design modifications (as needed) to support the casting of the ingot. INL and Lightbridge will work together for a concurred upon design and casting parameters. The final product of this task will be a fuel fabrication specification.

SPP Task 2: Fabrication Mockup

- SPP Task 2.1: Extrusion Method Engineering: Lightbridge has proposed two different methods to support extrusion. Method A is a modified/tapered stem and liner that will support the desired reduction ratio. Method B utilizes a larger can to produce an effective reduction ratio. Method A cannot be performed without additional engineering work. To this end, INL will serve as the deign authority and Butech, the manufacturer of the extrusion press, will perform engineering work to validate the Lightbridge proposed design IAW INL requirements to be provided to Lightbridge. The engineering efforts conducted by Butech are to be separately contracted and paid for by Lightbridge. If Option A is deemed acceptable and is chosen as the extrusion method then Lightbridge will purchase the necessary hardware from Butech.
- SPP Task 2.2: Casting Demonstration: INL will demonstrate the capacity to cast U-Zr billets for fuel extrusion. DU material will be used for the development of these processes along with Zr feedstock and other supporting materials supplied by INL. Casting of ingots will be performed on the vacuum induction furnace used by the crystal grower in the Advanced Fuel Fabrication (AFF) facility. Lightbridge will provide INL details regarding the objective alloy requirements such that INL can perform the necessary design modifications (as needed) to support the casting of the ingot. INL and Lightbridge will work together for a concurred upon design and casting parameters. As needed, ingots may also be cast using the triple arc-melting equipment at INL. Microstructure and chemical analysis will be performed on the resulting materials for validation of alloying through characterization performed in Task 5. The final product of this task will be an ingot casting specification to produce Lightbridge's delta-phase alloy using INL equipment, which will be incorporated into the fuel specification document.
- SPP Task 2.3: Extrusion Demonstration: INL will perform a series of extrusions using process parameters provided by Lightbridge. These extrusions will be done to ensure extrusion characteristics meet the expectations and needs of Lightbridge so that irradiation behaviors are representative of more prototypical fuel behaviors. Each extrusion run will be sectioned into a minimum of three pieces such that, at least, the bottom, middle, and top regions of each extruded pin can be characterized for chemical composition and microstructural features. Remaining material will be retained for archival purposes for a minimum of one year. Lightbridge will be involved in the interpretation of characterization results and will provide input into any corrections needed to achieve the necessary extruded product. Lightbridge will also provide final confirmation of acceptable results. The final extrusion parameters will be used to produce the final inputs to the fuel coupon sample specification document.

SPP Task 3: Casting of Enriched Ingot: INL will perform the casting of the ingot using parameters defined in Tasks 1 & 2. The sample will be sectioned to provide ample material needed for extrusion. A sample will be used for characterization prior to extrusion to confirm the characteristics of the cast material meet the expectations of the fuel spec for extrusion. An additional sample will be retained for archival purposes for a minimum of three years.

SPP Task 4: Extrusion of Enriched Ingot: INL will extrude the ingots from Task 3 in accordance with the parameters established in Task 2. The extruded coupons will be sectioned such that there is sufficient material to support post-extrusion characterization in Task 5. An additional sample will be retained for archival purposes for a minimum of three years.

SPP Task 5: Characterization of Ingot: The sections prepared in Task 2 will be analyzed using the following methods:

- X-ray diffraction (XRD) will be used to verify crystal structure, texture, and any impurity phases.
- Scanning electron microscopy (SEM) will be used to verify microstructural features along with energy dispersive x-ray spectroscopy (EDS) to verify chemical composition and phase homogeneity. Electron backscatter diffraction (EBSD) will be used to determine grain orientation.
- Isotopic analysis will be used to confirm final enrichment.

Characterization will occur in the AFF (MFC-784), Analytical Laboratory (MFC-752), Fuels and Applied Science Building (MFC-787) and possibly the Irradiated Materials Characterization Laboratory (MFC-1729). The results of characterization will be presented to Lightbridge and documented in a laboratory report.

INL will dispose of materials in accordance with standard procedures and methods.

SPP Phase 2: Post-Irradiation Examination of Coupons

INL will perform PIE of irradiated coupons. PIE will initially be performed at the Hot Fuel Examination Facility (HFEF) and then at either the Irradiated Materials Characterization Laboratory (IMCL) or Electron Microscopy Laboratory (EML), all at INL. PIE activities may include assessment of fission gas release/retention, radiography, thermal properties, microstructure, composition, and mechanical properties. This Phase 2 work is required to be conducted in accordance with a QA Program approved by Lightbridge which meets the requirements of 10 CFR 50, Appendix B, and is pending completion of a QA Audit by Lightbridge.

SPP Phase 3: Fabrication Processes for Lightbridge Fuel

INL, working at Lightbridge's direction and in accordance with task/work procedures and a Quality Assurance Plan approved by Lightbridge, will fabricate Lightbridge fuel elements based on Lightbridge's proprietary fabrication process for irradiation testing (e.g., co-extruded cladding and fuel in unique geometries). This work will leverage lessons learned from Phase 1 activities and be demonstrated with depeleted uranium. Upon Lightbridge acceptance, enriched uranium fuel tests will be fabricated for irradiation testing. Fuel specimens will be fabricated for testing within ATR and TREAT.

SPP Phase 4: Post-Irradiation Examination of Lightbridge Fuel

INL will perform PIE of irradiated Lightbridge fuel specimens from ATR. PIE will initially be performed at the Hot Fuel Examination Facility (HFEF) and then at either the Irradiated Materials Characterization Laboratory (IMCL) or Electron Microscopy Laboratory (EML), all at INL. PIE activities may include assessment of fission gas release/retention, radiography, thermal properties, microstructure, composition, and mechanical properties. This Phase 4 work is required to be conducted in accordance with a QA Program approved by Lightbridge which meets the requirements of 10 CFR 50, Appendix B and is pending completion of a QA Audit by Lightbridge.

SPP Phase 5: Post-Irradiation Examination of TREAT Irradiated Lightbridge Fuel

INL will perform PIE of irradiated Lightbridge fuel specimen from TREAT. PIE will initially be performed at the Hot Fuel Examination Facility (HFEF) and then at either the Irradiated Materials Characterization Laboratory (IMCL) or Electron Microscopy Laboratory (EML), all at INL. PIE activities may include assessment of fission gas release/retention, radiography, thermal properties, microstructure, composition, and mechanical properties. This Phase 5 work is required to be conducted in accordance with a QA Program approved by Lightbridge which meets the requirements of 10 CFR 50, Appendix B, and is pending completion of a QA Audit by Lightbridge.

This ECP will be revised as information becomes available for the activities covered in Phases 2 through 5.

Original ECP:

Lightbridge is developing proprietary next-generation metallic nuclear fuel technologies and a fuel assembly design for power uprates in existing water reactors. The purpose of the Advanced Test Reactor (ATR) Experiment Design Project is to evaluate thermo-mechanical properties of the Lightbridge fuel material, including thermal conductivity and volumetric swelling of fuel material as a function of nuclear burnup. The proposed action may investigate additional properties of the fuel material (e.g., Young's modulus, etc.) if physical and programmatic conditions allow.

INL personnel at the Materials and Fuels Complex (MFC) and ATR Complex coordinate experiment fabrication, characterization, irradiation, and post irradiation examination (PIE). The Project designs, analyzes, and fabricates experiment components at the Research and Education Campus (REC). MFC fabricates and characterizes experiments and performs post irradiation examination (PIE) on irradiated specimens. The Test Train Assembly Facility fabricates the experiment components, and ATR irradiates the experiments. The first designed experiment, designated as LB-1, will be a fueled drop-in experiment (B7). Experiment capsules each contain one fueled rodlet suitable for ATR irradiation.

The fuel in the Lightbridge experiments will be U-50Zr (50 weight percent zirconium, ~UZr2) The project fabricates and assembles experiment capsules meeting the intent of ASME Section III, Class 1. Personnel at MFC validate fuel compositions and forms prior to insertion in the ATR.

The project performs neutronic, structural, and thermal analyses, and prepares the Experiment Safety Assurance Packages (ESAPs) required for ATR experiment insertion. Operations Systems Engineering, ATR Facility Safety Engineering, and the Safety Operations Review Committee (SORC) review and approve the ESAPs.

Following fabrication, INL ships FAST fuel assemblies from MFC to ATR using a Type-A shipping container. The proposed action irradiates the experiment in ATR for multiple cycles, in both the OA and SI positions. INL removes capsules from the ATR core during scheduled ATR outages as needed to replace the cadmium baskets, replace flux-wire monitors, and accommodate basket reconfigurations. INL may remove some capsules from the experiment assembly, ship them to HFEF for NRAD radiography imaging, and then ship them back to the ATR for continued irradiation. INL will insert an empty "dummy" capsule in place of the removed capsule(s) if INL cannot perform NRAD imaging during the cycle outage. INL removes capsules from ATR and stores capsules in the ATR Canal until the capsules have cooled down.

Following irradiation, INL ships the capsules to HFEF for PIEs using the GE-100 cask or another approved shipping container. Prior to shipment, INL determines the source term and heat load for the shipment. HFEF may transfer samples to the Analytical Lab (AL), Fuels and Applied Sciences Building (FASB) or the Electron Microscopy Lab (EML) at MFC or other internal (INL) laboratories for additional PIE analysis, as necessary. Shipping material to other laboratories requires revising this Environmental Compliance Permit (ECP).

The following paragraphs discuss general operations performed in HFEF to support PIE:

Photo-visual Inspection: After unloading from the shipping cask, INL visually inspects experiment exteriors using a digital camera via periscope or through a hot cell window to identify any damage or degradation.

Neutron Radiography: Prior to disassembly, INL may perform neutron radiography using the NRAD reactor to establish the general condition of fuel.

Gamma Scanning:

INL may examine experiments using precision (isotopic) gamma scanning to obtain information on both fission product migration and shifting of fuel compacts within the capsules.

Disassembly:

INL disassembles experiments extract capsule components, including fuel. Activities include photographing and measuring fuel components from the irradiation capsules. The project may send some components sent to the AL for analysis, some to the containment box for sectioning and

mounting, and others to the FACS furnace for safety testing. The project also examines other hardware associated with disassembly in HFEF and the AL.

Safety Testing:

INL completes safety testing by placing irradiated fuel specimens in the high temperature furnace system in HFEF and heating the fuel while measuring the release of metallic and gaseous fission products as a function of time. A high-purity helium sweep gas is metered past the heated fuel sample in the furnace and is routed to a fission gas monitoring system, which cryogenically traps the Kr and Xe gases for radioactive emissions counting. Following counting, the Kr and Xe gases are exhausted to the HFEF stack.

After PIE, irradiated test pin segments and PIE remnants will be stored with other similar DOE-owned irradiated materials and experiments at MFC, most likely in the HFEF or the Radioactive Scrap and Waste Facility (RSWF) in accordance with DOE's Programmatic SNF Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement (FEIS) and ROD (DOE/EIS0203, 1995) and supplemental analyses (DOE/EIS-0203-SA-01 and DOE/EIS-0203-SA-02) and the Amended Record of Decision (February 1996). Ultimate disposal of the irradiated test pin segments and PIE remnants will be along with similar DOE-owned irradiated materials and experiments currently at MFC. Categorizing this material as waste is supported under Department of Energy Order (DOE O) 435.1, Att. 1, Item 44, which states "…Test specimens of fissionable material irradiated for research and development purposes only…may be classified as waste and managed in accordance with this Order...".

In addition, to complete proposed work activities, it is necessary for the project to use the HFEF hot cell which contains both defense and nondefense related materials and contamination. Project materials will come into contact with defense related materials. It is impractical to clean out defense related contamination, and therefore, 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 transuranic (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.

Packaging, repackaging, transportation, receiving, and storing used nuclear fuel and R&D for used nuclear fuel management is covered by DOE's Programmatic Spent Nuclear Fuel (SNF) Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement (EIS) and Record of Decision (DOE/EIS-0203, 1995) and supplemental analyses (DOE/EIS-0203-SA-01 and DOE/EIS-0203-SA-02) and the Amended Record of Decision (February 1996). The analyses include those impacts related to transportation to, storage of, and research and development related to used nuclear fuel at the INL (see Tables 3.1 of the SNF Record of Decision (May 30, 1995) and Table 1.1 of the Amended Record of Decision [February 1996].

The potential for transportation accidents was analyzed in the SNF EIS (Section 5.1.5 and Appendix I-5 through I-10).

The environmental impacts of transferring LLW from the INL Site to the Nevada National Security Site were analyzed in the 2014 Final Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada (DOE/EIS-0426) 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 MLLW disposal sites.

In addition to disposal of the irradiated fuel that will be generated as described above, industrial, mixed, and low-level waste (LLW) will be generated throughout the R&D process. This waste will be classified and disposed of in accordance with INL procedures and DOE regulations and requirements.

Environmental Aspects or Potential Sources of Impact:

Air Emissions

Experiment irradiation and PIE will be performed at the ATR and MFC facilities. Air emissions would include minor amounts of radionuclides and toxic air pollutants. The irradiation in the ATR is not a modification in accordance with Idaho Administrative Procedures Act (IDAPA) 58.01.01.201 and 40 Code of Federal Regulation (CFR) 61 Subpart H. ATR radionuclide emissions are sampled and reported in accordance with Laboratory Wide Procedure (LWP)-8000 and 40 CFR 61 Subpart H.

The irradiated specimens will be delivered to the MFC HFEF for disassembly and then undergo routine PIE before being sent to the AL for analysis. The PIE examination in HFEF and the analysis completed in the Analytical Lab is not a modification in accordance with Idaho Administrative Procedures Act (IDAPA) 58.01.01.201 and 40 Code of Federal Regulation (CFR) 61 Subpart H.

Packaging in HFEF is not a modification in accordance with Idaho Administrative Procedures Act (IDAPA) 58.01.01.201 and 40 Code of Federal Regulation (CFR) 61 Subpart H.

Releases of radioactive airborne contaminants from the proposed action are not expected to increase to the annual dose to the Maximum Exposed Individual (MEI).

Discharging to Surface-, Storm-, or Ground Water

NA

Disturbing Cultural or Biological Resources

CULTURAL RESOURCES: Pursuant to the 2023 Programmatic Agreement as amended in 2025, the proposed action does not meet the threshold of a federal undertaking with the potential to affect historic properties and will have no effect to historic properties.

Generating and Managing Waste

Total project transuranic waste volume is projected to be less than 1 m3. Experiment disassembly creates relatively small amounts of LLW radioactive waste for disposal. Cutting, slicing, grinding, and polishing activities create small volumes of remote handled LLW

Releasing Contaminants

When chemicals are used during the project there is the potential for spills that could impact the environment (air, water, soil).

Using, Reusing, and Conserving Natural Resources

Project description indicates materials will need to be purchased or used that require sourcing materials from the environment. Being conscientious about the types of materials used could reduce the impact to our natural resources.

Determination

References:

B3.6 Small-scale research and development, laboratory operations, and pilot projects. 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); and 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 or developed 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.

NEPA coverage for the transportation and disposal of waste to WIPP are found in the 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.

The environmental impacts of transferring LLW from the INL Site to the Nevada National Security Site were analyzed in the 2014 Final Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada (DOE/EIS-0426) 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 MLLW disposal sites.

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.

Approved by Robert Douglas Herzog, DOE-ID NEPA Compliance Officer on: 4/15/2026