

**SECTION A. Project Title: Integration of Microwave Readout into Nuclear Process Monitoring – University of Colorado, Boulder****SECTION B. Project Description**

The University of Colorado, in collaboration with Los Alamos National Laboratory and Savannah River National Laboratory, proposes to demonstrate that high-resolution  $\gamma$ -ray spectroscopy, based on emerging microcalorimeter sensors, can determine elemental and isotopic fractions with accuracy comparable to much slower mass spectrometry and with far better accuracy than germanium  $\gamma$ -ray sensors. An instrument called SLEDGEHAMMER will be used in a series of measurement campaigns beginning with actinide reference materials and progressing to measurements of actual process materials from a working reprocessing facility.

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

**Radioactive Material Use** – The proposed work will involve the use of gamma-ray emitting radioisotopes in order to acquire gamma-ray spectra using the novel spectrometer. All use of radioactive materials will require detailed planning to minimize dose to staff and to maintain custody of materials. Initial spectrometer characterization will be performed using sealed, commercial gamma-ray sources in the 10 microCi to few-milliCi activity range. Gadolinium-153 is the most likely gamma-ray source, but others will be considered. Spectrometer campaigns at Los Alamos National Laboratory will be conducted with a range of gamma-ray sources. Most sources will be sealed mixtures of solid or powdered Pu isotopes along with other actinides. Typical sample masses are expected to fall in the 0.1 – 10 gram range. Spectrometer campaigns at Savannah River National Laboratory will be conducted with a range of gamma-ray sources. Most sources will be contained aqueous mixtures of Pu isotopes along with other actinides from the H-Canyon reprocessing facility or from an existing library of historical samples. Sample volumes are likely to fall in the 10 – 100 milliliter range.

**Water/Well Use** – The novel gamma-ray spectrometer requires cooling water to operate. The flow rate depends on the inlet temperature but typically varies between 1 and 2 gallons per minute. The outlet water is clean and needs no special treatment before being returned to the preferred drainage system of the operating facility.

**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 g-ray spectroscopy research using a newly developed instrument to determine elemental and isotopic fractions with accuracy.

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on 06/30/2016