DOE-ID NEPA CX DETERMINATION
Idaho National Laboratory

CX Posting No.: DOE-ID-INL-18-031

SECTION A. Project Title: PINS Deuterium-Tritium Neutron Generator Operations

SECTION B. Project Description and Purpose:

Researchers at Idaho National Laboratory (INL) conduct Portable Isotopic Neutron Spectroscopy (PINS) Laboratory demonstrations, research and development, and training activities using deuterium-tritium (DT) neutron generators at INL's Research and Education Campus (REC) building IF-675. The PINS Team also demonstrates the system to INL visitors, and military personnel attend PINS training at INL several times per year.

The INL-developed PINS chemical assay system is a non-destructive evaluation (NDE) technology used by the U.S. military and foreign military units to identify and verify the contents of actual or suspect chemical warfare munitions. In addition to chemical warfare agents, the instrument can identify explosive substances, smoke generating chemicals, and practice munition fills.

The PINS laboratory uses neutron radiation from a portable MP-320 deuterium-tritium (DT) neutron generator to probe an item's fill. The chemical elements inside the item are revealed by their characteristic neutron-induced gamma-ray signature, which are measured by a gamma-ray spectrometer, usually a high-resolution high purity germanium (HPGe) spectrometer. The system computer then infers the fill compound or mixture from the chemical elements detected and their relative abundance.

The purpose of the proposed action is to expand the types of neutron generators used at the PINS Laboratory. The proposed action installs and operates a P-385 deuterium-tritium (DT) neutron generator produced by Thermo Scientific, which produces triple the number of DT neutrons as the MP-320 DT generator.

The expected dose to the public from the MP-320 DT generator was modeled in EDF-8134. The maximum potential annual dose delivered to the public from the MP-320 neutron generator was estimated to be about 60 mrem per year based on 2000 full output hours. However, based on historic research schedules, the most likely duty cycle was estimated to be 200 full output hours, which equates to a likley potential dose to the public of 6 mrem per year. Because the P385 neutron generator produces the same energy neutrons but triples the number, the estimated maximum potential dose to the public and likely potential dose to the public would both also triple. The estimated maximum potential dose would be about 180 mrem per year, and the likely potential dose to the public would be about 18 mrem per year.

Department of Energy (DOE) Order 458.1 Change 3 sets public dose limits from DOE radiological activities. DOE radiological activities, including remedial actions and activities using Technologically Enhanced Naturally Occurring Radioactive Material (TENORM), must be conducted so that exposure of members of the public to ionizing radiation will: (a) Not cause a total effective dose (TED) exceeding 100 mrem (1mSv) in a year, an equivalent dose to the lens of the eye exceeding 1500 mrem (15 mSv) in a year, or an equivalent dose to the skin or extremities exceeding 5000 mrem (50 mSv) in a year, from all sources of ionizing radiation and exposure pathways that could contribute significantly to the total dose, with a few exceptions. The dose to members of the public from DOE-related exposure sources only may be used if the projected DOE-related dose to the representative person or maximally exposed individual (MEI) is 25 mrem (0.25mSv) in a year or less. If the DOE-related dose is greater than 25 mrem in a year, the dose to members of the public must include both major non-DOE sources of exposure (excluding dose from radon and its decay products in air, background radiation dose, occupational doses and doses due to medical exposures) and dose from DOE-related sources. If it is suspected that any of the dose limits specified in the order may be exceeded or the estimated TED for members of the public exceeds 25 mrem (0.25 mSv) in a year, then dose to the lens of the eye, skin and extremities must be evaluated.

The Environmental ALARA Committee has recommended a maximum dose to the public as 25 mrem/yr at the property fence line. Due to the increased dose at the facility boundary, EDF-8134 requires revision. A radiation survey of the new generator is required as part of the revision of the EDF. To perform the radiation survey, the same type of neutron generator as that proposed for installation at PINS will be used. Any conditions imposed by the EDF revision require revision of this EC to incorporate those conditions. The signed EDF/ECAR and revised EC must be approved before putting the neutron generator into general use.

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

The only emissions are from a gas-fired heating system and from the use of solvents.

Generating and Managing Waste

Scrap metal, in the form of scrap solder, will be recycled. Scrap metal exposed to neutron radiation will be managed as low-level radioactive waste (LLW). Other LLW may include expired beta-gamma check sources. Industrial and hazardous wastes (or LLW and mixed waste) may include old simulants, packaging material (cardboard and wood). Wastewater discharges from projects activities only include sanitary discharges. All solid waste will be managed by WGS.

Releasing Contaminants

There may be some emissions from chemical use as discussed under air emissions above.

Using, Reusing, and Conserving Natural Resources

All applicable waste will be diverted from disposal in the landfill when possible. Project personnel will use every opportunity to recycle, reuse, and recover materials and divert waste from the landfill when possible. The project will practice sustainable acquisition, as appropriate and practicable, by procuring construction materials that are energy efficient, water efficient, are bio-based in content, environmentally preferable, non-ozone depleting, have recycled content, and are non-toxic or less-toxic alternatives. New equipment will meet either the Energy Star or SNAP requirements as appropriate (see http://www.sftool.gov/GreenProcurement).

SECTION D. Determine Recommended Level of Environmental Review, Identify Reference(s), and State Justification: Identify the applicable categorical exclusion from 10 Code of Federal Regulation (CFR) 1021, Appendix B, give the appropriate justification, and the approval date.

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, or similar requirements of Department of Energy (DOE) or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or facilities; (3) disturb hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021). In addition, no extraordinary circumstances related to the proposal exist that would affect the significance of the action. In addition, the action is not "connected" to other action actions (40 CFR 1508.25(a)(1) and is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1608.27(b)(7)).

References: 10 CFR 1021, Appendix B, B3.10 "Particle accelerators"

Justification: Project activities are consistent with 10 CFR 1021, Appendix B, B3.10 "Siting, construction, modification, operation, and decommissioning of particle accelerators, including electron beam accelerators, with primary beam energy less than approximately 100 million electron volts (MeV) and average beam power less than approximately 250 kilowatts (kW), and associated beamlines, storage rings, colliders, and detectors, for research and medical purposes (such as proton therapy), and isotope production, within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible), or internal modification of any accelerator facility regardless of energy, that does not increase primary beam energy or current. In cases where the beam energy exceeds 100 MeV, the average beam power must be less than 250 kW, so as not to exceed an average current of 2.5 milliamperes (mA).

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

Approved by Jason Sturm, DOE-ID NEPA Compliance Officer on: 7/09/2018