

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: Flexible Hard Ceramic Coatings by Ultrasonic Spray Mist CVD for Dry Storage Canisters of Spent Nuclear Fuel and Waste – North Carolina State University

SECTION B. Project Description

North Carolina State University proposes to develop and evaluate the use of emerging ultrasonic spray mist chemical vapor deposition (Mist-CVD) manufacturing processes to deposit flexible hard multi-component ceramic coatings on dry storage cannisters (DSC) of spent nuclear fuel for mitigating stress corrosion cracking (SCC). These layers are formed by alternating a single layer of ceramic with layers of flexible buffer layers to prevent cracking while resisting corrosion, heat, wear, and hydrogen permeation. The project will conduct well-defined corrosion experiments in aggressive chemical environments (at different pH values and temperatures) to test the performance of as-deposited and annealed ceramic coatings in simulated working environments of DSC.

SECTION C. Environmental Aspects / Potential Sources of Impact

Chemical Use/Storage / Chemical Waste Disposal – The proposed work will use a small quantity of chemicals to produce mist flow for coating deposition at the laboratory scale. The setup is connected with the chemical hood for safety consideration. The safe handling/disposal procedures of chemicals have been described in the lab safety plan and have been approved by the Division of Environmental Health & Public Safety at North Carolina State University.

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 an investigation into dry storage cannister coatings.

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 8/3/2020