

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: Liquid Metal-cooled Fast Reactor Instrumentation Technology Development – University of Wisconsin - Madison

SECTION B. Project Description

The University of Wisconsin - Madison (UWM) proposes to further efforts to realize the Versatile Test Reactor (VTR) and support future commercialization of sodium-cooled fast reactors (SFRs) by obtaining highly resolved temperature measurements in sodium to develop more precise heat transfer models, performing testing and analysis of compact heat exchangers for use with sodium, and develop, test and calibrate an in-pool submersible flow meter. The tasks associated with this project are (1) Conduct scaled shell-and-tube heat transfer measurements to obtain developing and fully-developed heat transfer data; (2) Development of a low Prandtl number mechanistic heat transfer correlation for both developing and fully-developed region; (3) Numerical model to predict heat transfer rates in a shell-and-tube configuration with low Prandtl numbers; (4) Experimental results indicating effectiveness of heat exchanger; (5) Design of a 25 kW sodium to sCO₂ heat exchanger; (6) Completion of a 25 kW sodium to sCO₂ heat exchanger; (7) Experimental 2D map of PCHE performance with sodium – sCO₂ fluids; (8) Conjugate heat transfer model capable of performing design calculations for sodium – sCO₂ PCHE; and (9) High temperature, radiation resilient, calibrated flowmeter probes for distributed SFR pool and core flow measurements.

SECTION C. Environmental Aspects / Potential Sources of Impact

Chemical Use/Storage – Sodium metal will be used (approximately 3 gallons). The chemical is contained, stored onsite, and filtered to clean for reuse. The Tantalus facility at UWM has been specially designed to handle dealing with sodium with extensive safety systems and environmental protection, with a sodium scrubber. Coolant use is from a chilled water system and no wastewater is used.

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 activities to develop an accurate flow meter for SFR applications.

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 08/26/2019