

**SECTION A. Project Title:** BWXT Advanced Nuclear Reactor**SECTION B. Project Description**

BWXT Advanced Technologies LLC proposes to conduct research and development activities to support conceptual design of a modular high-temperature gas reactor.

The project includes the development, production, and qualification of uranium nitride (UN) tristructural isotropic (TRISO) in a three-dimensional (3D) printed silicon carbide (SiC) matrix fuel form through irradiation, post-irradiation examination (PIE), and safety testing. This joint effort between BWXT, Oak Ridge National Laboratory (ORNL), and Idaho National Laboratory (INL) leverages the unique facilities and capabilities of each.

Further, in collaboration with ORNL and INL, BWXT will perform core design in an integral manner with advanced manufacturing development such that the core design is advanced in tandem with, and informed by, the associated manufacturing techniques. In parallel, the reactivity control system and passive cooling approach will be developed in an integral manner with the core design based on the requirements and advancement of the core design. As part of these activities, BWXT will evaluate opportunities to reduce the manufacturing, operations, and maintenance costs associated with these systems. Finally, in collaboration with INL, in-core sensor technologies will be selected and demonstrated to enable future options for autonomous operations.

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

**Radioactive Material Use:** As part of the fabrication of TRISO coated UN fuel, approximately 10 kg of High-Assay Low-Enriched Uranium (HALEU) will be provided. Once the TRISO fuel is produced, it will be packed into a shell with matrix material. The shell will then be densified using chemical vapor infiltration (CVI). These shells will then be shipped off for various examinations. All radioactive material handling is governed by site licenses.

**Radioactive Waste Generation:** An estimated 1 kg HALEU will be in the form of waste as a result of the fabrication process. Approximately 3 kg HALEU will be in the form of scrap. An estimated 50kg waste will also be generated during development. Disposal of radioactive waste is covered by area operating procedures.

**Mixed Waste Generation:** Mixed waste is generated from the forming process and is disposed of by area operating procedure.

**Chemical Use/Storage:** General laboratory chemicals are stored and used in metal processing activities. The project will involve binder jet operation which uses a phenolic binder material. Development activities will use SiC powders. Various chemicals are required for CVI and are covered under a site health & safety manual.

**Chemical Waste Disposal:** Excess binder waste will be collected and disposed of using a licensed waste disposal company.

**Industrial Waste Generation:** General non-hazardous laboratory industrial waste will be generated such as kim-wipes, nitrile gloves, and water filters. These are sampled and handled by a certified waste disposal vendor.

**Air Emissions:** Air emissions are through normal process operations and are covered by the site air operating permit.

**Water/Well Use:** City water is used for general laboratory and sanitary purposes.

**Discharge of Wastewater:** All water discharges are non-hazardous and disposed of in the city sanitary sewer system with routine sampling per city discharge permits.

**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.

## DOE-ID NEPA CX DETERMINATION

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 research and development activities to support an advanced nuclear reactor design.

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 2/18/2021