

# DOE-ID NEPA CX DETERMINATION

**SECTION A. Project Title: Integrating Dissolvable Supports, Topology Optimization, and Microstructure Design to Drastically Reduce Costs in Developing and Post-Processing Nuclear Plant Components Produced by Laser-based Powder Bed Additive– University of Pittsburgh**

**SECTION B. Project Description**

The University of Pittsburgh, in collaboration with Arizona State University, proposes to develop and establish an innovative approach to drastically reduce development and post-processing costs associated with laser powder bed additive manufacturing (AM) of complex nuclear reactor components with internal cavities and overhangs. The approach integrates dissolvable supports, topology optimization, and microstructure design. Objectives of the project include: 1) develop and validate recipes to dissolve support structures and reduce surface roughness using a self-terminating dissolution process, 2) develop an automated support structure design tool capable of maximizing the support dissolution rate and minimizing residual stress and distortion of AM parts, 3) design AM processing with post-heat treatment to optimize hierarchical structure of AM parts by applying modeling, 4) design surface heat treatment recipes for enhance mechanical property, and 5) demonstrate that the integrated technology is capable of removing internal support structures, not assessable by post-machining, for two complex nuclear reactor components in less than 24 hours.

**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 additive manufacturing of complex nuclear reactor components.

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 07/18/2018