DOE-ID NEPA CX DETERMINATION
Idaho National Laboratory

CX Posting No.: DOE-ID-INL-22-030

SECTION A. Project Title: Installation and Operation of Vitrification System in MFC-765, Fuel Conditioning Facility

SECTION B. Project Description and Purpose:

The Idaho National Laboratory (INL), through the Department of Energy (DOE), is responsible for the disposition of excess material and generated waste inventories. Following the successful disposal of legacy drums contaminated with residual Fermi reactor sodium using a vitrification technology, INL began to evaluate the potential to use vitrification technologies for other wastes. It may be possible to manage difficult materials and new wastes generated from Research and Development (R&D) activities using vitrification to incorporate and encapsulate wastes and excess materials within a glassified form.

Vitrification has been proposed for many different types of waste; borosilicate glass is being used to immobilize reprocessing waste from commercial spent fuel (i.e., West Valley, New York), and from reprocessing waste from weapons production at Hanford, Washington and Savannah River, South Carolina. Work in the 1970's and 1980's demonstrated vitrification methods for immobilizing wastes in soils. Adaptation of that technology demonstrated immobilization of wastes in containers, notably burial boxes, drums, and canisters. This type of "in-situ" vitrification has been commercialized and was the method used to dispose of the residual Fermi drums contaminated with radioactively contaminated sodium.

The Nation's renewed interest in nuclear power, and the government's advancement of new nuclear fuel and reactor designs, has led to an increase in work at the INL. Reactor development projects are driving changes to the type of materials being used to fuel these reactors. All types of advanced metal and ceramic fuels, as well as molten fuel salts, are being developed. INL is a natural place to develop and test these advanced fuels. INL has the capabilities, staffs, and facilities to develop fabrication methodologies, a test reactor to test the fuels, and facilities to perform post-irradiation examination of these fuels. In some cases, new reactors have been proposed to demonstrate and test both the fuel and operating principles of the reactor.

While many of these new wastes will have radionuclide contents that may meet the requirements for low-level waste (LLW), transuranic waste (TRU), and others, their physical form may not be amenable for disposal. Physically, some wastes may be reactive or pyrophoric, some may or will contain liquids, some might not have long-term stability, and others may require treatment. Vitrification can be used to convert these challenging waste streams into highly stable forms (e.g., glass, synthetic rock, cements) that are easily accommodated in any engineered barrier system envisioned for disposal.

INL has developed a strategy to partner with outside vendors and other National Laboratories and universities to develop a capability at the INL for demonstrating the vitrification processing of wastes and materials from new and existing reactor research and development efforts. This will enable these new projects to advance while responsibly managing the waste streams generated by these projects.

The purpose of the proposed work for this phase is to expand on the application of vitrification technology for processing newly generated and legacy liquid and solid radiological and hazardous radiological waste materials generated by INL Research and Development (R&D) activities. INL and an industry partner will construct and operate the Nuclear Material Waste Melter in the Fuel Conditioning Facility (FCF) at the Materials and Fuels Complex. The pilot-scale melter will be used to research the effectiveness and viability of developing vitrified waste forms suitable for disposal. Initially, the system will be used to process liquid waste from the Special Nuclear Material Test Bed (Beartooth) and sodium-contaminated plenum tips that are generated during spent fuel chopping operations in FCF. Conservatively, 160 liters of liquid waste may be produced quarterly from the Beartooth project; however only 1 gallon at a time will be processed in the melter. The number of plenum tips that will be processed at any one time will be determined at the time of loading and will be limited by the dose on the exterior of the melter container (and 55-gallon drum). The dose on the exterior of the melter container must be kept to less than 200 mrem on contact. The melter will consist of a vitrification unit coupled to an off-gas system. Design of this melter system is part of this project and is ongoing. The specifics of the melter have not been finalized, but previous projects have completed conceptual designs of similar units, and the industry partner has commercial vitrification units in operation today. The proposed pilot-scale melter system will provide scientists and engineers with the opportunity to develop better, more stable waste forms for final disposition. These designs will serve as the basis for a production scale melter to be installed in FCF to support future operations. Furthermore, successes at this initial stage are expected to lead to an expanded role for vitrification methodologies in support of these new reactor projects.

The melter will be installed in room 23A in FCF and control equipment will be installed in room 23B. The melter exhaust will tie into the FCF air cell exhaust system in Room 23A upstream of the two HEPA filters that meet the HEPA filter requirements in INL Air Quality Permit to Construct P-2020.0045 (PER-152). Physical modifications required for installation include drilling holes in the floor of rooms 23A and 23B for electrical tie-ins and cutting holes in the walls and installing conduit to connect to the FCF air cell exhaust system. To connect the control equipment to the melter, either the wall between rooms 23A and 23B will be removed entirely or penetrations will be cut into the wall. Shielding may be added to the doors and walls of room 23A.

THIS ECP MUST BE REVISED IF ADDITIONAL MATERIALS ARE IDENTIFIED FOR TREATMENT IN THE MELTER OR IF FULL SCALE WASTE TREATMENT WITH EXISTING OR NEW EQUIPMENT OCCURS.

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

The proposed action has the potential to generate chemical and radionuclide air emissions at FCF. However, these emissions are controlled by INL Sitewide Permit to Construct and Facility Emission Cap P-2015.0023 (PER-152) and are monitored continuously with a 40 CFR 61 Subpart H compliant stack monitoring system. An Air Permit Applicability Determination (APAD) will be required to document the anticipated emissions from the project. The melter exhaust will tie into the FCF air cell exhaust system which contains two HEPA filters that meet the HEPA filter requirements in INL Air Quality Permit to Construct P-2020.0045 (PER-152).

Discharging to Surface-, Storm-, or Ground Water

N/A

Disturbing Cultural or Biological Resources

The proposed action is a federal undertaking defined in 36 CFR 800.16(y), and although it is the type of activity that has the potential to cause effects to historic properties, it is excluded from Section 106 review per MCP-8008, Appendix B. The proposed action is excluded under Activity Type #8: Internal Reconfiguration of Active Laboratories, because the proposed actions will reconfigure Rooms 23A and 23B in support of new experimental equipment. While there will be some loss of historic fabric through the drilling of holes for floor anchors and running conduit, that loss is negligible given the size of the property. Based on available materials, the wall between Rooms 23A and 23B was added between 1996 and 2010. As it is not of historic age, penetrations through or the removal of the wall will have no effect. The addition of shielding falls under Exempt Activity #6: Safety Systems, as it proposes to install "personnel safety systems or devices within the built environment." Therefore, there are no further obligations under Section 106. No CRR is required.

Generating and Managing Waste

Project activities will generate waste including industrial, RCRA hazardous, radioactive, and mixed waste. PCB waste could be generated when modifying buildings built before 1982 or working with pre-1982 equipment/materials. Examples include electrical equipment/components, painted surfaces, light fixtures, caulking, ventilation duct gaskets, and insulation. It is estimated that a maximum of 0.50 cubic meters of industrial and hazardous waste and a maximum of 1 cubic meter of LLW or TRU waste would be generated annually. Project personnel will work with WGS to characterize and properly disposition waste

Releasing Contaminants

When chemicals are used, there is the potential for spills.

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, Item B3.6, "Small-scale research and development, laboratory operations, and pilot projects" and B1.31, "Installation or relocation of machinery and equipment".

Justification:

The proposed project is consistent with CX B.1.31 "Installation or relocation and operation of machinery and equipment (including, but not limited to, laboratory equipment, electronic hardware, manufacturing machinery, maintenance equipment, and health and safety equipment), provided that uses of the installed or relocated items are consistent with the general missions of the receiving structure. Covered actions include modifications to an existing building, within or contiguous to a previously disturbed or developed area, that are necessary for equipment installation and relocation. Such modifications would not appreciably increase the footprint or height of the existing building or have the potential to cause significant changes to the type and magnitude of environmental impacts.

The proposed R&D activities are consistent with CX 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.'

The proposed operation of a pilot-scale waste stabilization and treatment equipment is consistent with CX B6.2 "The siting, construction, and operation of temporary (generally less than 2 years) pilot-scale waste collection and treatment facilities, and pilot-scale (generally less than 1 acre) waste stabilization and containment facilities (including siting, construction, and operation of a small-scale laboratory building or renovation of a room in an existing building for sample analysis), provided that the action (1) Supports remedial investigations/feasibility studies under CERCLA, or similar studies under RCRA (such as RCRA facility investigations/corrective measure studies) or other authorities and (2) would not unduly limit the choice of reasonable remedial alternatives (such as by permanently altering substantial site area or by committing large amounts of funds relative to the scope of the remedial alternatives)."

The proposed research and development for used nuclear fuel management, treatment of wastes at INL, and transportation of wastes is consistent with DOE's Programmatic Spent Nuclear Fuel (SNF) Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement 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) and Final Waste Management Programmatic Environmental Impact Statement [WM PEIS] (DOE/EIS0200-F, May 1997).

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

Approved by Jason L. Anderson, DOE-ID NEPA Compliance Officer on: 12/19/2022