

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: High Temperature Electromagnetic Acoustic (EMAT) Transducers for Structural Health Monitoring – University of Cincinnati

SECTION B. Project Description

The University of Cincinnati proposes to develop a prototype electromagnetic acoustic transducer (EMAT) monitoring system for structural health monitoring (SHM) and process monitoring at the Mechanisms Engineering Test Loop (METL) at Argonne National Laboratory and similar high-temperature assets. The primary challenge is the long term (minimum of 10 years) of near-continuous operation at 550°C with the possibility of short-term temperature excursions up to 650°C. Further, the design should be low power with the target of operating at under 24V and 500mA so that it can be made to be intrinsically safe and be powered from a battery and/or commercial energy harvesting. The project will focus on fundamental design challenges that will enable ultrasonic measurements for a range of purposes and be transformative for the metrological capabilities at METL and similar environments. The project will be organized into three main work packages. Work package 1: Temperature tolerant transducers focuses on developing robust and reliable sensors for high-temperature industrial environments. Work package 2: Signal-to-noise ratio (SNR) enhancement addresses the fact that inevitably the advancements required to provide the temperature tolerance will reduce the SNR and so a parallel effort is required to boost it. The final work package, Work package 3: Demonstration and deployment, focusses on the experimental demonstration of the measurement system. The aim throughout the project is to build up confidence and capability in increasingly demanding and realistic conditions, ultimately resulting in installation at METL.

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 occurring 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). For purposes of this category, “demonstration actions” means actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment. Demonstration actions frequently follow research and development and pilot projects that are directed at establishing proof of concept.

Justification: The activity consists of an investigation of the development of permanently installable SHM systems and advanced sensors and instrumentation to ensure the safe operation of next generation nuclear reactor designs

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

Approved by Jason Anderson, DOE-ID NEPA Compliance Officer, on 09/17/2021.