

# DOE-ID NEPA CX DETERMINATION

## SECTION A. Project Title: Dual External Leak Sensing and Monitoring for Dry Storage Canister – University of Nebraska

## SECTION B. Project Description

The University of Nebraska (UN) proposes to develop two complementary external sensing methods to evaluate dry storage canister (DSC) integrity through monitoring DSC internal pressure, surface temperature, and helium gas concentration in air. An ultrasonic technique will be developed to continuously monitor changes of the internal pressure and canister surface temperature; a low-cost, miniature gas sensor will be developed for helium leakage detection. The proposed two sensing methods complement in sensing modes, sensitivities, and critical information about DSC operation condition. The ultrasonic method uses ultrasonic sensors installed on the external DSC wall to continuously monitor the internal pressure and surface temperature with high sensitivity. The electrostatic micro-electrical-mechanical-system (MEMS) helium gas sensor will provide an alarm signal when a certain helium concentration threshold is researched, which functions as a helium “smoke detector”. The ultrasonic system provides continuous monitoring and generates data with rich information about the operation condition of DSC, while the simple MEMS sensor is intended to provide alarms in critical conditions. Both sensing systems have low power consumption. The ultrasonic pressure sensing system can be powered by a solar panel on site, and the small MEMS gas sensor operation does not require the traditional signal conditioning circuit or processing unit, thus it can be powered by a lithium battery for more than 10 years. To achieve the proposed research objectives, UN will perform theoretical analysis, develop experimental setup, and apply machine learning techniques. The developed dual sensing system will be tested and validated on a lab-scale mockup. The following research tasks are proposed: Task 1- Ultrasonic sensing for internal pressure and surface temperature monitoring; Task 2- MEMS sensor for helium leak detection; Task 3- Mockup Fabrication and Tests; and Task 4- Machine learning (ML) of sensing data.

## 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 to develop external sensing systems to provide accurate and practical solutions to long-term monitoring of internal conditions of the dry storage canisters.

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.