

SECTION A. Project Title: Risk Reduction of TerraPower's Molten Chloride Fast Reactor**SECTION B. Project Description**

Southern Company Services, Inc. (SCS) in collaboration with TerraPower, Idaho National Laboratory (INL), Orano Federal Services, 3M company, and Electric Power Research Institute will conduct research and development efforts in support of the Advanced Reactor Demonstration Project (ARDP) Risk Reduction (RR) Award of TerraPower's Molten Chloride Fast Reactor. This ARDP RR Award Project is focused on the Molten Chloride Reactor Experiment (MCRE). Additional research and development efforts are necessary to advance reactor and ancillary equipment development in support of the MCRE design, including nuclear safety analysis, performance of safeguards and security analysis, and performance of mockup or prototype development. In addition to the reactor design activities, nuclear fuel production will occur at INL. Research and development specifically performed to either confirm necessary design assumptions or gather additional information to support an informed design decision is referred to as separate effects tests (SETs). The SETs consist of research and pilot tests to further the Molten Chloride Fast Reactor technology and MCRE Project. These include:

MCRE-SETs are planned to be completed primarily at the TerraPower's existing facility in Everett, Washington, however, as research and development progresses, additional facilities may be identified and used. MCRE-SETs include:

- Surrogate Fluid MCRE Twin Mockup, including surrogate Fuel Salt (as licensed within the respective facility) handling and transfer, heaters, I&C, KCS positioning, PCS heat transfer, pump operation at temperature
- Small isothermal molten-salt pumped loops
- Flow instrumentation test
- Pumped seal selection testing
- Pump preliminary test unit salt flow testing
- KCS motor and KCS actuation performance testing
- CGS filter, heat transfer, flow and scrubber performance testing including fission product chemical removal (non-nuclear)
- PCS heat removal performance testing
- Shielding material performance testing
- Structural material corrosion performance testing
- Confirmation of additional component/sub-component level design decisions through focused performance testing

SETs that are planned for implementation on the INL site include:

- Fuel Fabrication Scale Up Experiments
- Development of Methods for Fuel Salt Analysis
- Determine Thermophysical Properties of Unirradiated Fuel Salt
- Fuel Salt Irradiation Vehicle (FSIV).
- Determine Irradiated Salt Thermophysical Properties
- Investigate Chemical Speciation and Transport Phenomena

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use: Orano in France will perform tests with radioactive materials created and properly disposed of in France. This material will be used for salt measurement development techniques.

Radioactive Waste Generation: Orano in France will perform tests with radioactive materials created and properly disposed of in France. This material will be used for salt measurement development techniques.

Chemical Use/Storage: All chemicals will be managed in accordance with existing facilities' laboratory procedures.

Chemical Waste Disposal: All chemicals will be managed in accordance with existing facilities' laboratory procedures.

Hazardous Waste Generation: At the INL, the proposed action has the potential to generate small amounts of hazardous waste from cleaning solvents, solders, metals; scrap metal (held for recycle whenever appropriate). Waste Generator Services (WGS) will evaluate, characterize, and manage hazardous waste. In addition, WGS may establish satellite accumulation areas to manage hazardous waste

Industrial Waste Generation: Project activities would result in the generation of small amounts of industrial waste such as waste from machining/fabrication processes, which will be managed in accordance with existing partner facilities' procedures.

DOE-ID NEPA CX DETERMINATION

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 research activities for development of reactor design and nuclear fuel production.

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

Approved by Jason Anderson, DOE-ID NEPA Compliance Officer on 7/21/2021