

**SECTION A. Project Title: Self-powered Wireless Through-wall Data Communication for Nuclear Environments****SECTION B. Project Description**

The proposed action consists of developing and demonstrating an enabling technology for the data communications for nuclear reactors and fuel cycle facilities using radiation and thermal energy harvesters, through-wall ultrasound communication, and harsh environment electronics. Specifically, the consist of three actions: (1) Directly harvest electrical energy from the gamma rays using the gamma heating and thermoelectrics, and from the beta particles using betavoltaic cells; (2) Transmit large amount of sensing data through the metal wall and thick concrete via ultrasound based on “mode conversion” principle; and (3) Creatively design, develop, and deploy electronics for demonstration of the complete system, and provide a design, fabrication and shielding strategy for future realization of high-temperature and radiation-hardened electronics circuits and communication systems for use inside the enclosed nuclear vessels.

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

Virginia Tech and Westinghouse have procedures in place to handle radioactive materials and any waste that will be generated through this project. The action would not create additional environmental impacts above those already permitted at the university or Westinghouse.

**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 small-scale research and development aimed at developing data communications for nuclear reactors and fuel cycle facilities.

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on 7/01/2016