DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-16-101

SECTION A. Project Title: Accident Tolerant Fuel Program Extension – Westinghouse Electric Company LLC

SECTION B. Project Description

Westinghouse Electric Company, in collaboration, Los Alamos National Laboratory, Oak Ridge National Laboratory, Idaho National Laboratory and several universities, companies, utilities and foreign entities, proposes to develop and deploy Lead Test Rods (LTRs) by 2019 and Lead Test Assemblies (LTAs) by 2022 of Westinghouse's Enhanced Accident Tolerant Fuel (ATF). In order to achieve significant benefits from fuel cost savings and from the reduction or elimination of currently required safety requirements/systems, two options from the Westinghouse ATF program are proposed. The first option utilizes SiC composites/SiC monoliths ceramic matrix composite (CMC) for cladding containing high density and thermal conductivity U_3Si_2 pellets. The second option utilizes a coated zirconium (Zr) cladding containing high density and high thermal conductivity U_3Si_2 pellets. The coated cladding consists of a coated zirconium alloy (CZA). The CZA option will first be used in the LTRs in 2019 to first introduce U_3Si_2 into commercial reactors in preparation for the combination of CMC cladding and U_3Si_2 pellets in lead test rods in CZA LTAs in 2022. This program is aimed at performing the design and licensing tasks with the required experimental backup to obtain Nuclear Regulatory Commission (NRC) approval for insertion of LTRs in 2019 and LTAs in 2022.

The major tasks to be performed as part of the program include:
1. Performance of the in-reactor test programs at the Idaho National Laboratory's (INL's) Advanced Test Reactor (ATR), INL's Transient Reactor Test Facility (TREAT), IFE Halden (Halden), and the Massachusetts Institute of Technology Reactor (MITR);
2. Continuation of the technology development programs for SiC/SiC composites, coated zirconium alloy, integral fuel burnable absorbers, and U_3Si_2 manufacture;
3. LTR and LTA design, fabrication and testing;
4. Continued exploration by Westinghouse and their utility partners Southern Nuclear Operating Company and Exelon to identify ways to reduce the operating costs of nuclear plants utilizing ATF;
5. NRC licensing;
6. Experimental work to support the technology readiness and the licensing of the Westinghouse ATF options and
7. The Westinghouse computer code updates and methods needed to support ATF modeling and NRC licensing.

SECTION C. Environmental Aspects / Potential Sources of Impact

LANL will handle the radioactive material under approved Integrated Work Documents which document the relevant procedures, handling limits, and safety procedures. They are currently only intending to have fresh fuel material.

INL - The primary mission of the Idaho National Laboratory (INL) is to perform Nuclear Energy research and development. INL has over 40 years of experience in the handling of radioactive materials and has extensive facilities, procedures and trained personnel in place for handling significant quantities of all types of radioactive materials. Under the current proposal, INL's primary role includes fabrication and characterization of enriched U3Si2 pellets for irradiation testing in the ATR. Pellets fabricated by INL will be fabricated using DOE-owned materials and the pellets will be owned by DOE. INL will assemble the pellets into test rods and will irradiate the pellets in INL's Advanced Test Reactor (ATR), with subsequent post-irradiation examination (PIE) at INL facilities. The irradiated pellets and PIE samples will remain DOE property and will ultimately be disposed of by DOE along with other DOE-owned irradiated materials and samples.

National Nuclear Laboratory (UK) – NNL will be making U3Si2 powder from feedstock provided by Springfields Fuel Limited, making pellets from this powder and shipping pellets to GA, Halden and INL.

General Atomics (GA) – GA will be assemble test rods and for irradiation in INL's Advanced Test Reactor (ATR), with subsequent post-irradiation examination (PIE) at INL and for Halden test reactor with a subsequent PIE at Studsvik.

Halden - Halden will assemble the pellets into test rods and will irradiate the pellets in the Halden reactor, with subsequent post-irradiation examination (PIE) at Halden and Studsvik facilities. The irradiated pellets and PIE samples will remain DOE property and will ultimately be disposed of by Halden.

The chemical vapor infiltration (CVI) operation will be performed at a subcontractor (General Atomics) site that does internal R&D using CVI services. Off-gases are scrubbed as part of the process, neutralized and discharged as industrial waste.

LANL, INL and NNL will fabricate small quantities of fuel which will result in small quantities of other chemicals which are employed for processing and cleaning samples. All operations will be performed under authorized work procedures in authorized facilities. Waste profiles exist for disposal of all materials. Halden, INL, GA and ANL will fabricate small quantities of fuel rods

which will result in small quantities of other chemicals which are employed for processing and cleaning samples. All operations will be performed under authorized work procedures in authorized facilities. Waste profiles exist for disposal of all materials.

The cladding samples will be irradiated at the Massachusetts Institute of Technology Reactor along with other samples from academia and industry. After irradiation, the samples will be disposed of under their license. Their reactor discharges spent nuclear fuel which is disposed of under their license.

All steps will require some water use for cooling, cleaning samples, cleanup. No extraordinary water use is expected above current levels.

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.

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.)

Justification: The activity consists of research and development of enhanced accident tolerant fuels to support of deployment in commercial reactors.

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 09/27/2016