

DOE-ID NEPA CX DETERMINATION

Idaho National Laboratory

SECTION A. Project Title: Synthesis of Molten Chloride Salt Fast Reactor (MCSFR) Fuel Salt from Spent Nuclear Fuel (SNF)

SECTION B. Project Description and Purpose:

The purpose of the proposed action is to study the exchange chemistry between irradiated mixed-oxide (MOX) fuel from the Fast Flux Test Reactor and a ternary molten salt, e.g. NaCl-KCl-ZrCl₄. The ZrCl₄ is expected to convert the actinide oxides and many of the fission product oxides in the MOX fuel into metal chlorides in the molten salt. Approximately 600 g of molten salt and 150 g of MOX fuel will be used in the Hot Fuels Dissolution Apparatus (HFDA) furnace in the Hot Fuels Examination Facility (HFEF) at the Materials and Fuels Complex (MFC). Salt samples will be collected and analyzed in the MFC Analytical Laboratory (AL). The 150 g of MOX fuel is already present in HFEF in powder form. The 600 g of salt will be prepared in MFC-789 and sent to HFEF.

The proposed action is divided into the following four consecutive tasks:

Task 1: Prepare for Experiments in HFEF

An experiment plan will be prepared, and submitted to HFEF and AL management for approval.

The crucible and electrodes for use in the HFDA will be fabricated, and the salt (e.g., NaCl-KCl or NaCl-KCl-ZrCl₄) will be prepared in a non-radiological laboratory and transferred to HFEF. MOX fuel will also be prepared.

Task 2: Perform Experiments in HFEF

Experiment will be performed in the HFDA to study the exchange chemistry between the MOX fuel and the ternary salt (e.g., NaCl-KCl-ZrCl₄), and approximately six samples of the fuel and salt will be collected for chemical analyses. The residual salts and MOX fuel will be disposed as process waste.

Task 3: Perform Chemical Analyses in AL

Samples will be transferred from HFEF to AL for chemical analyses, including gamma spectroscopy, inductively coupled plasma mass spectroscopy (ICP-MS), and inductively coupled plasma optical emission spectroscopy (ICP-OES). When the chemical analyses are complete, the residual samples will be disposed of as process waste.

Task 4: Prepare Final Technical Report

A final technical report that describes the experiment and results will be completed.

The shipment of FTF fuel and R&D on that fuel was covered by the 1995 Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Environmental Impact Statement (SNF EIS) and was described in EC ANL-W-EC-513 "Transfer of FTF Fuel Pins." Furthermore, Section 3.1 of the Record of Decision (ROD) for the SNF EIS states that DOE decided to implement the preferred alternative (Alternative 4a, Regionalized by Fuel Type) for management of spent fuel. In Volume 1, Appendix B, Table 3-1 summarized the activities covered within Alternative 4a including R&D. R&D activities are described in more detail in Section 3.1.2.4, Research and Development, on page 3-10 of Volume 1, Appendix B. The fuel is described in Appendix J of Volume 1. The impacts from transportation of the SNF from Hanford were analyzed in section 5.1.5 and Appendix I of Volume 1 and were within the bounds of the amended ROD for the SNF EIS that was issued in March 1996.

After PIE at INL, the irradiated sample segments and PIE remnants generated from this research and development activity would be stored with other similar DOE-owned irradiated materials and experiments at MFC, most likely in HFEF or the Radioactive Scrap and Waste Facility (RSWF). Ultimate disposal of the irradiated sample segments and PIE remnants would be along with similar DOE-owned irradiated materials and experiments currently at MFC which are generated from other research and development activities. Categorizing this material as waste is supported under 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..."

Packaging, repackaging, transportation, receiving, and storing used nuclear fuel and research and development 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 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 analysis includes 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 environmental impacts of transferring low level waste (LLW) from the INL to the Nevada National Security Site were analyzed in the 1996 Nevada Test Site 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 MLLW disposal sites. The SA considers additional waste streams, beyond those considered in the 1996 NTS EIS that may be generated at or sent to the Nevada National Security Site for management.

To complete the proposed action, 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). 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)

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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.

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

Activities at the Hot Fuel Examination Facility and the Analytical Laboratory may contribute to radioactive emissions.

Generating and Managing Waste

The salt generated in HFEF will contain uranium and transuranics (as a result of contact with the MOX fuel) and has the potential to generate approximately 0.5 Liter TRU waste (NaCl-KCl salt containing TRU). As a consequence of analyzing the salt samples, the AL will also generate waste containing transuranic radionuclides. Hazardous/mixed waste is not expected. Project activities also have the potential to generate low level waste (LLW). Waste will be characterized with assistance from Waste Generator Services (WGS) to determine proper management.

Releasing Contaminants

As described in the air emissions section above, radioactive air emissions are anticipated as a result of irradiation activities associated with this project.

Using, Reusing, and Conserving Natural Resources

All material would be reused and/or recycled where economically practicable. All applicable waste would be diverted from disposal in the landfill when possible. Project personnel would use every opportunity to recycle, reuse, and recover materials and divert waste from the landfill when possible.

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, B3.6, "Small-scale research and development, laboratory operations, and pilot projects"

Programmatic Spent Nuclear Fuel 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-203-SA-02) and the Amended Record of Decision (1996).

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) Final Waste Management Programmatic Environmental Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (May 1997) and Record of Decision (DOE/EIS-200) and Revised Record of Decision (65 FR 10061, February 25, 2000).

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, Sept. 1997).

Justification: Project activities are consistent with 10 CFR 1021, Appendix B, 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); 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

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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."

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DOE/EIS-0200 made the Nevada National Security Site available to all DOE sites for low-level waste disposal, and DOE/EIS-0243 and ROD (65 FR 10061, February 2000) analyzed the impacts of transportation from the INL and disposal at the Nevada National Security Site.

The potential for transportation accidents has already been analyzed in the SNF EIS (Section 5.1.5 and Appendix I-5 through I-10). 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 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; SEISII addresses impacts associated with alternative treatment methods, the disposal of TRU waste at WIPP and alternatives to that disposal, and the transportation to WIPP.

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: October 30, 2017