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

April 6, 2018

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

FROM: Marieliz Vera, Project Manager ***/RA/***
Licensing Branch 1
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: SUMMARY OF THE JANUARY 30, 2018, CATEGORY 1 PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC DESIGN CERTIFICATION APPLICATION REQUEST FOR ADDITIONAL INFORMATION RESPONSES NOS. 9114, 8932, 8975, AND 8963

The U.S. Nuclear Regulatory Commission (NRC) held a Category 1 public teleconference on January 30, 2018, to discuss the responses to NuScale Power, LLC (NuScale) Design Certification, Requests for Additional Information (RAI) Nos. 9114, 8932, 8975, and 8963, regarding Final Safety Analysis Report Tier 2, Chapter 3, "Design of Structures, Systems, Components and Equipment." Participants included personnel from NuScale and no members of the public.

The public meeting notice can be found in the Agencywide Documents Access and Management Systems (ADAMS) under Accession No. ML18030A416. This meeting notice was also posted on the NRC public Website.

The meeting agenda and list of participants can be found in Enclosures 1 and 2, respectively. Some of the technical issues discussed are included in Enclosure 3.

CONTACT: Marieliz Vera, NRO/DNRL
301-415-5861

Summary:

The purpose of this meeting was to discuss the RAI response for RAIs 9114 question 03.07.02-31 (ML17317B553), 8932 question 03.07.02-01 (ML17356A024), 8975 (ML17297B940), RAI 8963, Questions 03.08.05-7 and 03.08.05-12, (ML17290B267). The NRC staff discussed their feedback on responses to RAIs 9114, 8932, 8975, and 8963 (Enclosure 3) with NuScale. For RAI 8975 question 03.08.04-33, the feedback is pointing that the numbering on tables and figures referenced on the response are incorrect also the description for some models are missing from the tables. As a result of several RAI responses, NuScale has added and deleted tables and figures to their FSAR and the numbering has changed. NuScale will supplement the responses with the correct numbering and will add the descriptions that are missing. Because the review is ongoing, there are still possible changes to the numbering on tables and figures, if that happens NuScale will re-supplement the RAIs closer to the end of the review. NuScale will address the remaining feedbacks discussed on the meeting with a supplemental to the RAI response.

Docket No. 52-048

Enclosures:
1. Meeting Agenda
2. List of Attendees
3. Comments presented by NRC staff

cc w/encls.: DC NuScale Power, LLC Listserv

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CATEGORY 1 PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC

DESIGN CERTIFICATION APPLICATION RESPONSES TO REQUEST FOR

ADDITIONAL INFORMATION NOS. 9114, 8932, 8975, AND 8963

January 30, 2017

11:00 p.m. – 1:00 p.m.

AGENDA

Public Meeting	
11:00-11:10	Introductions and identification of topics
11:10-12:30	NuScale response to request for additional information (RAI) 9114, 8932, 8975, and 8963 discussion
12:30-12:40	Public comments
12:40-1:00	Closed portion

U.S. NUCLEAR REGULATORY COMMISSION

CATEGORY 1 PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC

DESIGN CERTIFICATION APPLICATION RESPONSES TO REQUEST FOR

ADDITIONAL INFORMATION NOS. 9114, 8932, 8975, AND 8963

LIST OF ATTENDEES

January 30, 2018

NAME	AFFILIATION
Marieliz Vera	U.S. Nuclear regulatory Commission (NRC)
Robert Roche	NRC
Sunwoo Park	NRC
Manas Chakravorty	NRC
Ata Istar	NRC
John Ma	NRC
Pravin Patel	NRC
Alissa Neuhausen	NRC
Vaughn Thomas	NRC
Marty Bryan	NuScale Power, LLC (NuScale)
Josh Parker	NuScale
Jeremy Aatum	NuScale
Mohsen Azabakht	NuScale
Nick Brown	NuScale
Craig Harwood	NuScale
Giulio Flores	NuScale
Andre L'Eplattenier	NuScale
Hadi Razavi	NuScale
Evren Ulku	NuScale
Tom Ryan	NuScale
Kyra Perkins	NuScale
Kristen McKay	NuScale
Mohsin Khan	ARES

U.S. NUCLEAR REGULATORY COMMISSION

CATEGORY 1 PUBLIC TELECONFERENCE WITH NUSCALE POWER, LLC

DESIGN CERTIFICATION APPLICATION RESPONSES TO REQUEST FOR

ADDITIONAL INFORMATION NOS. 9114, 8932, 8975, AND 8963

Staff Feedback on Request Additional for Information 9114

Question 03.07.02-31:

The U.S. Nuclear Regulatory Commission (NRC) staff's concern is the adequacy of the NuScale Power Module (NPM) beam model used in the SASSI2010 and SAP2000 RXB models. The staff wants to know how this NPM beam model was developed and validated with respect to the three-dimension (3D) NPM model. As part of its request for additional information (RAI) response, the applicant stated the following:

> *The NPM beam model shown in FSAR Tier 2, Figure 3.7.2-28, and described in Section 3.7.2.1.2.2, was created to have similar dynamic characteristics as the 3D model and is used in the analysis of the SAP2000 and SASSI2010 RXB models. To validate the NPM beam model, a modal analysis in three directions was performed in order to tune the simplified model to match the detailed 3D model response.*

The NRC staff finds that the applicant's response quoted above addresses the staff's concern. However, the applicant did not provide any comparison of the dynamic characteristics between the simplified beam model and the 3D model that demonstrates the validity of the beam model. Therefore, the applicant should provide a revised RAI response that includes only the relevant information to address the NRC staff's concern and a DCD markup that captures the main points of the RAI response and a table that summarizes a comparison of the dynamic characteristics between the NPM simplified beam model and the 3D model.

Based on above review, RAI 9114 Question 03.07.02-31 will be tracked as an Open Item and the applicant should address NRC staff's concern in its revised RAI response.

Staff Feedback on RAI 8932

Question 03.07.02-1:

The NRC staff reviewed the applicant's response and identified the following issues that should be addressed by the applicant:

a) The NRC staff reviewed the sensitivity study included in the RAI response. The NRC staff noted that the applicant did not include any comparison of the ISRS obtained from a dynamic time history analysis using the NuScale ground motions. The applicant states that minor changes in the natural frequencies and mass participation ratios observed from the modal analysis indicates that other dynamic characteristics of the building models would not change by mesh refinement and therefore there is no need to study the effects of the mesh refinement on the SSI and ISRS. However, the NRC staff needs further technical justification for such a conclusion that demonstrates through

comparison of the ISRS at key selected locations based on a dynamic analysis using the NuScale specific time histories. The NRC staff believes that changes in the properties of individual modes (natural frequencies, mass participation ratios) may be minor; however, their cumulative effect should be assessed by looking into actual dynamic responses, such as ISRS, under applicable ground motions.

b) In the mesh sensitivity study, the applicant indicates that the area elements are refined by breaking each element into four elements. The NRC staff understands the RXB and CRB models include not only area elements but also 1-D beam and 3-D solid elements. Please clarify if these beam and solid elements are also refined and taken into account in the study.

c) Tables 4 and 19 in the RAI response present a comparison of dominant natural frequencies and corresponding mass participation ratios between the FSAR and refined mesh models for the RXB and CRB, respectively. The NRC staff notes, in Table 19, that the frequencies for the FSAR and refined mesh models for the CRB do not match closely for frequencies above 10.06 Hz. Please explain these discrepancies and its effect on the seismic demand (forces, moments, displacements, ISRS, etc.) computed based on the FSAR model.

d) The proposed markup included in the RAI response should be updated to reflect applicant's supplemental or revised response, as necessary.

Based on above review, RAI 8932, Question 03.07.02-1 will be tracked as an Open Item and the applicant should address NRC staff's concern in its supplemental or revised RAI response.

Staff Feedback on RAI 8975

Question 03.08.04-29:

In its response, the applicant describes that the pressure difference between the ANSYS and SASSI2010 analysis results is accounted for in the SAP2000 by amplifying the gravity load. FSAR Section 3.7.2.1.2.4 appears to indicate that the way such pressure difference is accounted for in SAP2000 is addressed differently for the horizontal and vertical directions. Therefore, the NRC staff request the applicant to clarify, whether the gravity load amplification applies only to the vertical loading or both the horizontal and vertical loading.

Additionally, in its response the applicant stated the mass sources from FSAR Table 3.8.4-7 that were considered in the ANSYS models. Consistent with DSRS Section 3.7.2.II.3D, in addition to the structural mass, the models used for dynamic analysis should include a floor load of 50 pound per square foot (psf) to represent miscellaneous dead weights such as minor equipment, piping, and raceways. The NRC staff request the applicant to clarify whether such floor load was included in the ANSYS models. If not, the NRC staff request the applicant provide the technical justification for excluding such load. Also the applicant is requested to clarify whether either the ANSYS model for FSI or pool water sloshing is used for the nonlinear stability evaluation addressed in FSAR Section 3.8.5. If either model is used, the NRC staff request the applicant to provide the technical justification for excluding any of the mass sources in Table 3.8.4-7. If not, the NRC staff request the applicant to describe the differences between the model(s) used for the nonlinear stability evaluation and the aforementioned models and to describe the applicable mass sources for the model(s) used in the nonlinear stability evaluation.

This question will be tracked as Open Item.

Question 03.08.04-31:

In its response the applicant clarified that the seismic demands for the design of the NPM passive support ring assembly is obtained from the detailed ANSYS seismic analysis of the NPM. The applicant described the ANSYS analysis cases considered, provided the vertical and lateral load, and the vertical NPM displacement, consistent with the results from the ANSYS analyses. Further the applicant provided FSAR markups for Appendix 3B with updated descriptions and design information. For consistency in the FSAR and technical report, the NRC staff request the applicant to address the updated information regarding the NPM passive support ring assembly in other sections of the FSAR (e.g. Section 3.8.2.1.3, Section 19.1.5.1.1.3, other, as applicable) and supporting technical report, as applicable.

This question will be tracked as Open Item.

Question 03.08.04-32:

In its response, the applicant provided FSAR markups to replace references to Figures 3B-63 and 3B-64 with references to Figure 3B-51. For consistency between text descriptions in Section 3B.2.7.4.1 and Figure 3B-51, the NRC staff request the applicant to include a cross-sectional detail of the bay wall (including the shear lugs and through bolts) in Figure 3B-51.

This question will be tracked as Open Item.

Question 03.08.04-33:

A number of items in the proposed Table 3.7.2-35 need of clarification. For example, some of the Figures referenced in row items 2, 3, 4, and 5, are not consistent with the current figures in the FSAR Rev. 0 (e.g. figure numbers appear to be off by one). Also, the figures under column heading FSAR Results for row item 3 appear to reference FSAR figures that are specific to soil Type 7 whereas the table item 3 indicates the consideration of all soil profiles. Row items 6, 7, and 8, are for the RXB Base Mat – Partial Model, however, the NRC staff did not find a description of the partial basemat model in the FSAR Sections referenced under the column heading FSAR Explanation and Figures. Row items 10 and 11, related to the CRB Stand-Alone Building, reference Tables 3B-28 through 51 under the column heading FSAR Results, however Tables 3B-50 and -51 are for the RXB. In addition, the proposed Table 3.7.2-35 did not include a description of the RFT models and analyses. Based on the above the staff request the applicant to review and update the Table 3.7.2-35 and or FSAR descriptions to ensure consistency between the Table and FSAR descriptions. Such review and update should be performed considering the resolution of the questions related to FSAR Sections 3.7 and 3.8 and respective incorporation of FSAR markups into the FSAR.

This will be tracked as an Open Item.

Question 03.08.04-34:

In its response, the applicant provided updated Tables for Appendix 3B with highlighted table entries, consistent with FSAR text descriptions. The NRC staff review noted that some Appendix B Tables were not updated. For consistency in the response and FSAR, the NRC staff request the applicant to update Table 3B-29, “Summary of D/C Ratios for Control Building Wall at Grid Line 4,” and Table 3B-42, “Summary of D/C Ratios for Control Building Slab at EL. 100'-0."

This question will be tracked as Open Item.

Staff Feedback on RAI 8963

Question 03.08.05-7:

In its response, the applicant provided the basis for the surcharge pressure of 0.25 ksf as that the most critical of either a minimum surcharge outside and adjacent to a subsurface wall due to wheel load converted to lateral equivalent or a railroad surcharge.

However, it appears that the applicant did not consider the potential differences in surcharge pressures on the walls of RXB and CRB due to the effects of adjacent buildings. Therefore, the applicant is requested to describe why the differences in surcharge pressures due to the effects of adjacent buildings were not determined/considered.

NOTES**:**

1- if there is a difference in surcharge pressures on the walls of RXB and CRB due to the effects of adjacent buildings that difference may need to be considered in the stability evaluations for the RXB and CRB also.

2- In deeply embedded structures, the surcharge-pressure loadings may have substantial contribution in the design of basemats.

Question 03.08.05-12:

In its response the applicant provided two tables (Tables 1 and 2) describing “Building Models” and “Basemat Model” of RXB Basemat designs.

The applicant concluded that there is no impact to the FSAR in their response. However, the applicant’s response provides information that should have been included (as markups) in Section 3.8.5.4.1.2, “RXB Basemat Model Description,” of the FSAR, to describe the models used for the RXB basemat designs. Furthermore, the NRC staff is requesting the applicant to respond the following questions:

1. It is not clear to the NRC staff whether deleting and restraining elements 10 feet (ft.) above the RXB basemat would provide critical flexural stiffness that would provide conservative results for the design of the RXB basemat. Therefore, sensitivity evaluation(s) may need to be performed -- unless otherwise, restraining the elements 10 ft. above the basemat can be justified to produce the worst boundary condition.

2. It is not clear to the NRC staff how the external loads considered in the design of RXB basemat (e.g.; walls), since all structural components 10 ft. above the basemat were deleted.

3. Is the CRB basemat model constructed in a similar fashion? If so, the applicant is requested to describe the CRB basemat Model in detail.