

DOE-ID NEPA CX DETERMINATION

Idaho National Laboratory

SECTION A. Project Title: Irradiation Testing of Accident Tolerant Fuels (ATF) in the Advanced Test Reactor (ATR) Water Loop
Revision 2

SECTION B. Project Description and Purpose:

Revision 2:

Revision 2 of this EC includes the scope from the original EC and adds activities for preparing test train assemblies for the Accident Tolerant Fuel program.

Unsealed/non-encapsulated radioactive materials are evaluated on a case-by-case basis to allow storage and handling in the Test Train Assembly Facility (TTAF). The Accident Tolerant Fuels Program (ATF-2) plans to ship ceramic fuel pellets packaged in unsealed/non-encapsulated fuel pins to the TTAF. The fuel pins are made of varying types of metallic thin-walled tubing with two end caps press fit into place. One end cap has a small weeper hole to reduce the heat introduced to the fuel rod during laser welding. The first press fit end cap is laser welded onto the fuel pin at the TTAF prior to fuel loading at the Materials and Fuels Complex (MFC). The prepared and empty fuel pins are then shipped to MFC for fuel loading. The fuel pellets are wiped clean (radiologically) prior to insertion into the fuel pin and then the last end cap press fit. The loaded fuel pins are then shipped to the TTAF for laser welding the non-welded end cap. The fuel pin is then loaded into a specially-designed pressurized weld fixture, where the fuel pin is purged of oxygen and backfilled with inert gas and pressurized. A TIG torch welder is then used to perform the final seal weld on the small weeper hole.

A test train assembly may consist of individual capsules or multiple capsules. The irradiation capsule, depending on experimenter specifications, may be fitted with multiple thermocouples and with separate gas supply and return lines. As applicable, each test train is pressure tested and leak tested during and after assembly. Each test train is assembled in accordance with specific work control documents, in addition to this EC, that identify additional equipment used. Assembly of the test trains involves machining, welding, brazing, plating, micro sandblasting, thermocouple potting, and thermocouple splicing (typical shop activities).

Major equipment used in the TTAF includes:

- Induction braze machine
- Resistance spot welder
- Tube welder
- GTAW Automated lathe welder
- Gas tungsten arc welder
- Laser Welder
- Oxyacetylene hand torch
- Electroplating Machine
- Vacuum Chamber Furnace
- Laser Micrometer
- Machining Mill
- Machining Lathe
- Drill Press.

Revision 1:

The Accident Tolerant Fuels (ATF) Project is in the pre-irradiation design validation phase for a water loop experiment, designated as ATF-2, to be irradiated in the Idaho National Laboratory (INL) Advanced Test Reactor (ATR) in 2018 as analyzed in the original EC. Prior to insertion of the ATF-2 experiment in the ATR, a Sensor Qualification Test (SQT) is required to validate sensor performance and structural stability. In order to validate the calculated /expected operation of the ATR SQT, the ATF Project has determined that an SQT mock-up assembly should be conducted out-of-pile (i.e., not in a nuclear reactor) under similar pressures and temperatures to verify the test can withstand the required test conditions prior to ATR insertion. This out-of-pile test will be conducted at the Westinghouse Advanced Loop Tester (WALT Loop) at the Westinghouse mechanical testing facility, located in Churchill, PA. This mock-up test has been designated as the WALT Loop SQT. Results from the WALT Loop SQT will provide data and input for performing the ATR SQT.

Idaho National Laboratory (INL) will conduct the activities listed below as part of this additional scope:

- Purchase and deliver coolant pump for use in the WALT Loop and perform and verify flow rate calculation of pumps
- Fabricate and ship top and bottom loop heads to bolt on to the WALT Loop
- Perform structural analysis to verify top and bottom loop heads meet requirements
- Assemble the WALT SQT test train at INL and ship test train along with a gas panel, cables, test control systems, and instrument data collection systems to the WALT Loop facility
- Maintain ownership of equipment and ship all equipment back to INL after the WALT Loop SQT experiment
- Examine structural integrity of sensors upon completion of the WALT Loop SQT
- Analyze water samples collected during WALT Loop SQT at the Westinghouse location (Westinghouse will dispose of water samples).

This additional scope will not involve radioactive shipments and does not change environmental aspects or work activities identified in the original EC.

Original EC:

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Idaho National Laboratory (INL) has been tasked with the responsibility for conducting irradiation experiments in the Advanced Test Reactor (ATR) for the purpose of assessing the performance of Accident Tolerant Fuels (ATF) concepts under prototypic Pressurized Water Reactor (PWR) operating conditions. INL will lead the planning, design, and analyses of these irradiation experiments in coordination with the various institutions that are engaged in developing the ATF concepts. The INL will perform these irradiation experiments in the ATR water loop 2A and will coordinate the post-irradiation examination (PIE) on the discharged fuels. The discharged fuels will be shipped from ATR to the Hot Fuels Examination Facility (HFEF) and/or the Transient Reactor Test (TREAT) facility at the Materials and Fuels Complex (MFC) of the INL. Although the majority of the PIE is expected to be performed at HFEF and supporting laboratories at MFC, selected samples may be shipped to other hot cell facilities or laboratories for complementary or additional examinations, contingent on the availability of an acceptable shipping cask/container.

Early in the planning phase, the INL design team identified that a Sensor Qualification (SQ) test should be performed in the ATR loop 2A (planned for cycle 162A-1) to validate in-line sensor functionality under ATR reactor/loop PWR operating conditions prior to assembly of the ATF-2 fueled test train. Two normal operating cycles prior to the SQ test (cycle 160A-1), the chemistry in the ATR water loop 2A will be adjusted to meet prototypic PWR conditions. This cycle and the following cycle (160B-1) are considered to be PWR chemistry conditioning cycles necessary to form a baseline prior to inserting the SQ and ATF-2 fueled test trains. The Loop 2A chemistry Experiment Safety Analysis (ESA) will be revised to include the addition of boric acid (H3BO3) to a concentration of 1200 ppm boron. In preparation for the ATR chemical conditioning cycles and subsequent SQ test, an ATR-Critical (ATRC) run will be performed using the ATR loop 2A stainless steel backup (BU) assembly (DWG#1928F23). The ATRC run will be performed utilizing a sealed can filled with PWR chemistry (i.e., borated water) in place of the ATRC flow tube. The can will have the same dimensions in the core region as the flow tube and will more closely represent the ATR water loop 2A conditions. The ATF-2 fueled test will also require an ATRC run. However, the run will utilize the ATF-2 fueled test train assembly (without sensor leads) instead of a backup test assembly.

After successful completion of the SQ test, a fueled test train will be inserted into the ATR water loop 2A using sensors qualified during the SQ test.

The proposed action would use existing facilities and would not expand Department of Energy (DOE) infrastructure.

After the SQ test ATRC run is performed, the borated water cans will be deconned and stored at the ATRC for potential future use. The backup test assembly will be deconned and stored at ATRC for potential future use. No waste will be generated for the ATF-2 fueled ATRC run (will utilize the ATR test assembly). After PIE, the irradiated sample segments and PIE remnants would 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). Ultimate disposal of the irradiated sample segments and PIE remnants would occur 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 Order (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..."

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/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.

Projected Start Date: 2016

Projected End Date: 2022

Estimated Cost: \$35 million

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

Experiment irradiation and PIE will be performed at the ATR and HFEF facilities, respectively. The irradiation of sealed capsules in the ATR primary coolant 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. Normal operation of sealed experiments in ATR primary coolant is not expected to contribute to and/or cause an increase in air emissions. ATR radionuclide emissions are sampled and reported in accordance with Laboratory-wide Procedure (LWP)-8000 and 40 CFR 61 Subpart H. The irradiated experiment 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 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. Therefore, no Air Permit Applicability Determination is required for the project. All experiments will be evaluated by ATR Environmental Support and Services staff, prior to insertion in the ATR. All radionuclide release data (isotope specific in curies) directly associated with this experiment will be calculated and provided to the ATR Programs Environmental Support organization by January 31 of each year for the preceding calendar year.

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Operation of the TTAF will produce emissions from welding, brazing, and plating type activities. Emission limits for non-radioactive pollutants were established in APAD 09-005. A new APAD is being developed to cover potential non-radioactive and radioactive emissions.

Generating and Managing Waste

Irradiated sample debris and PIE waste are expected to generate research and development-related TRU waste and mixed TRU waste. TRU waste generated for the ATF-2 experiments will be less than 50 cubic inches (conservative estimate assuming all UO₂ fuel will be converted to TRU). 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...".

Operation of the TTAF may result in the generation of small amounts of hazardous waste in the form of cleaning solvents, solders, metals; scrap metal (held for recycle whenever appropriate). WGS will evaluate, characterize, and manage potential TTAF waste. In addition, WGS may establish satellite accumulation areas to manage hazardous waste.

Small amounts of low-level waste would be generated in the form of personal protective equipment (PPE) and towels used for cleaning and polishing.

Project activities would also result in the generation of small amounts of industrial waste.

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

Releasing Contaminants

All chemicals and radioactive materials will be managed in accordance with laboratory procedures.

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.

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"

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 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

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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 Jason Sturm, DOE-ID NEPA Compliance Officer on: 8/14/2016