



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 17, 2024

MEMORANDUM TO: Stephen Philpott, Acting Chief
Advanced Reactor Licensing Branch 2
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation *Adrian Muñiz* Signed by Muniz Gonzalez, Adrian
on 07/17/24

FROM: Adrian Muñiz, Senior Project Manager
Advanced Reactor Licensing Branch 2
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF THE JUNE 20, 2024, PARTIALLY CLOSED
MEETING WITH TERRESTRIAL ENERGY USA, INC., TO DISCUSS
THE WHITE PAPER TITLED "MODELING AND SIMULATION
ACTIVITIES RELATED TO SOURCE TERM FOR IMSR DESIGN
BASIS ACCIDENTS" (EPID NO. L-2024-LRO-0014)

Meeting Information:

Applicant: Terrestrial Energy USA, Inc. (TEUSA)

Docket No.: 99902076

Public Meeting Notice Agencywide Documents Access and Management System (ADAMS)
Accession No.: [ML24155A108](#)

The applicant did not provide presentation slides. All the discussion items were covered during the public portion of the meeting. Therefore, there was no need to conduct a closed discussion.

Meeting Attendees: See the enclosure for a list of meeting attendees.

CONTACT: Michelle Vega Rodriguez, NRR/DANU
(301) 415-1170

Meeting Summary:

The U.S. Nuclear Regulatory Commission (NRC) staff conducted the meeting in accordance with NRC Management Directive 3.5, "Attendance at NRC Staff-Sponsored Meetings" (ADAMS Accession No. [ML21180A271](#)). The purpose of the meeting was to discuss TEUSA's requested feedback associated with the white paper titled, "Modeling and Simulation Activities Related to Source Term for IMSR [integral molten salt reactor] Design Basis Accidents". The table below contains the NRC questions and corresponding TEUSA responses for the topics discussed during the meeting.

NRC Questions	TEUSA Responses
<p>TEUSA request Part 1: "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."</p> <p>NRC questions: Regulatory Guide (RG) 1.203 provides guidance on developing and applying tools for reactor safety analysis. Please confirm that TEUSA plans to implement RG 1.203 to demonstrate that the source term evaluation model described in the white paper meets the safety analysis regulations. Please clarify whether TEUSA also plans to meet RG 1.247 (non-LWR Probabilistic Risk Assessment (PRA) standard) for the source term evaluation model described in the white paper.</p>	<p>TEUSA is partnering with the Department of Energy (DOE) labs to create a Nuclear Energy Advanced Modeling and Simulation (NEAMS) model for a generic MSR. The white paper describes the NEAMS model that TEUSA developed. The white paper also describes a comparison of TEUSA's NEAMS model results for normal operating conditions to the results from a Terrestrial Energy, Inc. (TEI) model calculation. TEUSA is requesting feedback on whether the documentation of this comparison has sufficient detail for NRC licensing review purposes.</p> <p>TEUSA is not committing to meet RG 1.203. In the future, TEUSA may decide to meet it. In the white paper, RG 1.203 is used as a template for laying out the approach to calculating source term. TEUSA is not committing to meet RG 1.247. TEUSA further stated that they have developed a preliminary PRA covering off-normal events and they are still evaluating whether they will meet RG 1.247 in the future.</p>
<p>The sufficiency of the design detail and modeling could be influenced by what scenarios are being simulated and what the simulations are being used to demonstrate. Could TEUSA clarify what scenarios will be simulated and what the simulations will be used to demonstrate? Also, could TEUSA clarify what data is referred to by "the data provided to support the calculations?" By data, does TEUSA intend the physical description of the reactor (i.e., dimensions), test data related to fission product transport in an MSR, or both?</p>	<p>The prediction of the radionuclide release following the design basis event of a break in an off-gas transfer line is the only scenario included in the white paper and review request. In the future, TEUSA may use the source term model described in the white paper to analyze other scenarios, such as reactivity insertion accident, loss of heat sink, and over cooling events.</p> <p>Regarding the data provided to support the calculations, the white paper feedback request is focused on the plant design details including plant dimensions. For example, the feedback should include whether the description of the reactor (e.g., reactor chimney) is sufficiently detailed for NRC</p>

	independent review purposes in a future topical report submittal.
<p>TEUSA request Part 2: “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.”</p> <p>NRC questions: Separate effects and integral test data are used to show that an evaluation model can accurately predict system behavior. The sections of the white paper (V.2.1 through V.2.4) dealing with test data indicate that the assessment will be included in a future topical report. As such, TEUSA should clarify the scope of review that should be applied for this topic within the white paper review.</p>	TEUSA is only requesting feedback on information included in the white paper. The feedback should address whether the information presented in the white paper has sufficient detail for an NRC licensing review.
<p>TEUSA request Part 3: “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.”</p> <p>NRC questions: Part of the RG 1.203 process for assessing what validation data is needed includes developing Phenomena Identification and Ranking Tables (PIRTs). The PIRTs can be used to ensure that the evaluation models chosen have the necessary phenomena modeled and have been sufficiently validated. The white paper discusses PIRTs for reactor physics and thermal hydraulics in Appendices A and B, respectively. Does TEUSA have plans to develop a PIRT for fission product transport?</p>	TEUSA is requesting feedback on what test data is needed and whether it would be acceptable to do a sensitivity analysis in lieu of test data. Regarding PIRTs, there are no plans for a PIRT for fission product transport. The fission product phenomena needed for fission product transport in the reactor coolant system and to the off-gas system are covered in the reactor physics and thermal hydraulics PIRTs.

No regulatory decisions were made as a result of this meeting.

Docket No. 99902076

Enclosure: List of Meeting Attendees

cc: Terrestrial IMSR via GovDelivery
dcarleton@terrestrialusa.com

SUBJECT: SUMMARY OF THE JUNE 20, 2024, PARTIALLY CLOSED MEETING WITH TERRESTRIAL ENERGY USA, INC., "MODELING AND SIMULATION ACTIVITIES RELATED TO SOURCE TERM FOR IMSR DESIGN BASIS ACCIDENTS" WHITE PAPER (EPID NO. L-2024-LRO-0014)
 DATED: JULY 17, 2024

DISTRIBUTION:

PUBLIC
 AMuniz, NRR
 SPhilpott, NRR
 MVegaRodriguez, NRR
 GOberson, NRR
 JSchaperow, NRR
 BAdams, NRR
 IBaek, NRR
 HEsmaili, NRR
 MSalay, NRR
 RidsNrrDanuUal1 Resource
 RidsNrrDanuUal2 Resource
 RidsNrrDanu Resource

ADAMS Accession No: ML24179A177

NRR-106

OFFICE	NRR/DANU/UAL2/PM	NRR/DANU/UAL2/PM	NRR/DANU/UAL2/(A)BC
NAME	MVegaRodriguez	AMuñiz	SPhilpott
DATE	06/27/2024	07/03/2024	07/10/2024
OFFICE	NRR/DANU/UAL2/PM		
NAME	AMuñiz		
DATE	07/17/2024		

OFFICIAL RECORD COPY

**LIST OF MEETING ATTENDEES
FOR THE JUNE 20, 2024, PARTIALLY CLOSED MEETING WITH TERRESTRIAL, USA,
“MODELING AND SIMULATION ACTIVITIES RELATED TO SOURCE TERM FOR IMSR
DESIGN BASIS ACCIDENTS” WHITE PAPER**

JUNE 20, 2024

Name	Organization
Adrian Muñiz	U.S. Nuclear Regulatory Commission (NRC)
Ben Adams	NRC
Derrick Cook	NRC
Inseok Baek	NRC
Jason Schaperow	NRC
Michael Salay	NRC
Michelle Hart	NRC
Michelle Vega Rodriguez	NRC
Paul Mouring	NRC
Zach Gran	NRC
Daniel Carleton	Terrestrial Energy USA, Inc. (TEUSA)
Dave Hill	TEUSA
Francis Akstulewicz	TEUSA
Thanh Hua	Argonne National Laboratory (ANL)
Travis Mui	ANL
Matthew Jesse	Oak Ridge National Laboratory
Edwin Lyman	Union of Concerned Scientists
Ingrid Nordby	Deep Fission
Jana Bergman	Curtiss-Wright

Enclosure