



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

November 6, 2018

MEMORANDUM TO: Samuel S. Lee, Chief  
Licensing Branch 1  
Division of Licensing, Siting,  
and Environmental Analysis  
Office of New Reactors

FROM: Rani L. Franovich, Senior Project Manager */RA/*  
Licensing Branch 1  
Division of Licensing, Siting,  
and Environmental Analysis  
Office of New Reactors

SUBJECT: SUMMARY OF THE JUNE 27, 2018, AND JULY 17, 2018,  
PUBLIC TELECONFERENCES WITH NUSCALE POWER, LLC,  
TO DISCUSS VARIOUS TOPICS RELATED TO NUSCALE'S  
TOPICAL REPORT, "LOSS OF COOLANT ACCIDENT  
EVALUATION MODEL" AND CHAPTER 19, "PROBABILISTIC  
RISK ASSESSMENT AND SEVERE ACCIDENT EVALUATION,"  
OF THE NUSCALE DESIGN CERTIFICATION APPLICATION  
(DOCKET NO. 52-048)

On June 27, 2018, and July 17, 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 NuScale's responses to the NRC staff Requests for Additional Information Nos. 8926 and 9138 related to Chapter 19.

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

Enclosure 1, "Summary of the June 27, 2018, and July 17, 2018, Teleconference between the NRC Staff and NuScale," provides a summary of the topics discussed during the teleconference.

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301-415-7334

The agenda 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. ML18141A730 and ML18141A735.

Docket No. 52-048

Enclosures:

1. Meeting Summary
2. Agenda
3. Attendees

SUBJECT: SUMMARY OF THE JUNE 27, 2018, AND JULY 17, 2018, PUBLIC TELECONFERENCES WITH NUSCALE POWER, LLC, TO DISCUSS VARIOUS TOPICS RELATED TO NUSCALE'S TOPICAL REPORT, "LOSS OF COOLANT ACCIDENT EVALUATION MODEL" (PROJECT NO. PROJ0769) AND CHAPTER 19, "PROBABILISTIC RISK ASSESSMENT AND SEVERE ACCIDENT EVALUATION," OF THE NUSCALE DESIGN CERTIFICATION APPLICATION (DOCKET NO. 52-048)  
 DATED: NOVEMBER 6, 2018

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ADAMS Accession No.: ML18267A356

\*via email

NRC-001

<b>OFFICE</b>	NRO/DLSE/LB1: PM	NRO/DLSE/LB1: LA	NRO/DSRA/SPRA: BC
<b>NAME</b>	RFranovich	MMoore	MHayes*
<b>DATE</b>	11/6/2018	9/25/2018	10/10/2018
<b>OFFICE</b>	NRO/DSRA/SRSB: BC		
<b>NAME</b>	CThurston for RKaras*		
<b>DATE</b>	10/5/2018		

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**U.S. NUCLEAR REGULATORY COMMISSION**  
**SUMMARY OF JUNE 27, 2018, AND JULY 17, 2018**  
**PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC**

**Chapter 19, “Probabilistic Risk Assessment And Severe Accident Evaluation”**

NuScale Power, LLC’s (NuScale) response to the following requests for additional information (RAI):

RAI No. 8926 (Module Drop Core Damage Scenario)

On June 27, 2018, the U.S. Nuclear Regulatory Commission (NRC) staff discussed NuScale’s response to RAI No. 8926, Question 19-23, dated September 29, 2017, and the supplemental response dated May 21, 2018. During a follow-up audit of Chapter 19 (Agencywide Documents Access and Management System Accession No. ML18254A340), the NRC staff confirmed that NuScale performed a sensitivity analysis to demonstrate that using air as fill gas would not result in significantly different severe accident progression and source term for the purposes of estimating the large release frequency. Based on this confirmation, the NRC staff indicated NuScale’s responses to RAI No. 8926, Question 19-23, resolved the technical question. However, the NRC staff requested NuScale to document in the final safety analysis report (FSAR) that the consequences of a module drop core damage scenario are not sensitive to the gas used for containment vessel pressurization (either nitrogen or air). NuScale indicated that it will supplement the RAI response with the requested FSAR revision.

RAI No. 9138 (Severe Accident with Steam Explosion)

The NRC staff requested NuScale to clarify its December 12, 2017, response to RAI No. 9138 on the severe accident issue of steam explosion, particularly with regard to the following:

1. In-vessel (i.e., inside the reactor pressure vessel, RPV) steam explosion

The NRC staff noted that the RAI response contained a brief description of the applicant’s comparison of the FSAR analysis to past NRC and industry analysis that have been performed using the Risk Oriented Accident Analysis Methodology (ROAAM) method described in a four-part set of papers that include “An Assessment of Steam Explosion-Induced Containment Failure. Part I: Probabilistic Aspects,” by Dr. T.G. Theonous published in 1987. The NRC staff requested NuScale to elaborate on its brief description in the RAI response. In response, the applicant clarified the analysis of in-vessel steam explosion and its comparison to the papers published in 1987. This discussion was closed to the public because it entailed an exchange of proprietary information.

The RAI response states the FSAR analysis is supported by “Evaluation of Dynamic Pressures from Steam Explosions Applied to Advanced Light Water Reactors” (authored by Dr. Michael Corradini et. al., published in Nuclear Science and Engineering in 2011) using preliminary NuScale design information. The NRC staff noted that the 2011 article appears to be an evaluation of the ability of the RPV lower head to withstand a steam explosion. It does not appear to address the issue of alpha-mode failure.

The applicant explained that the 2011 paper was cited in the RAI response because the analysis described in the paper showed that a steam explosion was not likely to fail the bottom of the reactor pressure vessel (RPV). It was not cited to address alpha-mode failure, which is the postulated failure of the containment top head caused by a steam explosion in the RPV lower plenum propelling upward a slug of material that impacts the inside surface of the RPV top head and propels the head into the containment top head. Such a steam explosion is hypothesized to occur during core heat-up and degradation as a result of molten corium falling into the water pool in the RPV lower plenum.

## 2. Ex-vessel (i.e., inside the CNV) steam explosion

The RAI response provides statements as to why an energetic ex-vessel steam explosion is not possible. The NRC staff noted that the RAI response does not appear to provide sufficient analytical and/or experimental basis for the statements.

The applicant stated that the NuScale design relies on in-vessel retention of core debris to prevent ex-vessel steam explosion by preventing corium from exiting the bottom of the RPV. The statements provided in the RAI response (regarding why an energetic steam explosion is not possible) are qualitative and are intended to describe the design's defense-in-depth regarding ex-vessel steam explosion. The applicant does not intend to provide the NRC staff with further analytical and/or experimental basis for these statements.

### **NRELAP Version Change for Loss of Coolant Accident Topical Report**

The NRC staff inquired about scheduling and further technical information regarding the NuScale's planned transition from NRELAP version 1.3 to 1.4. NuScale responded that in general the changes are corrections and improvements, not a major overhaul, with no major impacts expected to analysis results. NuScale further indicated the changes are being made under their normal Appendix B process for code changes. A portion of the meeting involved discussion of proprietary information and was subsequently closed to the public.

**U.S. NUCLEAR REGULATORY COMMISSION**  
**SUMMARY OF JUNE 27, 2018, AND JULY 17, 2018**  
**PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC**  
**MEETING AGENDA**

Wednesday, June 27, 2018

<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
1:00 pm – 1:45 pm	NuScale Response to eRAI 8926, Q. 19-23	NRC/NuScale

Tuesday, July 17, 2018

<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
1:00 pm – 2:00 pm	NRELAP Version Change for LOCA Topical Report	NRC/NuScale
2:00 pm – 3:00 pm	Response to eRAI 9138	NRC/NuScale

**LIST OF ATTENDEES**

**NuScale**

**June 27, 2018**

S. Bristol  
J. Curry  
B. Galyean  
N. Wahlgren  
C. Williams

**July 17, 2018**

S. Bristol  
J. Curry  
B. Galyean  
B. Haley  
R. Houser  
P. Infanger  
A. Lingenfelter  
J. Luitjens  
M. McCloskey  
G. Myers  
E. Mullin  
D. Peebles  
S. Weber  
B. Wolf

**NRC Staff**

**June 27, 2018**

R. Franovich  
M. Pohida

**July 17, 2018**

T. Drzewiecki  
H. Esmaili  
R. Franovich  
S. Haider  
M. Hayes  
R. Karas  
P. Lien  
S. Lu  
J. Schaperow  
R. Skarda  
C. Thurston

**Public**

**June 27, 2018**

None

**July 17, 2018**

None