

# DOE-ID NEPA CX DETERMINATION

## Idaho National Laboratory

### SECTION A. Project Title: Synthesis of Out-of-pile and In-pile Test Data for Advanced Technology Fuels (ATF)

### SECTION B. Project Description and Purpose:

Idaho National Laboratory (INL) proposes to collaborate with International Atomic Energy Agency (IAEA)'s Department of Nuclear Sciences and Applications to support interested IAEA Member States in their efforts to design and develop Accident Tolerant and Advanced Technology Fuels (ATF) for light water reactors (LWRs) and enhance the safety and sustainability of nuclear power. The primary goal of this work is to understand and address factors affecting the design, fabrication and in-pile behavior of currently operating and innovative nuclear fuels and materials for power reactors and to increase technology readiness for candidate ATF materials. Under the proposed action, the two organizations will continue to work together on ATF cladding and fuels, including high density pellets, doped UO<sub>2</sub>, and high burnups.

The team will collaborate with Czech Technology University in coated cladding testing and characterization and the University of Tennessee in developing ATF property models. The team will synthesize the published test results and open literature data to generate modeling inputs for model construction and validation.

The research objective is to synthesize out-of-pile and in-pile test results and identify the open literature data needed, which the two organizations have published, to develop computer codes and models to advance the understanding and licensing of advanced technology fuels. The modeling work will generate better understanding and prediction of the advanced technology fuels (ATF) behavior in normal operation and accident conditions to improve the ATF design. This iterative progress will also help accelerate qualification and licensing of ATF. The team will perform basic materials characterization on the coated cladding samples from Czech Technology University produced to improve the understanding of hydrogen migration and uptake in coated ATF cladding. The cladding samples will not be irradiated.

INL will perform the following tasks:

1. Determine the data needed to construct models for selected ATF concepts with IAEA members.
2. Identify and summarize the published test data including open literature data to support model development.
3. Perform microstructure characterization and micromechanical testing for coated cladding samples made at University of Wisconsin and Czech Technology University (the INL Irradiated Materials Characterization Laboratory [IMCL] is available).
4. Perform literature review of post-irradiation examination data for ATF.
5. Synthesize University of Tennessee test data for incorporation into ATF modeling.
6. Support to model benchmarking and validations.
7. Attend IAEA CRP meetings to report the progress every 18 months.
8. Develop a summary report for the IAEA project.

INL will also use previously irradiated material currently in storage for this project. Characterization includes electron microscopy, and may include fission gas measurement, thermal property measurement, non-destructive examination such as profilometry, and visual inspection. This work will take place at the Hot Fuel Examination Facility (MFC-785), IMCL (MFC-1789), and the Electron Microscopy Laboratory (MFC-774) at the Material and Fuels Complex. The project will return irradiated material to storage upon completion of the project.

### SECTION C. Environmental Aspects or Potential Sources of Impact:

#### Air Emissions

The specimens will be delivered to the MFC HFEF for disassembly and then undergo routine PIE. All radionuclide release data associated with the PIE portion of this experiment will be recorded as part of the HFEF continuous stack monitor. The PIE examination 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. SEM/TEM work will involve sample prep and PFIB at IMCL. This is important as PFIB removes material from the sample in preps for TEM and is required to have the IMCL stack monitor operable for air emissions.

In 2019, the effective dose equivalent to the offsite maximally exposed individual (MEI) from all operations at the INL Site was calculated as 5.59 E-02 mrem/yr, which is 0.56% of the 10-mrem/yr federal standard and was calculated using all sources that emitted radionuclides to the environment from the INL site. The emissions from the proposed action are part of the routine operations at the facility. Therefore, the emissions are bounded by the analysis in the 1995 EIS, which estimated the annual cumulative doses to the maximally exposed worker, offsite maximally exposed individual (MEI), and the collective population from DOE's decision to implement the preferred alternative (DOE/EIS-0203). The potential air emissions and human health impacts associated with the proposed action would be smaller than and are bounded by the impacts presented in the 1995 EIS.

#### Discharging to Surface-, Storm-, or Ground Water

N/A

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### Disturbing Cultural or Biological Resources

The Electron Microscopy Laboratory (MFC-774) is more than 50 years old. However, no structural or aesthetic changes will be made to the building.

### Generating and Managing Waste

The proposed action will generate small amounts of low-level waste (LLW) in the form of personal protective equipment (PPE) and towels used for cleaning and polishing.

Project activities will generate TRU waste. INL estimates the project will generate no more than 10 g of TRU waste.

Project activities will also generate small amounts of industrial waste.

Project personnel would work with WGS to properly package and transport regulated, hazardous or radioactive material or waste according to laboratory procedures.

### Releasing Contaminants

When chemicals are used, there is the potential for spills to air, water, or soil.

### 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. 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. Project activities may release known greenhouse gases (GHGs) to the atmosphere and increase INL's energy use.

**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".

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

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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 analysis, residues and products will be stored with other similar DOE-owned irradiated materials and experiments at MFC, most likely in the Hot Fuels Examination Facility (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 residues 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..."

NEPA coverage for the transportation and disposal of waste to Waste Isolation Pilot Plant (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.

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

Approved by Jason Anderson, DOE-ID NEPA Compliance Officer on: 04/07/2021