DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-18-005

SECTION A. Project Title: Continuation of Development of LWR Fuels with Enhanced Accident Tolerance – Framatome, Inc.

SECTION B. Project Description

Framatome proposes to advance both a near-term (CR-CR2O3) and long-term (SiC-SiC) enhanced accident tolerant fuel solution.

The Framatome Team's proposed effort over the next five (5) years on the near-term solution (Cr-Cr2O3) is divided into eight (8) main areas:
1. Tasks to support full characterization of the Cr-Cr2O3 concepts (through out-of-pile and in-pile testing in normal and severe accident conditions).
2. Tasks to support near-term insertion of the EATF concept LTRs/LTAs into a variety of commercial reactors.
3. Tasks to evaluate the GAIA™ fuel assembly design and, if promising, propose modifications to enhance its performance and gain greater safety margins during severe accidents thereby furthering the DOE objectives of safer and more reliable nuclear power production.
4. Tasks to evaluate Cr-Cr2O3 concept performance and assess safety and economic impacts.
5. Tasks to support the development, qualification, and integration of required EATF manufacturing equipment and processes to upscale manufacturing capabilities to support fabrication of LTAs and batch reloads of EATF fuel.
6. Tasks to update and validate codes and methods necessary to model EATF and license batch reload quantities (including all NRC interactions).
7. Tasks to support batch reload fabrication and licensing of the Cr-Cr2O3 concept for insertion into a U.S. commercial reactor(s).
8. Tasks to support modifying the existing U.S. regulatory framework to allow the realization of maximum safety and economic benefits from the implementation of EATF.

The Framatome Team's proposed effort over the next five (5) years on longer-term solution (SiC-SiC) is divided into six (6) main areas:
1. Tasks to support development of successful mitigation strategies to systematically address the currently identified critical SiC technical feasibility issues
2. Tasks to support development and characterization of the SiC-SiC concepts (through out-of-pile and in-pile testing in normal and severe accident conditions).
3. Tasks to evaluate SiC-SiC concept performances and assess safety and economic impacts
4. Tasks to support small scale test sample fabrication followed by initiation of pilot scale development to fabricate long SiC-/SiC cladding tubes.
5. Tasks to support insertion of the SiC-SiC segmented LTRs into a commercial reactor
6. Tasks to evaluate the GAIA fuel assembly design and modify it to accept SiC/SiC rods and perform in the temperature regimes that these rods may reach in severe accidents to gain greater safety margins thereby furthering the DOE objectives of safer and more reliable nuclear power production.

SECTION C. Environmental Aspects / Potential Sources of Impact

The Framatome Integrated Management Systems manual (D02-ARV-01-101-817) describes the Quality, Occupational Health and Safety (OH&S) and Environmental Management System implemented within Framatome Inc. It applies to all Framatome Inc. facilities. Regarding activities out of the Framatome nuclear market described in the manual, all stakeholders codes and standards compliance is managed within specific contracts monitored by Framatome, Inc. entities or Divisions.

Radioactive Material Use - The proposal involves production of nuclear fuel components (comprised of enriched UO_2 - <5 w/o. During the period of performance, tens to hundreds of kg's of enriched uranium will be fabricated into test rodlets and full length fuel rods at Framatome's Richland, WA fuel fabrication facility (HRR). They will be used for irradiation test programs at U.S. research reactors such as ATR and TREAT and for lead test assembly programs at U.S. commercial reactors. These quantities are insignificant relative to the several hundred metric tons of material processes during normal operations at HRR. All production will be performed under requirements dictated by the Framatome Integrated Management Systems manual (IMS) described above which ensures compliance with federal, state, and international regulations.

Radioactive Waste Generation - As noted above, Framatome will be producing nuclear fuel components (tens to hundreds of kgs of radioactive material) which will be irradiated and contribute to used nuclear waste. Waste material originating from test rodlets will be generated at DOE test facilities like ATR, TREAT, and HFIR, and therefore ultimate handling and disposal will be dictated by the DOE procedures for those facilities. Waste material originating from LTA fuel rods will be generated at commercial reactor sites and will be handled and disposed of in accordance with the sites' NRC license and approved procedures. All radioactive waste that remains at the HRR facility will be processed in accordance with standard site procedures to extract uranium for reuse and dispose of remaining low-level waste in accordance with US Federal and Washington State law. Again, all processes are developed and

performed under requirements dictated by the Framatome Integrated Management Systems manual (IMS) which ensures compliance with federal, state, and international regulations.

Mixed Waste Generation - Framatome's fuel production process generates mixed waste in the form of clothing, gloves, and other production materials during standard production processes that are contaminated with uranium oxide at low levels. Quantities of waste produced directly through this proposal are insignificant (tens of kgs) relative to the waste volumes produced during normal HRR facility operations and are disposed of at federally licensed mixed waste disposal facilities. Framatome processes these wastes in accordance with Framatome's Integrated Management Systems manual (IMS) which ensures compliance with federal, state, and international regulations.

Chemical Use/Storage / Chemical Waste Disposal - Framatome's fuel production processes use a variety of chemicals during the normal fabrication of nuclear fuel components. Quantities of each needed for the proposal are on the order of kgs which is insignificant relative to the quantities used during normal daily fuel production. All new development activities and production operations related to this proposal will be controlled by Framatome's Integrated Management Systems manual (IMS) which ensures compliance with federal, state, and international regulations.

Hazardous Waste Generation - Framatome's fuel production processes a number of hazardous waste streams in the normal fabrication of nuclear fuel including hydrofluoric acid. Many streams are recycled and/or reused. The total quantity of hazardous waste generated is on the order of a few kgs which is very small relative to the quantities of waste produced during normal daily fuel production. All production operations related to this proposal will be controlled by Framatome's Integrated Management Systems manual (IMS) which ensures compliance with federal, state, and international regulations.

Industrial Waste Generation - Framatome fuel production processes generate several industrial waste streams as part of the normal operation. Additional waste streams created through this proposal would include Cr_2O_3 dopant mixed in with UO_2 powder, depleted chromium targets used in the PVD coating process, and SiC waste stream associated with the production of SiC cladding. The quantity of waste generated as a result of this proposal is on the order of tens of Kgs. The development of new production processes that lead to these new waste streams is controlled by Framatome's Integrated Management Systems manual (IMS) which ensures compliance with all Federal, State, and International regulations.

Air Emissions - This proposal includes the addition of Cr_2O_3 dopant to the fuel. This fuel is sintered in furnaces which can potentially volatilize the chromium. Framatome process development procedures are controlled by Framatome's Integrated Management Systems manual (IMS) which ensures compliance with all Federal, State, and International regulations. This includes the monitoring of airborne samples to ensure all OSHA requirements are met with regard to exposure to hexavalent chromium.

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 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 Jason Sturm, DOE-ID NEPA Compliance Officer on 06/28/2018