

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: Continuation by Ceramic Tubular Products (CTP) of Ceramic Clad R&D for Accident Tolerant Fuel (ATF)

SECTION B. Project Description

Ceramic Tubular Products, LLC, in collaboration with Raytheon Technologies and Framatome Inc., proposes to support development of enhanced accident tolerant fuels for commercial light water reactors (LWRs) by addressing challenges with ceramic cladding. The project will undertake the following actions: 1) depositing silicone carbide (SiC) environmental barrier coating onto the ceramic matrix composite layer; 2) adapt the Polymer Infiltration and Pyrolysis process to the composite layer of clad, 3) demonstrate that brazing processes produce reliable joints in an LWR coolant environment and demonstrate that the joint remains robust under neutron radiation conditions; 4) assurance of 100% defect-free cladding; 5) demonstrate the irradiation resistance of SiC fiber by trial irradiation of cladding in the Massachusetts Institute of Technology research reactor; 6) demonstrate the cost-effective manufacture of the cladding; 7) testing of fueled cladding in the Advanced Test Reactor (ATR) Water Loop; 8) perform Departure from Nucleate Boiling testing of cladding; 9) apply the Phase Array Ultrasonic technique to SiC composite cladding; and 10) initiate development of the analytical models and the material property database required to support licensing of the cladding.

SECTION C. Environmental Aspects / Potential Sources of Impact

Chemical Use/Storage: Chemicals used in this project are ammonia gas and boron trichloride precursor. Both are in metal cylinders. Each of them is stored in a separated and individual ventilated gas cabinet.

Hazard Waste Generation: A very small amount of ammonium chloride salts and boron nitride particulates are generated. They will be captured in a cold trap and filtration system and it will be cleaned periodically.

Air emissions: Prior to release to the air, spent gases are processed through a dry scrubber, a cold trap and gas filtration system. These gas cleaning systems make sure the gases exiting to air are full compliance with State and Federal regulations of air emissions.

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.

Justification: The activity consists of small-scale research and development of ceramic cladding for light water reactor fuel.

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 9/24/2020