DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-18-097

SECTION A. Project Title: Advanced Alloy Innovations for Structural Components of Molten Salt Reactors – University of Wisconsin

SECTION B. Project Description

The University of Wisconsin, in collaboration with Oak Ridge National Laboratory (ORNL), Terrestrial Energy USA, and Computherm LLC, proposes to develop and evaluate advanced metallic alloys for structural components for fluoride salt-cooled molten salt reactors (MSRs). The objectives of the project include: (1) Design and selection of alloys for structural applications in MSR; (2) Corrosion testing of alloys in molten FLiBe & FLiNaK salts, and determine the role of UF4 fuel and impurity additions to the salt and effect of graphite in the salt, on alloy corrosion; (3) Electrochemistry for measurements of redox potential and salt impurity concentration for understanding alloy corrosion; (4) Understand embrittlement effects due to radiation damage and tellurium fission product; and (5) Investigate welding performance of alloys, including corrosion and embrittlement effects.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use/Waste Generation – Molten salt experiments will be conducted in one of the laboratories belonging into the Characterization Laboratory for Irradiated Materials (CLIM) at the University of Wisconsin. Approximately 50 – 100 g of LiF-BeF2 salt will be used, and all experiments will be performed in the dedicated glove-box. Elemental analysis is outsourced to the Wisconsin State Hygiene Lab. All solid Be-contaminated material generated as part of the experiment are disposed of as hazardous waste through the University Wisconsin's Environmental Health and Safety (EHS) Department. No liquid waste is expected from the experiments with molten salt.

Chemical Use/Storage, Chemical Waste Disposal, and Hazardous and Industrial Waste Generation – At the conclusion of the experiment, all remaining salt and metal samples are stored in a sample library maintained by the Couet group. Small amounts of chemicals will be stored and used for etching metals for optical observations. Etchants will be disposed of using routine practices followed at ORNL. If any organic solvents are used for equipment cleaning or sample preparation, waste is disposed of as liquid chemical waste through EHS. Uranium fluoride will be purchased to a US company or given by ORNL. The salt will remain sealed in its original packaging until open in the glovebox. The glovebox is equipped with high-efficiency particulate air (HEPA) filters on all its lines in contact with the outside environment. Total uranium mass will not exceed 10 g. The main source of waste generation is the solidified salt at the end of the experiment. Industrial laboratory wastes (i.e., polishing supplies and other routine laboratory laboratory supplies) will be generated and disposed using routine practices. Metallic wastes will be recycled using standard practices followed at ORNL. The University of Wisconsin, Department of Engineering Physics, has appropriate procedures approved by the University Radiation Safety Office, for the waste segregation and storage. At the end of the project, all samples and generated waste will be stored safety by the Radiation Safety Officer.

Water/Well Use and Discharge of Wastewater – Water will be used for polishing and for cooling metals processing equipment.

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 university-scale research activities aimed at developing and evaluating advanced metallic alloys for structural components for fluoride salt-cooled MSRs.

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 08/14/2018