DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-18-034

SECTION A. Project Title: Development of LWR Fuels with Enhanced Accident Tolerance – General Electric Global Research Center

SECTION B. Project Description

General Electric (GE), in collaboration with Global Nuclear Fuels, Oak Ridge National Laboratory (ORNL), Idaho National Laboratory (INL), and Los Alamos National Laboratory, proposes to evaluate iron-chrome-aluminum (FeCrAl) alloys as cladding material for uranium dioxide (UO_2) fuel in light water reactors (LWRs). GE proposes to continue the FeCrAl cladding (trade named IronClad) project. The principal aim during this project is to produce a second installation of a fueled lead test assembly (LTA) into a commercial power reactor (Clinton Unit 1 plant) in the fall of 2019. An additional critical goal is to obtain neutron irradiated data for FeCrAl material and to advance manufacturing processes for ferritic alloys. During this proposal period, GE is planning to expand the scope of the project to coating of Zircaloy tubes to increase fretting and corrosion resistance and to develop silicon carbide (SiC) compatible with 300°C water to be used for the fuel channels. Lastly, the GE team will explore changes in the fuel itself to make it more accident tolerant.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use – Global Nuclear Fuels will provide several rodlets containing UO_2 fuel to be irradiated in the INL Advanced Test Reactor (ATR). 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. The INL Nuclear Safety Program provides the methodologies, processes, and procedures necessary to support compliant operations of INL nuclear facilities and activities. A primary objective of the Nuclear Safety Program is to protect the public, workers, and environment through the identification, evaluation, and control of hazards in nuclear facilities. The Nuclear Safety Program assures identification, management, and implementation of requirements through documented processes and procedures. The Nuclear Safety Program manages these requirements in the Nuclear Safety Management System in accordance with GDE-611, "Management System Guide," and implements program requirements as documented in Laboratory-wide Manual 18, *Nuclear Safety*.

Radioactive material processing and disposal is part of standard operations at Los Alamos National Laboratory and will generally be covered under low-level radiological waste for this work, which can be disposed of according to DOE Order (O) 435.1, Chg. 1. The amount of material will total <500 g for the duration of the work.

Radioactive Waste Generation – 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 experiments at INL will be less than 50 cubic inches (conservatively). 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…" Small amounts of low-level waste would be generated in the form of personal protective equipment (PPE) and towels used for cleaning and polishing. Waste Generator Services (WGS) manages certification, storage, handling, treatment, and disposal of waste generated at INL. Project personnel work with WGS representatives and Program Environmental Leads (PELs) to properly package and transport regulated, hazardous, or radioactive material or waste according to laboratory procedures.

Mixed Waste Generation – Mixed waste is discussed above in the section regarding "Radioactive Waste Generation."

Chemical Use/Storage and Chemical Waste Disposal – Non-hazardous small amounts of chemicals (e.g., 100 g of sodium sulfate, sodium chloride, or zinc acetate) will be used to prepare aqueous solutions that will be used for testing of materials. Use of chemicals at the INL Site is restricted to chemicals that are approved in laboratory procedures (LWP-14607 and LWP-14620). Chemicals are required with the coordination of an INL chemical coordinator in order to ensure compliance with facility limits, approval requirements, and to ensure material safety data sheet (MSDS) information is kept up-to-date. Prior to the acquisition of any new chemical, INL evaluates program requirements with waste minimization techniques, such as product substitution of less hazardous materials or source reduction to only obtain quantities required. INL segregates chemicals by compatibility and stores chemicals according to Guide (GDE)-14302, "Compatible Chemical Storage." WGS manages certification, storage, handling, treatment, and disposal of waste generated at INL. Project personnel work with WGS representatives and PELs to properly package and transport regulated, hazardous, or radioactive material or waste according to laboratory procedures.

Hazardous Waste Generation – Activities at INL have the potential to generate hazardous waste in the form of cleaning solvents, solders, metals, and scrap metal (held for recycle whenever appropriate). WGS evaluates, characterizes, and manages hazardous waste. In addition, WGS may establish satellite accumulation areas to manage hazardous waste.

Industrial Waste Generation – Project activities would also result in the generation of small amounts of industrial waste. WGS manages the certification, storage, handling, treatment, and disposal of waste generated at INL. Project personnel work with WGS representatives and PELs to properly package and transport regulated, hazardous, or radioactive material or waste according to laboratory procedures.

Air Emissions – Experiment irradiation and PIE will be performed at the ATR and HFEF facilities. 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 Regulations (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 LWP-8000 and 40 CFR 61, Subpart H. All experiments are 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 receding calendar year. 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. INL evaluates each project with a potential to emit pollutants, as necessary, using the Air Permitting Applicability Determination (APAD) process (Management Control Procedure [MCP]-8104).

Discharge of Wastewater – After the tests, the waste electrolytes will be properly disposed.

SECTION D. Determine the Level of Environmental Review (or Documentation) and Reference(s): Identify the applicable categorical exclusion from 10 CFR 1021, Appendix B, give the appropriate justification, and the approval date.

Note: 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, including requirements of DOE orders; 2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities; 3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; 4) adversely affect environmentally sensitive resources. In addition, no extraordinary circumstances related to the proposal exist which would affect the significance of the action, and the action is not "connected" nor "related" (40 CFR 1508.25(a)(1) and (2), respectively) to other actions with potentially or cumulatively significant impacts.

References: 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 development.

R&D activities are further encompassed by DOE/EIS-0203, DOE/EIS-0203-SA-01, and DOE/EIS-0203-SA-02 and the Amended ROD (1996). DOE/EIS-0200 made the Nevada National Security Site available to all DOE sites for low-level waste disposal, and DOE/EIS-0243 and ROD (65 FR 10061, February 2000) analyzed the impacts of transportation and disposal at the Nevada National Security Site.

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 Plan (WIPP; 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.)

Justification: The activity consists of research and development activities aimed at evaluating FeCrAl alloys as cladding material for UO_2 fuel in LWRs.

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 08/13/2018