

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: Development of Repair and Mitigation Methods for Enhancing Stress Corrosion Cracking Resistance of Stainless Steel Spent Nuclear Fuel Storage Canisters – University of Cincinnati

SECTION B. Project Description

The University of Cincinnati, in collaboration with the University of Alabama and Idaho National Laboratory, proposed to investigate and develop the novel and promising techniques of laser-assisted cold spray (LACS) and MELD (formerly additive friction stir-AFS) processing to repair pits and cracks, in combination with laser shock peening (LSP) and ultrasonic nanostructure surface modification (UNSM) to mitigate adverse tensile residual stresses arising from welding and repair in order to enhance the resistance to chloride-induced stress corrosion cracking (CISCC) and extend life of austenitic 304 SS spent nuclear fuel (SNF) dry storage canisters (DSC). This project employs a holistic sp3 processing-structure-property-performance framework to provide solutions to the above challenges, with quantitative rigor and mechanistic insight. The microstructure and residual stress state of the processed weldments will be characterized in detail using a host of diffraction and analytical electron microscopy tools and mechanical properties (hardness, strength, ductility, etc) will be determined. Performance testing for pitting and SCC crack initiation and crack growth will be conducted under conditions of relative humidity, temperature and chloride salt chemistry that simulates the anticipated service conditions that might lead to SCC.

SECTION C. Environmental Aspects / Potential Sources of Impact

The university has procedures in place to handle any waste that will be generated through this project. The action would not create additional environmental impacts above those already permitted at the 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 university-scale research aimed at investigating and developing LACS and MELD techniques to mitigate stresses arising from welding and repair to extend the life of SNF DSC.

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 08/01/2018