

DOE-ID NEPA CX DETERMINATION

Idaho National Laboratory

SECTION A. Project Title: JAEA-NFD-Hitachi LWR ATR Irradiations Experiment

SECTION B. Project Description and Purpose:

The Japanese Atomic Energy Agency (JAEA) is an independent administrative institution within the government of Japan. The mission of JAEA is to contribute to the welfare and prosperity of human society through nuclear science and technology as Japan's sole comprehensive nuclear research and development institution.

The proposed JAEA Irradiation testing involves the Advanced Test Reactor (ATR) which has availability for up to six JAEA capsules for irradiation beginning in September of 2024. The JAEA experiment will utilize the Acceptance Test Facility (ATF)-1 drop-in capsule design with the outer capsule radially enlarged to allow for the larger Boiling Water Reactor (BWR) sized fuel rodlets.

JAEA has requested irradiating pellets of two different diameters to provide a varied pellet-clad gap irradiation performance which will inform and/or aid viability determination of a Uranium dioxide (UO₂) FeCrAl-ODS Light Water Reactor (LWR) fuel systems and provide the measurements necessary for fuel performance code verification. Proposed irradiation will provide the UO₂/FeCrAl-ODS LWR fuel system with experimental proof to achieve Technology Readiness Level (TRL) 4. The proposed testing strategy will allow JAEA to receive early Post Irradiation Examinations (PIE) measurements on low and moderate burnup fuel rods.

ATR operations strive for 240 days of irradiation per calendar year. For a September 2024 initial insertion date, the low burnup capsules should reach their expected 10 GWd/MTU burnup target after approximately 120 days of irradiation at full power. A target burnup of 30-35 GWd/MTU should be reached after approximately 420 to 480 days of irradiation at full power.

JAEA has requested the UO₂ be procured by INL. UO₂ pellets will be procured from a U.S. Boiling Water Reactor fuels vendor by INL and the pellets will be turned down using the centerless grinder located at the Materials and Fuels Complex (MFC). The INL will fabricate all hardware associated with this irradiation.

The FeCrAl-ODS cladding to be provided by JAEA has an outer diameter that is slightly larger (~0.76 mm larger) than the Pressurized Water Reactor (PWR) specimens that have been irradiated in the ATF-1 program. The current ATF-1 outer capsule design must be modified to account for the larger cladding diameter, and the INL will expand on the current ATF-1 capsule design to accommodate the larger diameter cladding. The modified design will be analyzed to establish the operating limits that meet ATR Safety Analysis Report (SAR) requirements. INL will identify the optimal fuel enrichments that yield JAEA's temperature requirements in the best available positions of ATR prior to procuring the fuel from a U.S. vendor.

The specific scope for these examinations will be refined prior to irradiation and can be modified with consent from INL and JAEA. Modifications are common and come as information revealed during irradiation and/or PIE on low burnup samples.

INL can perform a broad variety of Post Irradiation Examination (PIE). The PIE analyses are proposed based on the assumption that the main objective is the collection of data to validate predictions of fuel performance codes for this rod system. The project is expected to span a time period of 6 years and is subject to change given alterations to the scope e.g., fewer irradiation cycles, added PIE, etc.

The work will correspond with the respective facilities/buildings within INL. The design and analysis work will be performed by resources within Nuclear Science and Technology (NS&T) with support by ATR and MFC engineering resources. The fabrication of hardware will be performed at the North Holmes Lab. The fuel handling, fuel loading, and capsule assembly work will be performed at MFC in either Advanced Fuels Facility (AFF) or Experimental Fuels Facility (EFF). The irradiations work will be performed at ATR and the PIE work will be performed within Hot Fuels Examination Facility (HFEF).

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

There will be potential hexavalent chromium emissions from welding on stainless steel. The emissions are not anticipated to exceed the permitted emission level.

The proposed action has the potential to generate radiological and chemical emissions from irradiation in ATR and PIE at MFC (HFEF). Air emissions are anticipated to be minor, and concentrations would not exceed the current monitored air emissions from these facilities. An Air Permitting Applicability Determination (APAD) would not be required.

Discharging to Surface-, Storm-, or Ground Water

N/A

Disturbing Cultural or Biological Resources

N/A

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Generating and Managing Waste

The project anticipates generating industrial and radioactive waste from fuel loading, capsule assembly, irradiation, and PIE activities.

Releasing Contaminants

There is potential for waste to be released through the sewer system, however; none is anticipated at this time. When chemicals are used during the project there is the potential for spills that could impact the environment (air, water, soil).

Using, Reusing, and Conserving Natural Resources

All materials will be reused and recycled where economically practicable.

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).

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 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,

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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.

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: 12/13/2021