SECTION A. Project Title: Developing fuel specification and fuel manufacturability for Radiant using Natural Uranium

SECTION B. Project Description and Purpose:

This Idaho National Laboratory (INL) Project Task Statement (PTS)-3 under the Umbrella Cooperative Research and Development Agreement (CRADA) No. 23CRU1 is a collaboration with Radiant Industries Incorporated (Radiant) to aid in Radiant's development of the tristructural isotropic (TRISO) fuel specification for the Kaleidos Demonstration Unit (KDU) reactor by contracting with BWX Technologies, Inc. (BWXT) for unique TRISO manufacturing capabilities.

Through this effort Radiant, INL, and BWXT will gain valuable insight into the Radiant fuel specification manufacturability and process improvements using Natural Uranium (NU) instead of enriched Uranium. This will eliminate waste of high-assay low-enriched uranium (HALEU) and prepare Radiant and BWXT for future fabrication of the TRISO fuel that will be tested in Radiant's KDU reactor.

BWXT uses Natural Uranium to form simulated Fuel kernels to meet Radiant's fuel specification. Feedback from this step will inform change to the fuel spec or kernel forming process. BWXT will use the kernels from the step above and coat them with multiple silicate layers to meet Radiant's fuel specification. Feedback from this step will inform change to the fuel spec or coating process. BWXT will use the coated particles from the above steps mixed with a graphite composite to make mock fuel compacts meet Radiant's fuel specification. Feedback from this step will inform change to the fuel spec or compact forming process.

This work directly supports the U.S. in enabling U.S. private sector developers, developing clean nuclear energy systems, demonstrating microreactors that can support national security.

The scope of this PTS includes:

- Testing of NU material to ensure it meets Radiant's HALEU specifications.
- Collaboration between INL, Radiant and the fuel fabricator to develop a fuel specification that meets the Radiant reactor designs and fuel fabrication capabilities.
- Development of fuel fabrication capabilities and the production of Natural Uranium that support the Radiant reactor design.
- Oversight and quality of fabrication activities at the fuel fabricator.
- Shipment and storage of produced Natural Uranium compacts that support the Radiant reactor design and qualification.

Work will be completed at the BWXT Nuclear Operation Group (NOG) in Lynchburg, VA.

Tasks include:

- Formalize fuel specification and purchase order (PO) for fuel (INL/Radiant).
- Process development with natural uranium to meet fuel spec (INL/BWXT).
- Required observations and oversight of fuel fabricator (INL).
- Oversight and technical expertise support (INL/Radiant).
- Disposition of remaining fuel materials (INL//BWXT).
- Optional objective of isotopic testing of Radiant feedstock sample material (INL/BWXT).
- Final Report (INL/Radiant).

Waste may include:

INL:

- No waste will be generated.

BWXT:

- Fuel fabrication waste (no enriched uranium). No new waste streams will be generated at BWXT through this project.

BWXT waste will be managed according to facility specific requirements (https://www.bwxt.com/what-we-do/environment-management).

All off-site partners will comply with their local procedures and state/federal regulations as identified in contract agreements.

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

Air emitting activities will not be conducted at INL.

Discharging to Surface-, Storm-, or Ground Water

NA

Disturbing Cultural or Biological Resources

Cultural: Section 106 consultation is not needed at this time. The scope of this PTS proposes to develop TRISO fuel using existing equipment off of the INL Site. See Hold Points for further information.

Generating and Managing Waste

No waste will be generated at INL. BWXT will generate typical waste associate with it's fuel fabrication processes. No new BWXT waste streams will be generated in association with this project.

Releasing Contaminants

NA

Using, Reusing, and Conserving Natural Resources

NA

Environmental Justice

NA

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: B3.6 "Small-scale research and development, laboratory operations, and pilot projects"

Justification: Based on the purpose and need and description of the proposed action and potential environmental impacts, the proposed action fits within the class of actions that is listed in Appendix B CX 3.6. There are no extraordinary circumstances related to the proposed action that may affect the significance of the environmental effects of the proposal (10 CFR 1021.410(b)(2)). The proposed action has not been segmented to meet the definition of a categorical exclusion (10 CFR 1021.410(b)(3)). This proposal is not connected to other actions with potentially significant impacts, is not related to other actions with individually insignificant but cumulatively significant impacts, and is not precluded by 10 CFR 1021.211 concerning limitations on actions during preparation of an environmental impact statement (10 CFR 1021.410(b)(3)).

Authorizing the proposed action will not (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, including DOE and/or Executive orders; (2) require siting of new facilities or expansion of existing facilities; (3) disturb hazardous substances, pollutants, or contaminants; (4) adversely affect environmentally sensitive resources; or (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species.

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

Approved by Robert Douglas Herzog, DOE-ID NEPA Compliance Officer on: 2/26/2025