

DOE-ID NEPA CX DETERMINATION

Idaho National Laboratory

SECTION A. Project Title: Training Research Isotope (General Atomic) [TRIGA] Eutectics Evaluation

SECTION B. Project Description:

Fuel element temperature is a safety parameter for TRIGA reactors. High-temperature limits are established to mitigate loss of cladding confinement and the subsequent release of fission products. For some TRIGA reactors, a Loss of Coolant Accident (LOCA) is postulated where the fuel element temperatures could exceed safe levels. It is postulated that excessive temperatures could cause the cladding to fail by the following:

- Over-pressurization caused by contained gases in the fuel element
- Eutectic phases could form between the uranium in the fuel meat and the iron, chromium, or nickel in the cladding.

The propensity for the formation of eutectic phases between the constituents of typical TRIGA fuel and cladding materials [fuel/cladding chemical interaction (FCCI)] has surfaced in the past. Prototypic work to investigate if there is a formation of eutectics has not been conducted nor has it been observed at the operating conditions that are characteristic of TRIGA reactors. Some calculations have shown that temperatures during latter stages of decay heating could exceed those for eutectic phase formation between the constituents of the TRIGA fuel/cladding materials.

The project plans to transfer two TRIGA elements currently stored at the Idaho Nuclear Technology and Engineering Center (INTEC) to the Hot Fuels Examination Facility (HFEF) at the Materials and Fuels Complex (MFC) at Idaho National Laboratory (INL) using the Battelle Energy Alliance, LLC (BEA) Research Reactor (BRR) cask in order to perform post irradiation examination (PIE) to determine if eutectic phases are formed between the differing materials, and its impact on cladding integrity. Process modifications and operational changes at INTEC to support the proposed action have been documented in the Idaho Cleanup Project's environmental checklist 32092.

The proposed PIE includes sectioning the fuel, heating the fuel, then optically analyzing the fuel in HFEF. Sections would then be sent to the electron microscopy laboratory/analytical laboratory for scanning electron microscope analysis.

Engineering design and analysis and other activities will be performed at the Research and Education Campus in Idaho Falls as well as the Materials and Fuels Complex (MFC). Equipment modifications to support the activities will occur within HFEF at MFC. Fabrication of equipment may be performed off-site or on-site by craft personnel.

Project activities described in this environmental checklist will use existing facilities at INL and proposed activities are consistent with current facility operations.

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] (Department of Energy (DOE)/Environmental Impact Statement (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 Record of Decision (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. (SEIS-II also includes potential transportation between generator sites.)

Project Start and End Dates: October 1, 2014 - December 30, 2015

Approximate Project Costs: \$1.8M

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions: This project will result in radioactive air emissions. Emissions from the MFC facilities will be within those historically generated and bounded by existing analyses. All radionuclide release data will be recorded as part of the HFEF continuous stack monitor and calculated and provided to Programs Environmental Support organization by January 31 of each year for the preceding calendar year as part of the INL Annual National Emission Standards for Hazardous Air Pollutants (NESHAPs) report to DOE. Releases of radioactive airborne contaminants from this process are not expected to result in an increase to the annual HFEF dose to the Maximum Exposed Individual.

Project personnel must coordinate with the appropriate Program Environmental Lead (PEL) to evaluate each project with the potential to emit air pollutants to ensure air emissions would not constitute a new source or modification to an existing source. This includes radionuclides, criteria pollutants (i.e., oxides of sulfur [SO_x], oxides of nitrogen [NO_x], particulate matter [PM], volatile organic compounds [VOCs] or toxic air pollutants (i.e., carbon tetrachloride, mercury).

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Generating and Managing Waste: Small amounts (< ~2 ft³) of remote-handled transuranic (RH-TRU) waste may be generated. Remote-handled low level waste and contact handle waste could also be generated. Pollution Prevention would be incorporated whenever economically practicable to reduce the volume and/or toxicity of waste generated. The project manager would ensure Waste Generator Services (WGS) is provided with a charge number to perform waste determinations and waste characterization. This characterization would be performed according to WGS published procedures. All waste generated would be managed in accordance with laboratory procedures.

Releasing Contaminants: Very small amounts of radioactive material may be emitted during the course of this work as discussed in "Air Emissions." All chemicals will be handled in accordance with laboratory procedures.

Using, Reusing and Conserving Natural Resources: All materials would be reused and/or recycled where economically practicable and as accepted by the customer. All applicable waste would be diverted from disposal in the landfill where conditions allow. New equipment would meet either the Energy Star or Significant New Alternatives Policy (SNAP) requirements as appropriate (see <https://sftool.gov/green-products/0/hvacmechanical?agency=0>). In addition, the project would practice sustainable acquisition, as appropriate and practicable, by procuring construction materials that are energy efficient, water efficient, are bio-based in content, environmentally preferable, non-ozone depleting, have recycled content, or are non-toxic or less-toxic alternatives.

SECTION D. Determine the Recommended Level of Environmental Review (or Documentation) and Reference(s): 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 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"

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: 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."

The impacts of transporting and disposing of waste resulting from defense activities that was placed in retrievable storage pursuant to a 1970 Atomic Energy Commission policy (see Section 1.2) and TRU waste that was reasonably expected to be generated by ongoing activities and programs was analyzed in DOE/EIS-0026 (October 1980) and the Final Supplement Environmental Impact Statement for the Waste Isolation Pilot Plant (SEIS-I) (DOE/EIS-0026-FS, January 1990).

NEPA coverage for the transportation and disposal of waste to WIPP are found in 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. DOE has analyzed TRU waste management activities in 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. (SEIS-II also includes potential transportation between generator sites.)

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

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on: 1/7/2015