TERRESTRIAL
ENERGY USA

April 19, 2024

Project Number: 99902076
TEUSA Letter: #240419

US Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Submission of White Paper Titled "Modeling and Simulation Activities Related to Source Term for IMSR Design Basis Accidents"

Please find attached the white paper titled, "Modeling and Simulation Activities Related to Source Term for IMSR Design Basis Accidents." TEUSA is providing this white paper to the NRC for their review and feedback. The purpose of this white paper is to develop a broadly applicable, modeling and simulation capability for molten salt reactors (MSRs). The capability will include a methodology for determining and propagating the uncertainties in parameters of importance for fission product source terms specific for MSRs. The capability will be accomplished using available Nuclear Energy Advanced Modeling and Simulation (NEAMS) tools.

This white paper summarizes the methodology, key analysis parameters, and generic model of an MSR facility that are important for the generation of a radiological source term that is to be used in calculating the radiological consequences following a postulated design basis accident. This white paper discusses the key phenomenological attributes of molten fuel salt that contribute to the potential release of volatile radionuclides. The document also discusses key parameters and uncertainties that must be considered in estimating a mechanistically derived radionuclide source term. The application of the methodology and simulations specific for the IMSR400 will be described in a future topical report.

TEUSA is specifically requesting feedback on information related to the design detail and modeling efforts for the key components associated with the primary loop and reactivity calculations. This would include the data provided to support the calculations. In addition, TEUSA requests feedback on the reference TEI calculation that is incorporated in the white paper. The TEI calculation is the calculation of reference that is being used for acceptance criteria to demonstrate that the modeling and simulation using the NEAMS stable of codes can accurately predict MSR physical and criticality behaviors. Finally, TEUSA would like to know NRC's view on specific data and information that would need to be collected through testing and R&D pertaining to reactor and fuel performance in order to provide sufficient confidence in the mechanistic approach.

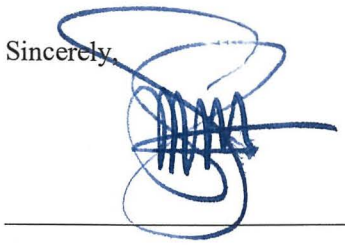
TEUSA requests that the NRC complete its initial review of the white paper and provide its feedback and any requests for information within 90 days of receipt of this letter. TEUSA is prepared to provide a briefing on this activity if it supports the NRC review efforts. TEUSA also requests that the NRC review not exceed a total of 150 total staff hours for this initial review to develop questions, comments, and requests for additional information. If TEUSA's schedule or resource requests cannot be met, TEUSA requests that the NRC notify TEUSA within 30 days of receipt of this letter and establish a time for NRC and TEUSA to discuss the outcomes sought, any additional staff resource requirements, and the schedule for completing the review.

The white paper has been prepared by Terrestrial Energy USA with the assistance of both Argonne National Laboratory and the Oak Ridge National Laboratory as part of a cost-shared project funded by Terrestrial Energy USA and the US Department of Energy under Funding Opportunity Number DE-FOA-1817 – "U.S. Industry Opportunities for Advanced Nuclear Technology Development."

Portions of the enclosed white paper are proprietary, and TEUSA requests that it be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390. Enclosure 1 provides the proprietary version of the white paper and Enclosure 2 provides the non-proprietary version. An affidavit supporting the withholding request is provided in Enclosure 3.

If you have any questions or need any additional information, please contact Daniel Carleton by email at dcarleton@terrestrialusa.com or by phone at 646-687-8212 ext. 533.

Sincerely,



Simon Irish
Chief Executive Officer
Terrestrial Energy USA

Enclosures:

Enclosure 1: Modeling and Simulation Activities Related to Source Term for IMSR Design Basis Accidents" (Proprietary)

Enclosure 2: Modeling and Simulation Activities Related to Source Term for IMSR Design Basis Accidents" (Non-Proprietary)

Enclosure 3: Affidavit Supporting Request for Withholding from Public Disclosure

CCs

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