



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

March 22, 2018

MEMORANDUM TO: Samuel S. Lee, Chief  
Licensing Branch 1  
Division of New Reactor Licensing  
Office of New Reactors

FROM: Anthony W. Markley, Senior Project Manager /RA/  
Licensing Branch 1  
Division of New Reactor Licensing  
Office of New Reactors

Rani L. Franovich, Senior Project Manager  
Licensing Branch 1  
Division of New Reactor Licensing  
Office of New Reactors

SUBJECT: SUMMARY OF JANUARY 16, 2018, AND JANUARY 23, 2018,  
PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC,  
TO DISCUSS VARIOUS TOPICS RELATED TO CHAPTER 19,  
"PROBABILISTIC RISK ASSESSMENT AND SEVERE  
ACCIDENT EVALUATION," CHAPTER 9, "AUXILLIARY  
SYSTEMS," AND THE PATH FORWARD FOR THE ACCIDENT  
SOURCE TERM METHODOLOGY TOPICAL REPORT (DOCKET  
NO. 52-048)

On January 16, 2018, and January 23, 2018, representatives of the U.S. Nuclear Regulatory Commission (NRC) and NuScale Power, LLC, (NuScale) held a public teleconference meeting. The purpose of this meeting was to discuss the following:

1. NuScale's responses to the NRC staff's Requests for Additional Information (RAI) Nos. 9043, 9112, 8882, 8903, 8977, 8889, 8813, 9151, and 8899 related to severe accident analyses;
2. RAI 8907 related to equipment floor drains, and
3. NuScale's path forward for the Accident Source Term Topical Report.

A complete copy of NuScale's DCA is available on the NRC public Webpage at <https://www.nrc.gov/reactors/new-reactors/design-cert/nuscale/documents.html>.

CONTACTS: Anthony W. Markley, NRO/DNRL      Rani L. Franovich, NRO/DNRL  
301-415-3165      301-415-7334

Enclosure 1, "Summary of the January 16, 2018, and January 23, 2018, Teleconference between the NRC staff and NuScale," provides a summary of the topics discussed during the teleconference.

The agendas and list of meeting attendees are provided in Enclosures 2 and 3, respectively. The meeting notices are available in the NRC's Agencywide Documents Access and Management System under Accession Nos. ML18003A613 and ML18003A616.

Docket No. 52-048

Enclosures:

1. Meeting Summary
2. Agenda
3. Attendees

SUBJECT: SUMMARY OF JANUARY 16, 2018, AND JANUARY 23, 2018, PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC, TO DISCUSS VARIOUS TOPICS RELATED TO CHAPTER 19, "PROBABILISTIC RISK ASSESSMENT AND SEVERE ACCIDENT EVALUATION," CHAPTER 9, "AUXILLIARY SYSTEMS," AND THE PATH FORWARD FOR THE ACCIDENT SOURCE TERM METHODOLOGY TOPICAL REPORT (DOCKET NO. 52-048)

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NRC-001

OFFICE	NRO/DNRL/LB1: PM	NRO/DNRL/LB1: PM	NRO/DNRL/LB1: LA
NAME	RFranovich	AMarkley	MMoore
DATE	3/12/2018	03/09/2018	3/12/2018
OFFICE	NRO/DSRA/SPRA: BC	NRO/DSEA/RPAC: BC	NRO/DSRA/SPSB: BC
NAME	MHayes*	MDudek*	ADias*
DATE	3/13/2018	3/22/2018	3/20/2018

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**U.S. NUCLEAR REGULATORY COMMISSION**  
**SUMMARY OF JANUARY 16, 2018, AND JANUARY 23, 2018,**  
**PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC**

**TOPIC 1: NuScale Power, LLC's Response to Request and Additional Information 8907**

On January 16, 2018, the U.S. Nuclear Regulatory Commission (NRC) staff met with NuScale Power, LLC (NuScale) to discuss the responses to Request For Additional Information (RAI) 8907. During the course of the presentation, there were numerous questions from the NRC and interactions with NuScale representatives. The discussions centered on the following subject areas:

- Drainage associated with the chemical waste collection sumps, why fire water removal pumps are not required for some sumps that receive drainage from floor drains – NuScale agreed with the NRC staff's question and will provide a supplemental response.
- Discuss issue regarding the seismic classification of the radioactive waste and balance of plant drain systems - NuScale will provide a supplemental response.
- Concerns with meeting Generic Design Criteria 60 versus meeting Title 10 of the *Code of Federal Regulations*, Section 20.1406. The staff does not agree that by meeting 10 CFR 20.1406 and complying with RG 4.21 that the system therefore meets GDC 60 for control of radioactive liquid effluents. NuScale will provide additional information of how the radioactive waste and balance of plant drain systems comply with GDC 60.
- Discrepancies that were noted with Tier 1 Table 3.0-1, "Shared Systems Subject to Inspections, Tests, Analyses, and Acceptance Criteria " Section 9.3.3, "Equipment and Floor Drain Systems," and use of the Revision 5 of Regulatory Guide 1.29, "Seismic Design Classification". – NuScale indicated that they would evaluate and make corrections, as needed.

**TOPIC 2: NuScale Response to RAI Nos. 9043, 9112, 8882, 8903, 8977, and 8889**

*RAI 9043 (in-vessel retention) and 9112 (high pressure melt ejection)*

On January 16, 2018, the NRC staff and the applicant discussed sections a, b, and c of RAI 9043 and NuScale's response. The NRC staff clarified the technical issues that the RAI response did not appear to address. The NRC staff agreed with the applicant that tests indicate that the lowest critical heat flux for a downward facing hemisphere is on the bottom of the hemisphere. The NRC staff stated that other geometric factors (e.g., the seismic retention pin, the distance between the reactor vessel outer surface and the containment inner surface) could influence the value of the lowest critical heat flux. The applicant stated it could provide additional documentation describing the basis for its parameter values. The NRC staff suggested it might be helpful to first discuss the remaining two sections (sections d and e) of RAI 9043. The NRC staff and applicant agreed to a follow-up call on January 23, 2018, to accommodate this discussion. Additionally, to enable the applicant to more effectively prepare

for the follow-up call, the NRC staff agreed to provide the applicant more clarity regarding what was deficient with the response to RAI 9043 (sections d and e) and all of RAI 9112.

On January 23, 2018, the applicant indicated it recently developed an enhanced analysis to help address deficiencies in its initial response to RAI 9043. The enhanced analysis is documented in Engineering Change Notice(s) that are available for staff review. The applicant offered and the NRC staff agreed to review the enhanced analysis as part of a future (Stage 2) Chapter 19 audit.

Also on January 23, 2018, the applicant further discussed its response to RAI 9112 and agreed that the basis for a cutoff pressure [whether it is 200 pounds per square inch differential (psid) or 100 psid] below which high pressure melt ejection could be supported is deficient. However, the applicant stated that by the time the water had boiled out of the reactor pressure vessel (RPV) lower plenum and the RPV bottom head heats up, there would be no pressure difference between the RPV and the containment vessel (CNV) as shown in its MELCOR analyses. The applicant noted that the issue of backflow of water from the CNV into the RPV through an open reactor recirculation valve (RRV) is addressed in a response to another RAI (RAI 8903 on gravity-driven reflood).

During the January 23, 2018, follow-up teleconference the NRC staff asked about the effect of the operators adding water after the RPV has boiled dry. The applicant stated that the potential pressure increase from the water addition does not need to be analyzed as part of the evaluation of high pressure melt ejection because there are no plans to add water to the RPV after core damage begins. The final safety analysis report (FSAR) does not state that the operators should not add water after core damage begins. The NRC staff stated that the applicant's plan to not add water to the RPV after core damage begins is different from other light-water reactors and that the NRC staff would need to consider this position further.

#### *RAIs 8882, 8903, and 8977*

These RAIs pertain to pool decontamination factor for module tip-over, gravity-driven RPV reflood via open RRVs, and larger release definition, respectively. In its responses to these RAIs, NuScale referred to supplemental analyses that resolve the matters raised in the RAIs. During the January 16, 2018, teleconference, the NRC staff indicated an interest in reviewing those supplemental analyses. The applicant offered to make the analyses available to NRC staff review in the applicant's Rockville office. The NRC staff agreed to include this review of supplemental analyses in the scope of its future (Stage 2) Chapter 19 audit plan.

#### *RAI 8977 (large release definition)*

On January 16, 2018, the NRC staff made the following additional observations and requests regarding NuScale's response to RAI 8977:

- The RAI response states that, to estimate the release magnitude that constitutes a large release, the relative release fractions for the radionuclide groups from Sandia National Laboratories Report SAND2011-0128, "Accident Source Terms for Light-Water Nuclear Power Plants Using High-Burnup or [Mixed Oxide (MOX)] Fuel," were assumed. The NRC staff requests the basis for this assumption, because of the disclaimer in SAND2011-0128 regarding use for small modular reactors. The NRC staff noted that the relative fractions of core inventory released to the containment in SAND2011-0128

may not be applicable to NuScale due to differences between the geometry of NuScale and large light water reactors and differences in volatility among the radionuclide groups.

- The RAI response states that the following was assumed to estimate the maximum release from a leaking containment: a) the relative release fractions for the radionuclide groups from SAND2011-0128 and b) retention of radionuclides in the reactor vessel except for xenon and iodine. The NRC staff requests the applicant clarify these two assumptions, because they do not appear to be consistent with each other.
- Estimating the release magnitude using MELCOR accident consequence code system (MACCS) involves sampling from weather data (i.e., wind speed, wind direction, precipitation, and atmospheric stability) and specifying the location of the receptor with respect to the release direction. The NRC staff requests clarification of what percentile dose(s) and what receptor location(s) (e.g., direction(s)) were used in the analysis, due to the variety of possible ways to define a large release.

The applicant agreed to provide a supplemental response that is responsive to these NRC staff requests.

*RAI 8889 (steam generator tube failure induced by severe accident)*

During the January 16, 2018, teleconference, the NRC staff requested an estimated date that a supplemental response to this RAI would be forthcoming. The applicant indicated it had recently submitted the supplemental information for to the NRC.

*RAI 8813 (Probabilistic Risk Assessment [PRA] model for emergency core cooling systems [ECCS])*

During the January 23, 2018, call, the NRC staff requested NuScale to clarify a response to RAI 8813 received on June 28, 2017. In its response, NuScale stated that the "IAB [inadvertent actuation block] is a normally open valve that is not required to change state upon receipt of a non-spurious ECCS actuation signal." NuScale confirmed the NRC staff's understanding of the design that IAB is normally open, closes when the RPV to CNV differential pressure (DP) is high, and then opens again when the DP becomes low for inadvertent actuations. NuScale further clarified that the IAB is designed to not have to change positions for scenarios that call upon the ECCS function to achieve a safe end state (e.g., chemical and volume control system line break). NuScale stated that this is accomplished by setting the IAB setpoint sufficiently high to allow the RPV to CNV DP to clear the IAB setpoint before an ECCS actuation setpoint is reached. Scenarios such as a loss of direct current power will require the IAB to change state.

*RAI 9151 (Key PRA Assumptions)*

During the January 23, 2018, call, the NRC staff discussed NuScale's response to RAI 9151, received on November 21, 2017, and asked if the proposed wording for combined operating license (COL) Item 19.1-8 provides sufficient guidance for COL applicants and/or holders to ensure validity of key PRA assumptions during the COL phases because the COL Item does not reference specific FSAR tables containing the key assumptions. Following the discussion, the applicant agreed to supplement the RAI response with a revised COL Item 19.1-8 that refers to the specific FSAR tables that list the key PRA assumptions.

*RAI 8899, Question 19.1-15*

During the January 23, 2018, call, the NRC staff discussed NuScale's supplemental response to RAI 8899, question 19.1-15, and indicated that the FSAR 3.8.5 analysis for sliding and overturning does not demonstrate that a seismic margin of 1.67 times the certified seismic design response spectra (CSDRS) is met for the seismic margin assessment. The NRC staff stressed that, as stated in the original RAI, a safety finding needs to be made that a seismic margin of 1.67 times the CSDRS is met for the seismic Category I structures against seismic-induced sliding and overturning.

The NRC staff additionally requested clarification on the assumption added to Table 19.1-40, specifically whether it is the applicant's intent that the COL applicant verify this assumption. The NRC staff further elaborated that, if the intent is for the COL applicant to verify this assumption, the assumption to be verified should not confirm the applicability of the stability analysis in FSAR 3.8.5, but should confirm the stability of the structures for a higher demand (i.e. 1.67 times the CSDRS).

The applicant stated its intent to discuss the resolution of this RAI with NuScale management. Should the applicant choose to perform an additional analysis, a supplemental RAI would be needed to justify the effort. Alternatively, should the applicant choose to add a COL item and modify Table 19.1-40, it would indicate this resolution in a supplemental response.

### **TOPIC 3: NuScale Path Forward for Accident Source Term Methodology Topical Report**

NuScale Power, LLC staff met with the NRC staff to discuss a revision to their approach for the Accident Source Term Methodology Topical Report (ASTTR) on January 23, 2018. In advance of this meeting NuScale provided the NRC staff with the slides that were used during the NuScale presentation. These slides are publicly available and can be found at ADAMS Package ML17254B067. After introductions, NuScale proceeded through their presentation which followed their slides.

During the course of the presentation, there were numerous questions from the NRC and interaction with NuScale representatives. The discussions centered on the following subject areas:

- Use of an operational iodine spike event that uses maximum technical specifications values versus a core damage event.
- Concern for choke flow rates given the size of the leak.
- Concern for greater leakage at lower pressures.
- Equipment survivability and scenario applicability.
- Effects upon control room habitability and effects upon multi module operations.
- Regulatory processes that may be needed, e.g., exemptions.
- Concerns for a potential policy issue and potential impact upon schedules.

As a result of the NuScale presentation and dialogue, the NRC staff requested that early interaction with NuScale as the revised approach becomes formalized to minimize impact upon schedule and for to ensure NRC understanding of the revised approach.

There were no substantive comments from members of the public. The meeting was then closed.



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**MEETING AGENDA**

Tuesday, January 16, 2017

<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
1:00 pm – 2:00 pm	NuScale Response to eRAI 8907	NRC/NuScale
2:00 pm – 3:00 pm	NuScale Response to eRAI Nos. 9043, 9112, 8882, 8903, 8977 and 8889	NRC/NuScale

Tuesday, January 23, 2018

<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
10:00 am – 12:00 am	NuScale Power, LLC Path Forward for Accident Source Term Methodology Topical Report (ASTTR)	NRC/NuScale
1:00 pm – 3:00 pm	Resumed - NuScale Response to eRAI Nos. 9043 and 9112 NuScale Response to eRAIs 8813, 9151 and 8899	NRC/NuScale

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**SUMMARY OF JANUARY 16, 2018, AND JANUARY 23, 2018,**  
**PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC**  
**LIST OF ATTENDEES**

**NuScale: January 16, 2016**

G. Buster  
J. Curry  
B. Galyean  
B. Haley  
L. McSweeney  
E. Mullin  
C. Sexton  
J. Wike  
C. Williams  
C. Fosaaen  
J. Wike  
M. Paul  
A. Maass (Flour)

**NuScale: January 23, 2016**

S. Bristol  
G. Buster  
J. Curry  
J. Doyle  
B. Galyean  
D. Gardner  
B. Haley  
E. Mullin  
S. Weber  
J. Wike  
C. Williams  
D. Gardner  
M. Shaver  
G. Becker  
T. Bergman  
R. Gamble  
A. Callaway  
D. Botha  
B. Bristol

**NRC Staff January 16, 2018**

Hossein Esmaili  
Rani Franovich  
Tony Nakanishi  
Marie Pohida  
Jason Schaperow

Anthony Markley  
Robert Vettori  
Dennis Andrukat

**NRC Staff January 23, 2018**

Hossein Esmaili  
Rani Franovich  
Bhagwat Jain  
Tony Nakanishi  
Alissa Neuhausen  
Marie Pohida  
Jason Schaperow  
Mark Caruso  
Michelle Hayes  
Michael Dudek  
Ron Lavera  
Rich Clement  
Steve Williams  
Zachary Gran  
Andy Campbell  
Robert Taylor  
Samuel Lee  
Brad Harvey  
Jason White  
Ed Stutzcage  
Anne-Marie Grady  
Greg Cranston  
John Monninger  
Donald Palmrose  
Shawn Campbell  
Michael Salay  
Anthony Markley

**Public**

Jim Kenzie  
Ray Schiele  
Alex Young  
Bryan Welch  
Sarah Fields  
Amir Afzali