

SECTION A. Project Title: Wirelessly Powered Sensing Platform to Interrogate and Report Spent Nuclear Fuel Dry Storage Canister Conditions – University of Nevada**SECTION B. Project Description**

The University of Nevada (UN) proposes to develop a proof-of-concept sensing platform that may be safely and compactly integrated into a wide variety of dry storage canister (DSC) designs. The UN researchers will use experimental and computational methods to develop and optimize magnetic-resonance systems to (a) wirelessly power the platform from an external source, and (b) reliably transmit the measured data from the platform to an external receiver. The UN researchers will also use experimental techniques to assess a variety of novel and existing gas composition (oxygen, hydrogen, and xenon) and radiation spectra measurement technologies (in addition to measuring humidity, pressures, and temperatures). The electronics will be shielded, sealed, and inert, to minimize their interference with normal DSC materials and operations. The UN researchers will work with researchers from Pacific Northwest National Laboratory (PNNL) to develop sensors that can be integrated within DSC's high temperature and radioactive environment. They will also work with the industrial partner, Orano/TN America, to determine and mitigate degradation mechanisms, including any incompatibilities with DSC components/operations, for each candidate technology. The University researchers will also use their advanced computational fluid dynamics (CFD) capabilities to determine if leakage of the inert gas from the DSC (and replacement by air) can be practically detected by measuring temperatures on the DSC external surface. This work will allow the researchers and partners to develop a proof-of-concept platform that will reliably operate during long periods of extended dry storage and after transport and will be available for future development. The following five tasks will be performed: Task 1. Design and development of a wireless through-metal power and data transmission system; Task 2. Development of sensors for the measurement of canister internal conditions; Task 3. Sensors and transmission system testing in conditions relevant to the storage of spent nuclear fuels in DSC; Task 4. Placement of the sensing platform and sensors based on numerical simulation; and Task 5. Measurement platform integration within a DSC, employing industry partner guidance.

SECTION C. Environmental Aspects / Potential Sources of Impact

The university (and its research partners) have 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 research locations.

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 to develop a proof-of-concept sensing platform that can be compactly and safely integrated into a wide variety of DSC designs to measure and report internal conditions.

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.