

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: Versatile Acoustic and Optical Sensing Platforms for Passive Structural System Monitoring – Virginia Polytechnic Institute and State University

SECTION B. Project Description

Virginia Tech, in collaboration Oak Ridge National Laboratory, proposes to develop an acoustic based sensing system capable of monitoring phenomena such as strain, temperature, pressure and corrosion to better evaluate the aging and degradation of relevant structural components in nuclear facilities. As part of this work, a first-of-its-kind sensing system based on acoustic fiber Bragg gratings (AFBGs) will be developed. The distributed acoustic based sensing system will be radiation hardened via the use of acoustic fiber waveguides (AFWs) designed and constructed from radiation tolerant fused silica and sapphire fibers. The performance of the AFBGs and AFWs will be qualified via comprehensive theoretical modeling, experimental validation, and radiation exposure testing. A prototype AFBG based sensing system will be benchmarked against commercially available fiber optic sensing techniques in a representative target environment in a laboratory setting.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use - Selected optical fibers and acoustic waveguide sensors will be exposed to radiation to test performance. It is estimated that 3-5 tests will be performed with the following exposure: ~ 1 MGy γ dosage (Co-60 source) /~100 Gy/hr on fibers. The irradiations will be performed at ORNL under their approved work control documents.

Chemical Use/Storage - Common laboratory chemicals such as acetone and ethanol will be used sparingly during the duration of the project.

Chemical Waste Disposal - The Hazardous Waste Disposal Program at Virginia Tech oversees the collection, handling, and disposal of chemicals and hazardous materials from the laboratories located on Virginia Tech's main campus. This program ensures compliance with all federal, state, and local regulations which govern the handling, storing, and disposing of hazardous waste.

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 investigating acoustic sensing systems.

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 07/26/2017