



January 15, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Supplemental Response to NRC Request for Additional Information No. 180 (eRAI No. 9010) on the NuScale Design Certification Application

REFERENCES: 1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 180 (eRAI No. 9010)," dated August 12, 2017
2. NuScale Power, LLC Response to NRC "Request for Additional Information No. 180 (eRAI No.9010)," dated October 11, 2017

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) supplemental response to the referenced NRC Request for Additional Information (RAI).

The Enclosures to this letter contain NuScale's supplemental response to the following RAI Question from NRC eRAI No. 9010:

- 09.01.02-1

Enclosure 1 is the proprietary version of the NuScale Supplemental Response to NRC RAI No. 180 (eRAI No. 9010). NuScale requests that the proprietary version be withheld from public disclosure in accordance with the requirements of 10 CFR § 2.390. The enclosed affidavit (Enclosure 3) supports this request. Enclosure 2 is the nonproprietary version of the NuScale response.

This letter and the enclosed responses make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Carrie Fosaaen at 541-452-7126 or at cfosaaen@nuscalepower.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Zackary W. Rad".

Zackary W. Rad
Director, Regulatory Affairs
NuScale Power, LLC

Distribution: Gregory Cranston, NRC, OWFN-8G9A
Samuel Lee, NRC, OWFN-8G9A
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Enclosure 1: NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9010, proprietary

Enclosure 2: NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9010, nonproprietary

Enclosure 3: Affidavit of Zackary W. Rad, AF-0118-58156



Enclosure 1:

NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9010,
proprietary



Enclosure 2:

NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9010,
nonproprietary

Response to Request for Additional Information Docket No. 52-048

eRAI No.: 9010

Date of RAI Issue: 08/12/2017

NRC Question No.: 09.01.02-1

10 CFR Part 50, Appendix A, General Design Criteria (GDC) 1, 2, 4, 5, 63, and 10 CFR 52.80(a) provide the regulatory requirements for the design of the new and spent fuel storage facilities. SRP Section 9.1.2 and DSRS Section 3.8.4 Appendix D describe the specific SRP acceptance criteria for the review of the fuel racks to meet the requirements of the Commission's regulations identified above. DSRS 3.8.4 specifically states that dynamic input data such as floor response spectra or ground response spectra are developed using the criteria described in DSRS Section 3.7.1, 3.7.2, 3.7.3, and SRP Section 3.7.4. It also states that the seismic input motion to the racks should consider the spectra at the rack base and the wall of the spent fuel pool. It is acceptable to envelope the seismic motion at these two locations for the input loading to the racks.

The staff reviewed the description of the time history development in TR-0816-49833-P, Section 3.1.2. The staff requests the applicant clarify the steps taken in the development of the time histories for the fuel storage rack analysis. Specifically, the applicant should clarify the purpose of developing a target low frequency (LF) and high frequency (HF) response spectra and describe the enveloping methodology that yields the frequency targeted spectra. The applicant should also describe the basis for selecting one set of time histories to envelop RS (TH1), four sets of time histories for the LF target RS, and two sets of time histories for the HF target RS.

With respect to the identification of the selected wall nodes, in the 1st paragraph of Section 3.1.2.4, the applicant describes the eight nodes selected for time history generation. The paragraph states that nodes represent locations in the SFP walls, up to an elevation of +50 ft-0 in, which is consistent with the Figures 3-3 and 3-4 which show node locations at multiple elevations above the basemat. Also in the same paragraph, the applicant states that the nodal ISRS are enveloped at two elevations, 24 ft. and 50 ft. consistent with Figures 3-6 through 3-14. The applicant should clarify whether nodes are enveloped up to +50 ft-0 in. or at +50 ft-0 in.

Additionally, the nodes located on the basemat (5237 and 5981) appear to be located at the corner and edge of the basemat. Because Figures 3-8, 3-11, and 3-14 show that at some frequencies the ISRS in the Z direction, the acceleration at 24 ft-0 in. exceeds the acceleration at 50 ft-0 in., the applicant should explain why there is no node selected at the center of the SFP at the basemat elevation. The applicant should address the possible amplification in the ISRS due to flexibility of the basemat at this location.

NuScale Response:

This response is a revision to the original response sent on October 11, 2017.

The purpose of developing target low frequency (LF) in-structure response spectra (ISRS) is to generate certified seismic design response spectra (CSDRS) consistent with the design ISRS applicable to the spent fuel pool (SFP) racks. The target LF ISRS maintain the dynamic characteristics of the CSDRS and associated ground motions selected for the Reactor Building soil-structure interaction (SSI) analysis. Target LF ISRS are developed by enveloping the nodal responses due to CSDRS motions only. Target high frequency (HF) ISRS are developed to preserve the characteristics of the high frequency certified seismic design response spectra (CSDRS-HF) and associated HF ground motions selected in a supplemental HF SSI analysis.

Target HF ISRS are developed by enveloping the nodal responses due to CSDRS-HF motions only. In accordance with the guidance in the NuScale SMR Design-Specific Review Standard (DSRS) 3.7.1 Subsection II.1.B.ii, an initial calculation was completed following Option 1: Single Set of Time Histories. The generation of this set (TH1) met the criteria outlined in the DSRS and the time history was used to support the whole pool analysis. It was later determined that a calculation using multiple time histories would help remove potential uncertainties in the responses due to the variability of phase in the time series. The generation of multiple sets of time histories followed DSRS 3.7.1 Subsection II.1.B.ii-Option 2: Multiple Sets of Time Histories. In addition to TH1, six more sets of time histories were generated which utilize both low frequency and high frequency response spectra for a total of seven independent sets of time histories. Since the pool fluid behavior is controlled by low frequency motions, fluid movements dominate the loads on the spent fuel storage racks. Therefore, emphasis is placed on the low-frequency region where four time history sets were generated. To capture the effects of the rack and the pool structure that are in the HF region, two high frequency sets of time histories were generated.

All eight nodes that were used to compute the target response spectra were enveloped up to +50 ft-0 in. The nodes at the 24 ft-0 in and 50 ft-0 in elevations are enveloped separately and then the envelope of the two elevations is generated. The target response spectra for each analysis case are labeled "Envelope" in TR-0816-49833, Figures 3-6 to 3-14.

The nodes enveloped at the 24 ft-0 in elevation contain two basemat nodes (5237 and 5981), while the 50 ft-0 in elevation contains only nodes in the SFP area. Therefore, the response spectra at the 24 ft-0 in location capture local effects near the basemat edge and may exceed responses shown for the 50 ft-0 in location outside the main amplified region. The Reactor Building basemat has a relatively large thickness of 10 ft compared to its span between SFP walls. The dimensions of the basemat at the location of the SFP are such that the local vertical response of the basemat (also considering fluid mass) is beyond the frequency of interest (50 Hz). Since there are no amplifications due to the flexibility of the basemat in the SFP area (as



justified in the next paragraph), the SFP basemat is considered rigid, with no need to select an additional node at the center of the SFP.

Below are plots of ISRS in the RXB basemat beneath NPMs (also known as RXMs) 1 through 6 for each direction of motion (X, Y, and Z). Although the ISRS are not directly at the center of the SFP, they are representative of this point due to the RXB basemat being a monolithic member. Hence, there is very little variation in the seismic response throughout the basemat. The small variation is demonstrated in the following ISRS plots of the response at each of the six NPM locations. Also plotted (in red) in Figures 1 - 18 are the enveloped ISRS at the 24' elevation, as requested. In some cases, the ISRS beneath the NPMs exceed the 24' elevation spectra. However, the design response spectra used in calculating the seismic demand on the fuel storage rack is the spectra enveloped at the 24' and 50' elevations, shown in red in Figures 19 - 36. As can be seen, the basemat ISRS are enveloped in every case by the enveloped design response spectra. This demonstrates that the seismic input used for the analysis of the fuel storage rack is conservative, and there is no ISRS amplification due to the "flexibility" of the basemat.

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Figure 1

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Figure 2

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Figure 3

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Figure 4

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Figure 5

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Figure 6

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Figure 7

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Figure 8

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Figure 10

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Figure 11

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Figure 12

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Figure 13

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Figure 14

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Figure 15

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Figure 16

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Figure 17

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Figure 18

Figures 19 - 36 compare the ISRS at NPM 1 through 6 to the design ISRS for the fuel racks.

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Figure 19

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Figure 20

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Figure 21

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Figure 22

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Figure 34

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Figure 35

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}}^{2(a), (c)}

Figure 36

Impact on DCA:

There are no impacts to the DCA as a result of this response.



RAIO-0118-58153

Enclosure 3:

Affidavit of Zackary W. Rad, AF-0118-58156

NuScale Power, LLC
AFFIDAVIT of Zackary W. Rad

I, Zackary W. Rad, state as follows:

1. I am the Director, Regulatory Affairs of NuScale Power, LLC (NuScale), and as such, I have been specifically delegated the function of reviewing the information described in this Affidavit that NuScale seeks to have withheld from public disclosure, and am authorized to apply for its withholding on behalf of NuScale.
2. I am knowledgeable of the criteria and procedures used by NuScale in designating information as a trade secret, privileged, or as confidential commercial or financial information. This request to withhold information from public disclosure is driven by one or more of the following:
 - a. The information requested to be withheld reveals distinguishing aspects of a process (or component, structure, tool, method, etc.) whose use by NuScale competitors, without a license from NuScale, would constitute a competitive economic disadvantage to NuScale.
 - b. The information requested to be withheld consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), and the application of the data secures a competitive economic advantage, as described more fully in paragraph 3 of this Affidavit.
 - c. Use by a competitor of the information requested to be withheld would reduce the competitor's expenditure of resources, or improve its competitive position, in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.
 - d. The information requested to be withheld reveals cost or price information, production capabilities, budget levels, or commercial strategies of NuScale.
 - e. The information requested to be withheld consists of patentable ideas.
3. Public disclosure of the information sought to be withheld is likely to cause substantial harm to NuScale's competitive position and foreclose or reduce the availability of profit-making opportunities. The accompanying Request for Additional Information response reveals distinguishing aspects about the structure by which NuScale develops its NuScale fuel storage racks.

NuScale has performed significant research and evaluation to develop a basis for this structure and has invested significant resources, including the expenditure of a considerable sum of money.

The precise financial value of the information is difficult to quantify, but it is a key element of the design basis for a NuScale plant and, therefore, has substantial value to NuScale.

If the information were disclosed to the public, NuScale's competitors would have access to the information without purchasing the right to use it or having been required to undertake a similar expenditure of resources. Such disclosure would constitute a misappropriation of NuScale's intellectual property, and would deprive NuScale of the opportunity to exercise its competitive advantage to seek an adequate return on its investment.

4. The information sought to be withheld is in the enclosed response to NRC Request for Additional Information No. 180, eRAI No. 9010. The enclosure contains the designation "Proprietary" at the top of each page containing proprietary information. The information considered by NuScale to be proprietary is identified within double braces, "{{ }}" in the document.
5. The basis for proposing that the information be withheld is that NuScale treats the information as a trade secret, privileged, or as confidential commercial or financial information. NuScale relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC § 552(b)(4), as well as exemptions applicable to the NRC under 10 CFR §§ 2.390(a)(4) and 9.17(a)(4).
6. Pursuant to the provisions set forth in 10 CFR § 2.390(b)(4), the following is provided for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld:
 - a. The information sought to be withheld is owned and has been held in confidence by NuScale.
 - b. The information is of a sort customarily held in confidence by NuScale and, to the best of my knowledge and belief, consistently has been held in confidence by NuScale. The procedure for approval of external release of such information typically requires review by the staff manager, project manager, chief technology officer or other equivalent authority, or the manager of the cognizant marketing function (or his delegate), for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside NuScale are limited to regulatory bodies, customers and potential customers and their agents, suppliers, licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or contractual agreements to maintain confidentiality.
 - c. The information is being transmitted to and received by the NRC in confidence.
 - d. No public disclosure of the information has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or contractual agreements that provide for maintenance of the information in confidence.
 - e. Public disclosure of the information is likely to cause substantial harm to the competitive position of NuScale, taking into account the value of the information to NuScale, the amount of effort and money expended by NuScale in developing the information, and the difficulty others would have in acquiring or duplicating the information. The information sought to be withheld is part of NuScale's technology that provides NuScale with a competitive advantage over other firms in the industry. NuScale has invested significant human and financial capital in developing this technology and NuScale believes it would be difficult for others to duplicate the technology without access to the information sought to be withheld.

I declare under penalty of perjury that the foregoing is true and correct. Executed on 1/15/2018.



Zackary W. Rad