

DOE-ID NEPA CX DETERMINATION

Idaho National Laboratory

SECTION A. Project Title: Advanced Fuels Campaign Fuel Dissolution in HFEF

SECTION B. Project Description and Purpose:

The purpose of the proposed chemical fuel dissolution technique is to remove the fuel without causing damage to the microstructure of the fuel's cladding. This way the cladding can be used in mechanical testing with more certainty that the microstructure is unchanged from its irradiated state. The chemical fuel dissolution will also give the program the ability to perform fuel refabrication with the cladding. This will allow prior fuel to be removed and leave a clean surface for cladding welding techniques once fresh fuel is placed in the cladding.

The Advanced Fuels Campaign (AFC) dissolution experiment will require custom fixturing for the exams. The following equipment and new systems will be needed to support AFC dissolution activities:

- Chemical compatible containers and handling aids.
- A hot plate that is remotized for use in the Hot Fuel Examination Facility (HFEF).
- Chemical buffer system to remove fumes from dissolution process. The buffer system can be a vapor collection system that bubbles the vapor through a neutralizing agent. Verification of the proper neutralizing agent will occur prior to design qualification.

AFC proposes to experiment with 6-inch segments of fuel. The fuel and cladding pieces are to be dissolved in 6M nitric acid (HNO₃). The 6M HNO₃ will be heated to near boiling and the fuel and cladding pieces will be introduced to the system. Depending on fuel content, the samples will be exposed for 20-minute increments. Visual inspection will be used to verify absence of fuel until a conservative time can be estimate for all pieces. Verification of the absence of fuel can be accomplished through use of a microscope. Depending on the length of the samples, the fuel may be etched out of the cladding in half sample increments by dipping the sample into the acid bath and then rotating it once half of the sample is complete. The Nitric Acid bath will dissolve the fuel out of the cladding but not completely dissolve the fuel. The solution will then need neutralized with Magnesium Oxide (MgO) to eliminate the hazardous nitrates and then solidified using a Waste Isolation Pilot Plant (WIPP) Basis of Knowledge (BoK) approved sorbent.

The proposed action is anticipated to use commercial fuel from the Byron plant if it is approved to be shipped to INL.

In April 1995, DOE completed the *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE/EIS-0203) (hereafter, 1995 EIS) (DOE 1995a). The 1995 EIS contains an analysis of the potential environmental impacts associated with managing DOE's complex-wide spent nuclear fuel (SNF) Program from 1995 until 2035 and includes an analysis of a broad spectrum of fuel element designs.

In the June 1995 Record of Decision (ROD) for the 1995 PEIS, DOE selected Alternative 4a (Regionalization by Fuel Type) and decided to transport 165 Metric Tons of Heavy Metal (MTHM) in 1,940 planned shipments of SNF (including 575 Navy shipments) to the INL Site through the year 2035 [60 Federal Register (FR) 28680, June 1, 1995].

DOE issued an amended ROD in June 1996 for the 1995 PEIS, which lowered the number of planned shipments of SNF to the INL Site to 1,133 (575 shipments for the Navy and 558 planned shipments for DOE) (61 FR 9441, March 8, 1996).

At present, INL cannot accept irradiated fuel subject to the Idaho Settlement Agreement. In November 2019, DOE and the State of Idaho signed the *Supplemental Agreement Concerning Conditional Waiver of Section D.2.e and K.1 of 1995 Settlement Agreement* wherein the parties agree that DOE may resume the receipt of and plan for additional research quantities of commercial SNF at INL pursuant to the 2011 Memorandum of Agreement, the terms and conditions of which govern such additional shipments, upon successful production of at least 100 canisters of treated sodium-bearing high-level waste (HLW) located at INL and so long as:

- DOE is not in breach of any terms and conditions of the 1995 Agreement, or the 2008 Agreement other than those described in the Supplemental Agreement and
- The Integrated Waste Treatment Unit (IWTU) is continuing sustained operations to treat the remaining Sodium Bearing HLW located at INL.

INL anticipates it will be able to accept the irradiated lead test rods by 2022. If INL cannot accept the irradiated lead test rods, another facility will complete PIE and other activities.

The amount of irradiated fuel INL can receive remains subject to the limits established in the 1995 Agreement, —55 metric tons heavy metal (MTHM)—, and the INL Site has received 81 shipments of spent nuclear fuel that contained 27.8646 MTHM since 1995. DOE anticipates it will not reach the total number of shipments or MTHM limits identified in the MOA and amended ROD before 2035. Based on current planning, DOE anticipates the INL Site will receive less than 21 MTHM of additional SNF before 2035. Therefore, DOE would not exceed the 55 MTHM limit imposed through the Settlement Agreement by receiving the additional LFR or LTAs. However, prior to planning to receive or ship commercially

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irradiated materials to INL, this EC will be revised to verify material quantities and transportation routes have been evaluated in compliance with the National Environmental Policy Act (NEPA).

In the meantime, alternate fuels include accident tolerant fuel, HB Robinson, and Dresden fuel that currently exists in cell.

Following the proposed research and development (R&D), 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/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). 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 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 potential for transportation accidents was analyzed in the SNF EIS (Section 5.1.5 and Appendix I-5 through I-10).

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

Emissions from the project will be discharged into the facility exhaust, which is run through several series of HEPA filter banks prior to its emission. These emissions are monitored with an ANSI N13.1 2011 compliant monitor. NOx emissions will be negligible as documented in TEV-4215, "Evaluation of Off-gas Effects when Performing Aqueous Leaching in HFEF Shield Cells". Radionuclide emissions would be encompassed by source term documented in APAD INL-20-002, Table 3-HFEF Source Term from DSA-003-HFEF.

Discharging to Surface-, Storm-, or Ground Water

N/A

Disturbing Cultural or Biological Resources

HFEF is eligible for listing on the National Register of Historic Places (NRHP), and all project activities associated with the building must undergo cultural resource review (CRR). Contact INL CRMO (Reese Cook, 208.526.4029 or reese.cook@inl.gov) to initiate cultural resource review.

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Generating and Managing Waste

The project will generate acid solution from the chemical dissolution process, which will require neutralization and absorption of the solution before disposal. All neutralization and absorption will be compatible with the WIPP BoK. It is estimated that no more than 0.02 cubic meters of TRU waste would be generated.

Releasing Contaminants

All chemicals typically used will be managed in accordance with laboratory procedures. 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 MFC Environmental staff. If the MFC Environmental Manager 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 Waste Generator Services.

Using, Reusing, and Conserving Natural Resources

All material will 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. The project would practice sustainable acquisition, as appropriate and practicable, by procuring materials that are energy efficient, water efficient, are bio-based in content, environmentally preferable, non-ozone depleting, have recycled content, and are non-toxic or less toxic alternatives.

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"

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-0203-SA-02) and the Amended Record of Decision (1996)

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 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, December 2014).

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."

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

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Programs Final Environmental Impact Statement (FEIS) and ROD (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). 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. Irradiated sample debris and secondary waste could total as much as 20-30 Kg. 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...".

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.

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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: 07/08/2021