RAIO-0617-54692

June 28, 2017

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 Response to NRC Request for Additional Information No. 19 (eRAI No. 8769) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 19 (eRAI No. 8769)," dated May 08, 2017

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

The Enclosures to this letter contain NuScale's response to the following RAI Question from NRC eRAI No. 8769:

- 04.02-7

Enclosure 1 is the proprietary version of the NuScale Response to NRC RAI No. 19 (eRAI No. 8769). NuScale requests that the proprietary version be withheld from public disclosure in accordance with the requirements of 10 CFR § 2.390. The proprietary enclosure has been deemed to contain Export Controlled Information. This information must be protected from disclosure per the requirements of 10 CFR § 810. 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 Darrell Gardner at 980-349-4829 or at dgardner@nuscalepower.com.

Sincerely,

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

Distribution: Gregory Cranston, NRC, TWFN-6E55
Samuel Lee, NRC, TWFN-6C20
Bruce Bavol, NRC, TWFN-6C20

Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 8769, proprietary

Enclosure 2: NuScale Response to NRC Request for Additional Information eRAI No. 8769, nonproprietary

Enclosure 3: Affidavit of Zackary W. Rad, AF-0617-54694

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 8769, proprietary

Enclosure 2:

NuScale Response to NRC Request for Additional Information eRAI No. 8769, nonproprietary

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

eRAI No.: 8769
Date of RAI Issue: 05/08/2017

NRC Question No.: 04.02-7

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, Criterion 2, requires that SSCs important to safety are designed to withstand the effects of earthquakes without the loss of capability to perform their safety functions. The design bases for these SSCs shall reflect: (1) the severity of the historical reports, with sufficient margin to cover the limited accuracy, quantity, and time period for the accumulated data, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena, and (3) the importance of the safety functions to be performed. SRP Section 4.2 Appendix A (II)(1) provides review guidance regarding the review of inputs used to analyze the loads.

Technical Report TR-0816-51127 provides NuScale specific fuel and control rod assembly analyses including the fuel structural analysis for externally applied forces. This analysis is based on input motions which cover a variety of conditions. It does not appear to the staff that the input motion analysis covers fuel in a power module located in the Reactor Vessel Flange Tool (RFT) after the crane and upper portion of the NPM have been removed.

In order to make an affirmative finding associated with the above regulatory requirement that accounts for all relevant SSCs important to safety, the NRC staff requests the following information to be provided:

a. Describe the power module locations included in the NuSCale fuel assembly structural response to externally applied forces analysis that is addressed in TR-0816-51127.
b. Provide a fuel structural response to externally applied loads analysis for any permissible fuel locations not included in the answer to part (a) of this RAI (e.g. fuel located in the RFT while the crane and upper portion of the NPM are no longer attached, if applicable).
    a. Include in this analysis a reference for the input motion assumptions
    b. Provide justification for the applicability of the fuel assembly natural frequency testing used in this model. In particular, the staff is interested in the applicability of the fuel assembly pluck tests to a situation in which the fuel assembly is constrained only on one end (after the upper core plate has been removed).

NuScale Response:

The NuScale response is provided below:

a. The structural response of the fuel assembly to externally applied forces is evaluated in TR-0816-51127 using core plate motion time histories. These time histories are generated by the seismic analysis of the NuScale Power Module (NPM) in its operating bay for the design basis safe shutdown earthquake (SSE). As noted in the NuScale Technical Report "NuScale Power Module Seismic Analysis," TR-0916-51502, Section 4.0, "The NPMs in operating bays 1 and 6 are representative of the other NPMs since the forces at the CNV support skirt and lug supports in bays 1 and 6 bound those of the other NPM." No other permissible fuel locations are addressed explicitly in TR-0916-51502.
b. The permissible locations for fuel are identified below by describing the preparation for refueling. The refueling process begins when the NPM is transported from the operating bay to the containment vessel flange tool (CFT) using the reactor building crane. During transport, the NPM is isolated from the transmission of horizontal seismic loads because the module lifting adapter does not provide lateral restraint when suspended by the crane.

   Once seated in the CFT, lateral support is provided to the lower half of the module, which transmits horizontal and vertical accelerations to the NPM, while the reactor building crane continues to engage the NPM. The containment flange bolts which connect the upper and lower portions of the containment vessel are then removed. The upper NPM is then lifted out of the CFT leaving behind the lower containment vessel head and exposing the lower head of the reactor pressure vessel (RPV) to the reactor pool.

   The reactor building crane lifts the upper NPM with the lower RPV still attached and transports it to the reactor pressure vessel flange tool (RFT). Once the upper NPM is seated in the RFT, the upper NPM is separated from the lower RPV leaving behind the reactor core and lower riser assembly (LRA) that includes the upper core plate. The reactor building crane transports the upper NPM to the module inspection rack located in the dry dock.

   The LRA is connected to the lower RPV by four lock plates that capture the upper core plate to the core barrel and lower RPV. Prior to full core offload, the four lock plates are rotated ninety degrees, releasing the upper core plate. The LRA is removed (including the upper core plate) exposing the reactor core. In this configuration the lower RPV is supported by the RFT, which transmits the floor motion to the core support structure and to the fuel assemblies (FA).

With the core exposed, the fuel handling machine (FHM) is used to offload the entire core and transfer the 37 assemblies to the spent fuel pool (SFP) storage racks.

The permissible fuel locations include the operating bays, CFT, RFT, and the SFP. Fuel structural responses to externally applied loads are not specifically analyzed for the CFT and RFT. The SFP structural analysis can be found in TR-0816-49833, Fuel Storage Rack Analysis, Revision 0.

When the NPM is fully assembled, the transmissibility of the flexible structures between the building and the core results in amplification of the input spectrum as explained in Section 2.2 of TR-0916-51502-P, Revision 0. The design of CFT and RFT do not provide the same degree of amplification of the input spectrum. As a result of these design differences, the fuel structural response in the CFT and RFT is bounded by the case in which the NPM is positioned in the operating bays.

Seismic input spectra for the permissible fuel locations are presented in FSAR Chapter 3.7. The enveloped seismic floor spectra representative for the CFT and RFT locations are shown in FSAR Figure 3.7.2-107. Typical enveloped seismic input spectra representative for the NPM supports are shown in FSAR Figures 3.7.2-114 and 3.7.2-115. Input core plate motion spectra for FA design are provided in TR-0916-51502-P Revision 0, Figures B-16 through B-21.

Peak and zero period acceleration (ZPA) component design input spectra at the upper and lower core plate in each direction for various configurations during a refueling outage are summarized in Table 1 below. The percentages shown are based on a ratio of the core plate acceleration for the given direction and NPM location to the core plate acceleration in the operating bay. The coordinate system employed is consistent with TR-0916-51502-P, Revision 0, Figure 5-6, where positive X is in the East building direction, positive Y is in the vertical direction, and positive Z is in the South building direction.

Table 1 Core Plate Accelerations

	Location	Direction	NPM in operating in bay	NPM in CFT	NPM (without lower CNV) in RFT	Lower RPV/LRA in RFT
Peak Acceleration (g)	Top of lower core plate	X	{{			
		Y				
		Z				
	Bottom of upper core plate	X				
		Y				
		Z				
ZPA (g)	Top of lower core plate	X				
		Y				
		Z				
	Bottom of upper core plate	X				
		Y				
		Z				}}2(a),(c), ECI

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}}2(a),(c), ECI

As demonstrated by Table 1, the design basis FA input core plate motions while the NPM is in the operating bay envelop other locations where the fuel assemblies may be present and the upper core plate is locked in place.

The pluck test methodology applied by NuScale to the fuel in the NPM when in the operating bay is not valid for the condition where the fuel is in the RFT and the upper core plate is removed. The fuel is exposed to this condition for a short period of time. For

NuScale, the FHM is capable of completing a full core load or offload in less than 9 hours. Therefore, the time the fuel resides in the lower RPV unrestrained by the upper core plate is nominally 18 hours per module per refueling outage, or four and one half days per year based on 6 outages per year for a 12 unit plant. Thus, the total time the NuScale fuel assemblies are exposed to this condition is comparable to the operating fleet.

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

Enclosure 3:

Affidavit of Zackary W. Rad, AF-0617-54694

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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 methodology by which NuScale performs its seismic analysis.

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

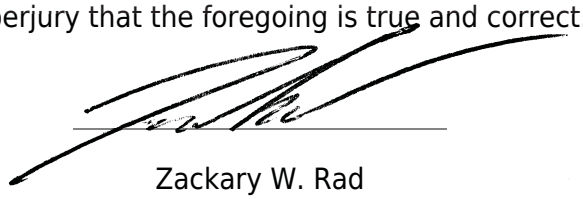
    The precise financial value of the information is difficult to quantify, but it is a key element of the design basis for a NuScale plant and, therefore, has substantial value to NuScale.

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 Request for Additional Information No.19, eRAI 8796. 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 6/28/2017.



Zackary W. Rad