

SECTION A. Project Title: Irradiation Performance Testing of Specimens Produced by Commercially Available Additive Manufacturing Techniques – Colorado School of Mines

SECTION B. Project Description

The Colorado School of Mines, in collaboration with the Idaho National Laboratory, proposes to collect first-ever irradiation performance data for stainless steel and Inconel specimens produced using a range of commercially available additive manufacturing techniques. The University will conduct pre-irradiation thermo-mechanical testing and micro-structural characterization of the specimens at the University's facilities. A subset of the tensile bar specimens will be irradiated to a range of fast neutron fluences at typical light water reactor temperatures in the Advanced Test Reactor (ATR). Thermo-mechanical testing and micro-structural characterization of the irradiated specimens will be conducted at the Advanced Test Reactor National Scientific User Facility (ATR-NSUF) post-irradiation facilities. The remaining un-irradiated specimens will be thermally aged at the University and subjected to post-aging thermo-mechanical testing and micro-structural characterization. A comparison of the physical properties and microstructure of the irradiated specimens to those of the as-fabricated and thermally-aged specimens will provide insight into the viability of additively manufactured parts for nuclear reactor applications, identify key areas of concerns for further technology development efforts, and provide data for future computational model development.

SECTION C. Environmental Aspects / Potential Sources of Impact

The project will involve metallographic analysis of un-irradiated and irradiated stainless steel and Inconel specimens. Chemicals and hazardous materials/waste are a standard part of the metallographic sample preparation process. The non-radioactive samples will be prepared and evaluated in the Mines' Physical Metallurgy and Microscopy Labs. The labs have the permits, procedures, and processes in place to handle these materials and subsequent wastes. Handling of radioactive specimens will take place at existing Idaho National Laboratory facilities, governed by existing procedures for the handling of these materials. Some low-level radioactive material handling could take place at Mines, governed by existing permits, procedures, and processes.

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 collecting irradiation performance data for stainless steel and Inconel specimens using commercially available additive manufacturing techniques.

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act) Yes No

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on 09/22/2016