DOE-ID NEPA CX DETERMINATION
IDAHO NATIONAL LABORATORY

CX Posting No.: DOE-ID-INL-10-018

SECTION A. **Project Title:** Active Measurements Campaign (AMC) at the Materials and Fuels Complex (MFC) - Zero Power Physics Reactor (ZPPR)

SECTION B. Project Description: .

The Department of Energy (DOE) Office of Dismantlement and Transparency (NA-241) is funding an AMC at the Idaho National Laboratory (INL) that would be conducted at the ZPPR building at the MFC and will involve experimenters from several national laboratories and the United Kingdom (UK). These experimenters will determine how well and how rapidly unknown inspection objects [containing shielded, nuclear category (CAT-I) material] can be correctly characterized using a variety of inspection/detection technologies. The campaign will allow active technology developers to test their inspection systems in an environment (i.e., ZPPR facility) where significant quantities of fissile material (up to CAT-I) are available. Preparations for the measurement campaign can be broken down into four areas: 1) preparing the facility for operation of the accelerators and detectors, 2) developing necessary criticality and nuclear safety documentation, 3) designing, fabricating and assembling the approved IOs, and 4) preparing for the participants and conducting the campaign.

This campaign will use a Varitron electron accelerator (LINAC), a Deuterium/Tritium (D/T) neutron generator, and a Deuterium/Deuterium (D/D) neutron generator to actively interrogate inspection objects (IOs) containing standard nuclear and non-nuclear ZPPR materials. These IOs have been designed to include materials similar to those contained within components at various stages of a representative weapon dismantlement process. For this campaign, experimenters will be presented with up to ten IOs for inspection using their specific detection technologies. Each experimental team will be given a period of time in which they are allowed to inspect any of the IOs with one of the three active accelerator sources.

The three accelerator sources selected to support this measurements campaign will be located within the ZPPR workroom (or adjoining hallway to the cell) and will interrogate up to two IOs located in the workroom. The first active source, the Varitron, is an electron accelerator having a maximum photonuclear performance of 10-MeV operation for these tests. The two other active sources (D/T and D/D n-generators) will operate at a maximum beam energy of 14 and 2.5 MeV, respectively. Because of the associated radiation fields produced by these instruments, each accelerator will be operated from the reactor control room.

To operate the accelerator remotely and support detector data acquisitions, control cables will be routed from the workroom to the control room. A bundle of Ethernet, coaxial, and twisted-pair cables will be drawn through an existing conduit that runs from the control room basement to the ZPPR cell alcove area and then down the hallway to the workroom. These will become common cables for all experimenters. The IOs will be positioned on a table expected to be located in the southwest corner of the workroom. Detectors will be arranged around the IOs as determined by the participants. A camera directed at the table will be displayed in the control room to eliminate the need for the participants to enter the workroom every time an IO is replaced.

Each undeclared inspection object will be approximately 20-cm cubed and weigh approximately 25 kg. The outer shell will be fabricated from aluminum to allow an inert cover gas enclosure, and contain spacers/holders that will retain the various materials inside. The shell and internals will be fabricated in a machine shop and then the IOs will be assembled in the workroom hoods. Standard ZPPR plates will be used for the IO SNM. After assembly of the IOs and prior to the campaign, gamma spectrometry measurements will be obtained for each IO. Six new storage drums will be fabricated for storage of the IOs in the vault. In addition, some sealed sources will be used for system calibration. Calibration sources will include a relatively weak neutron source and some radioisotopic photon sources.

Criticality and nuclear safety issues will be addressed in conjunction with this activity including a Criticality Safety Evaluation (CSE) and a revision to the Criticality Hazards Control Statement (CHCS).

Preparations for this measurement campaign will include gathering information regarding the inspection systems being used by participants, receiving the inspection equipment, staging the materials in the ZPPR cell or warehouse, and routing special system control/acquisition cabling from the workroom to the control room. About a month prior to the measurement campaign, the inspection systems will be shipped by the participants to the INL/MFC. After the campaign, the equipment will be returned to the participants. The campaign will last for 2 weeks.

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

Air Emissions - Operation of the LINAC will generate minute quantities of activation products in the air, primarily Ar-41. Any air emissions from this activity will be easily encompassed by historical activities from past ZPPR operations. These activities would not constitute a new source or modification to an existing source, and therefore would not require preparation of an Air Permitting Applicability Determination (APAD) for this project.

Generating and Managing Waste - Project activities would result in small amounts of radioactive waste in the form of personal protective equipment used during IO handling operations in the workroom hoods. Project personnel shall work with Waste Generator Services to properly characterize and dispose of all waste according to established company procedures.

Releasing Contaminants - Small air emission quantities of ozone and oxides of nitrogen are expected from radiolysis.

SECTION D. Determine the Level of Environmental Review (or Documentation) and Reference(s): Identify the applicable 10 CFR 1021,Appendix B, give the appropriate justification and the approval date.

Note: For projects 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: 10 CFR 1021, Appendix B to Subpart D, B3.6, and B3.10

Justification: The information gained from this nuclear inspection project may well contribute to the effort to reduce the US and world-wide inventory of nuclear weapons. Activities described above are consistent with Categorical Exclusions **B3.6** "operation of facilities for indoor bench-scale research projects and conventional laboratory operations; small-scale laboratory research and development projects; and small-scale pilot projects …" and **B3.10** "Operation of a particle accelerator, including electron beam accelerator with primary beam energy less than approximately 100 MeV, within or contiguous to an already developed area."

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act) ☐ Yes ☒ No

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer, on 8/24/2010.