

SECTION A. Project Title: Additive Manufacturing of Thermal Sensors for In-pile Thermal Conductivity Measurement – Boise State University**SECTION B. Project Description**

The Boise State University, in collaboration with the University of Notre Dame and Idaho National Laboratory (INL), proposes to develop and demonstrate an additive manufacturing approach to directly print spatially resolved sensors onto fuel components and materials for in-pile thermal conductivity measurement. The printed sensors can generate in-situ and in-depth thermal conductivity profiles using frequency-modulated thermal wave probing. The 3D conformal printing of sensors directly on curved components provides intimate contact and tight integration with specimens of interest, enabling high measurement accuracy with minimum intrusion. The proposed project will achieve four important research objectives: (1) Print sensors onto conforming surfaces; (2) Evaluate sensor performance with characterization, testing, & modeling; (3) Evaluate sensor in-pile performance and irradiation effect; (4) Validate the performance of printed sensors using other independent methods.

SECTION C. Environmental Aspects / Potential Sources of Impact

The universities will fabricate and prepare the test samples (e.g. metal films printed on substrate) and send to NSUF facilities at INL for irradiation, and post-irradiation analysis. The universities will only examine and test samples that are non-radioactive. It is not anticipated that radioactive materials will be directly handled at the universities. The action would not create additional environmental impacts above those already occurring at the universities. The INL has procedures to handle radioactive materials and dispose of any radioactive waste generated by the project.

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 developing an additive manufacturing approach to directly print onto fuel components and materials.

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 08/17/2017