DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-19-050

SECTION A. Project Title: GUARDIAN: General Active Sensing for Condition Assessment – Duke University

SECTION B. Project Description

Duke University, in collaboration with Sandia National Laboratory (SNL) and Westinghouse, proposes to develop a robust active sensing framework (GUARDIAN) through the integration of model-based inference and mobile actuating/sensing robots. The tasks associated with this project are (1) Application description – develop a set of robotic responses to changes in a set of reactor vessel internal (RVI) components; (2) Computational modeling – steady-state approximations of the elastodynamics; (3) GUARDIAN framework – consisting of two main components, the estimator (a physics-based inverse problem module used to determine the location of an anomaly given a set of observations) and the controller (optical measurement system to determine the next set of measurement locations based on the data gathered by the estimator); and (4) Simulated and physical experiments – test the developed GUARDIAN system using both simulated data from finite element models and experiments conducted on a fabricated cylindrical pressure vessel with both static and moving components to simulate behavior modes potentially leading toward failure. Existing equipment and laboratory facilities will be used. Duke University will construct and deploy the robotic system. SNL will supply access to SIERRA-SD, a massively parallel structural acoustics code. Westinghouse will be responsible for deployment of technology, data collection, and providing physical insight of reactor internals and other passive structures in a nuclear power plant.

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 permitted 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). 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 and test a dependable autonomous or semi-autonomous and minimally disruptive framework for monitoring equipment and components in nuclear 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 08/21/2019