February 10, 2018

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

FROM: Marieliz Vera-Amadiz, Senior Project Manager ***/RA/***
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Rani L. Franovich, Senior Project Manager ***/RA/***
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Office of New Reactors

SUBJECT: SUMMARY OF NOVEMBER 21, 2017, AND DECEMBER 12, 2017, PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC, TO DISCUSS VARIOUS TOPICS RELATED TO CHAPTER 19, "PROBABILISTIC RISK ASSESSMENT AND SEVERE ACCIDENT EVALUATION," AND CHAPTER 3, SECTION 3.9.1 "SPECIAL TOPICS FOR MECHANICAL COMPONENTS," OF THE NUSCALE DESIGN CERTIFICATION APPLICATION (DOCKET NO. 52-048)

On November 21, 2017, and December 12, 2017, 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 Requests for Additional Information (RAI) No. 8926 related to Probabilistic Risk Assessment (PRA) modeling of refueling operations in the NuScale Design Certification Application (DCA); and

2. NuScale's responses to the NRC staff RAI No. 9039 related to Special Topics for Mechanical Components in the NuScale DCA

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.

Enclosure 1, "Summary of the November 21, 2017, and December 12, 2017, Teleconference between the NRC staff and NuScale," provides a summary of the topics discussed during the teleconference.

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The agenda and list of meeting attendees are provided in Enclosures 2 and 3, respectively. The meeting notice is available in the NRC's Agencywide Documents Access and Management System, under Accession No. ML17275A036.

Docket No. 52-048

Enclosures:
1. Summary of the November 21, 2017, and December 12, 2017, Teleconference Between the NRC Staff and NuScale
2. Agenda
3. Attendees

SUBJECT: SUMMARY OF NOVEMBER 21, 2017, AND DECEMBER 12, 2017, PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC, TO DISCUSS VARIOUS TOPICS RELATED TO CHAPTER 19, "PROBABILISTIC RISK ASSESSMENT AND SEVERE ACCIDENT EVALUATION," AND CHAPTER 3, SECTION 3.9.1 "SPECIAL TOPICS FOR MECHANICAL COMPONENTS," OF THE NUSCALE DESIGN CERTIFICATION APPLICATION (DOCKET NO. 52-048)
DATED: 2/10/2018

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DATE	1/22/2018	1/10/2018	

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SUMMARY OF NOVEMBER 21, 2017, AND DECEMBER 12, 2017,

PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC

TOPIC 1:

NuScale Power, LLC's Response to RAI No. 8926

The U.S. Nuclear Regulatory Commission (NRC) staff discussed NuScale's Power, LLC (NuScale's) response to Request for Additional Information (RAI) 8926, Question 19-23. In their response, NuScale explained that the containment vessel (CNV) is pressurized with nitrogen such that the hydrostatic pressure on the inside and outside of the CNV is approximately equal when the vessel is upright. The intent is to limit the exchange of water when the CNV flange is opened.

- The NRC staff asked if this operating practice will be included in the Final Safety Analysis Report (FSAR) as a key assumption, since it explains why the core damage with an intact module can occur if the module is on its side after a postulated drop, as opposed to a postulated module drop when the CNV flange is open. NuScale confirmed that they will provide additional information in the FSAR in a revised RAI response. No submittal date was given.

- The NRC staff asked if this operating practice of pressurizing the module for transport and restart with nitrogen as opposed to air or oxygen will be described in the FSAR as a key assumption, since the potential for hydrogen combustion is reduced as a result of using nitrogen and was not analyzed with another gas. NuScale responded that they performed a MELCOR sensitivity study with a gas other than nitrogen that will be added to the electronic reading room (ERR) for staff review as part of the Environmental Audit. NuScale will inform the staff when this sensitivity study is uploaded to the ERR.

- During restart, following the pressurization of the CNV, the NRC staff asked NuScale whether the CNV can be over drained such that there is a loss of decay heat removal. NuScale responded that if the reactor recirculation valves (RRV) are left open, the CNV could, in theory, be over drained, and a loss of decay heat removal could occur. However, NuScale believes that this scenario is not credable since procedures would be violated and the timing of this scenario would be hours. The NRC staff questioned the basis for assuming a human error probability of zero. NuScale agreed to provide an updated RAI response to justify that the human error probability is very small. This updated RAI response will discuss event timing, available instrumentation, available alarms, and procedures.

In its response to RAI 8926, Question 19-23, the NRC staff noted an assumption in Table 19.1-71, "Key Assumptions for the Low Power and Shutdown Probabilistic Risk Assessment," that the module is kept below the height that could damage the ultimate heat sink (UHS) with no defined height. The NRC staff asked NuScale at what height would a postulated module drop damage the UHS. The NRC staff learned the design for the containment flange tool has not been finalized. NuScale responded that the specific height has not yet been determined. The NRC staff replied that operator errors dominate the module drop frequency. The NRC staff also asked if the FSAR will be updated to document how operator errors, such as over travel raise with an intact module and over load with an intact module, will be reduced. NuScale responded that the design features of the Reactor Building Crane (RBC) that limit operator errors will be addressed in the response to RAI 9128.

In its response to RAI 8926, Question 19-23, FSAR Table 19.1-74, “External Flooding Susceptibility During Low Power and Shutdown Plant Operating States,” and Table 19.1-75, “High-Wind Susceptibility during Low Power and Shutdown Plant Operating States,” were modified to state that operators are anticipated to suspend module movement prior to high winds and external flooding events. NuScale further indicated that in the event of a loss of alternating current (AC) power, the RBC brakes will set and stop the motion. The NRC staff requested clarification of what NuScale means by “anticipated.” NuScale responded that high winds and external flooding are not bounding events. NuScale agreed to supplement the RAI response with revised FSAR Tables 19.1-74 and 19.1-75 and a justification of why a loss of AC power is bounding (e.g., all controls and instrumentation for the RBC are protected in a Seismic Category 1 structure).

The NRC staff asked NuScale to clarify what specific calculation in report ER-P060-7085, “Dropped Module Consequence Analysis,” Revision 1, dated August 11, 2016, NuScale considers representative of dropping the reactor internals onto the reactor fuel in the Refueling Flange Tool. NuScale responded that Case 2b is representative of this scenario.

TOPIC 2:

NuScale Response to RAI No. 9039

Question 03.09.01-1.

NuScale will provide a mark-up to revise FSAR Table 3.9-1 “Summary of Design Transients” for the following items:

1. Change description of the first column of Table 3.9-1 from “Name” to “Event Name.”

2. Change “Events” in description of the last column of Table 3.9-1 to “Cycles.”

3. Add a note to Table 3.9-1 for OBE vibratory cycles in fatigue calculation based on Sections 3.10 “Seismic and Dynamic Qualifications of Mechanical and Electrical Equipment” and/or 3.12 “ASME Code Class 1, 2, and 3 Piping Systems, Piping Components and Associated Supports.”

Question 03.09.01-2.

NuScale will provide a basis that assumes the turbine trip with bypass flow to occur 180 times for 60 years.

Question 03.09.01-3.

As discussed in the public meeting, the NRC staff concludes that the applicant did not provide a deviation response to this RAI question related to Level A transient 3 and 4 event cycles.

The response stated:

> *In the response to RAI 03.09.01-3, the applicant indicated that of the 300 cycles for power descents, 60 occur following a normal refueling (as shown in Table 3.9-1) and 240 will occur following circumstances that require a transition to hot shutdown, which includes equipment failures or a lack of power demand from the grip. Of the total 700 cycles for power ascents, 300 cycles will occur consistent with the number of power descents to hot shutdown. The remaining 400 events account for the service level B, C, and D transients that result in a reactor trip and transition to hot shutdown, and will require a subsequent power ascent to return to normal operation when conditions permit.*

The above response was discussed between the NRC staff and the applicant. The question's concern was the Level A transients 3 and 4 that both cover the reactor conditions between 15 percent of full power and hot zero power. As such, the response should not account for Level B, C, or D transient event cycles into these Level A transients. The response is therefore unacceptable to the staff. As a result, the staff will issue a new eRAI for this question.

Question 03.09.01-4.

After the meeting, the applicant provided an MicroSoft Excel file for the 2015 results of the industry average parameter estimates for component reliability, which are updates to those originally provided in NUREG/CR-6928 "Industry-Average Performance for Components and Initiating Events at U.S. Commercial Nuclear Power Plants." Over a 60 year design life, this equates to 0.12 events. Based on this failure probability, 15 cycles over 60 years is sufficiently bounding for design analysis.

The NRC staff would review and confirm the updated information for the mean frequency for, "Air Operated Valve Fails To Control", that is, 2.28E-07 per hour.

MEETING AGENDA

Tuesday, November 3, 2017

Time	Topic	Speaker
2:00 pm – 3:00 pm	NuScale Response to eRAI 8926	NRC/NuScale

Tuesday, December 12, 2017

Time	Topic	Speaker
1:00 pm – 2:00 pm	NuScale Response to eRAI 9039	NRC/NuScale
2:00 pm – 3:00 pm	Resumed - NuScale Response to eRAI 8926	NRC/NuScale

LIST OF ATTENDEES

NuScale

S. Bristol
J. Curry
C. Fosaaen
B. Galyean
D. Gardner
W. Massie
E. Mullen
P. Pigman
C. Williams
N. Wahlgren
S. Weber
J. Wike (partial)
M. Bryan
W. Massie
JJ. Arthur
O. Hand
H. Rooks

NRC Staff

Rani Franovich
Michelle Hayes
Marie Pohida
Jason Schaperow
Marieliz Vera
Cheng-Ih (John) Wu

Public
Bryan Welch
Sarah Fields