

**SECTION A. Project Title: Non-Intrusive Flow Monitoring for Liquid Metal and Molten Salt Cooled Reactors****SECTION B. Project Description**

The Virginia Polytechnic Institute and State University (Virginia Tech), in collaboration with the Mechanisms Engineering Test Loop Facility (METL) at Argonne National Laboratory (ANL) and Oak Ridge National Laboratory (ORNL) and Pysmian Group, proposes to develop a first-of-its kind flow monitoring system with significantly enhanced capabilities for liquid metal fast reactors and other advanced reactors. The project will develop and demonstrate the performance of a non-intrusive liquid metal/salt flow monitoring system based on an ultra-sensitive distributed fiber optic acoustic sensing system. The radiation tolerant optical fiber sensors will be configured in a readily deployable “sensing pad” that can be applied around the piping insulation to limit exposure to radiation and high temperatures. Theoretical modeling and analysis of liquid metal and molten salt flow will drive the development of the stable sensing algorithms that will generate accurate real-time measurements. The performance of the prototype flow monitoring system will be demonstrated on small-scale flow loops by Virginia Tech. Ultimately, the prototype monitoring system will be field tested in liquid metal and molten salt flow loops at ORNL and METL.

**SECTION C. Environmental Aspects / Potential Sources of Impact**

Chemical Use/Storage, Chemical Waste Disposal- Virginia Tech: (B4)Common laboratory chemicals such as acetone and ethanol will be used sparingly (< 1 liter each) during the duration of the project. The Hazardous Waste Disposal Program at Virginia Tech ensures compliance with all federal, state, and local regulations which govern the handling, storing, and disposing of hazardous waste.

ORNL: Common laboratory chemicals such as acetone and ethanol will be used sparingly (<1 liter each) during the duration of the project. Chemical waste will be handled and disposed of via the Waste Disposal Programs at METL/ANL.

METL/ANL: Common laboratory chemicals such as acetone and ethanol will be used sparingly (<1 liter each) during the duration of the project. Chemical waste will be handled and disposed of via the Waste Disposal Programs at METL/ANL.

**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 a liquid metal/salt flow monitoring system for advanced reactors.

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 8/10/2020