



June 19, 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 Response to NRC Request for Additional Information No. 429 (eRAI No. 9396) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 429 (eRAI No. 9396)," dated April 23, 2018

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. 9396:

- 18-44

Enclosure 1 is the proprietary version of the NuScale Response to NRC RAI No. 429 (eRAI No. 9396). 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 Steven Mirsky at 240-833-3001 or at smirsky@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
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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9396, proprietary



RAIO-0618-60468

Enclosure 2: NuScale Response to NRC Request for Additional Information eRAI No. 9396,
nonproprietary

Enclosure 3: Affidavit of Zackary W. Rad, AF-0618-60523

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Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9396, proprietary



Enclosure 2:

NuScale Response to NRC Request for Additional Information eRAI No. 9396, nonproprietary

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

eRAI No.: 9396

Date of RAI Issue: 04/23/2018

NRC Question No.: 18-44

Title 10 of the Code of Federal Regulations (10CFR) Section 52.47(a)(8) requires an applicant for a design certification to provide a final safety analysis report (FSAR) that must include the information necessary to demonstrate compliance with any technically relevant portions of the Three Mile Island requirements set forth in 10 CFR 50.34(f), except paragraphs (f)(1)(xii), (f)(2)(ix), and (f)(3)(v). Section 10 CFR 50.34(f)(2)(iii) requires an applicant to "Provide, for Commission review, a control room design that reflects state-of-the-art human factor principles prior to committing to fabrication or revision of fabricated control room panels and layouts." Chapter 18, "Human Factors Engineering," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," and NUREG-0711, "Human Factors Engineering Program Review Model," identify criteria the staff uses to evaluate whether an applicant meets the regulation. The applicant stated in the FSAR, Tier 2, Section 18.0, "Human Factors Engineering - Overview," that its human factors engineering (HFE) program incorporates accepted HFE standards and guidelines including the applicable guidance provided in NUREG-0711, Revision 3.

NUREG-0711, Section 11.4.3.3, "Validation Testbeds," Criterion 9 states, "The applicant should verify the conformance of the testbed to the testbed-required characteristics before validation tests are conducted." NuScale provided the verification and validation (V&V) implementation plan (IP) for review. The staff reviewed the V&V IP. In Section 4.3.9 the applicant states, "The testbed is verified to conform with the required characteristics before validation tests are conducted." However, no further information is provided. As part of an audit of documents in NuScale's electronic reading room, the staff had the opportunity to review an "Integrated Systems Validation Test Plan." In sections 9.2 and 9.3 of this document, the applicant provides more information regarding the methods used to verify the conformance of the testbed to the testbed-required characteristics. Please either update the V&V IP to include this information or reference sections 9.2 and 9.3 of the "Integrated Systems Validation Test Plan." If referencing ISV test plan, please indicate revision number.

NuScale Response:

RP-0914-8543, Human Factors Verification and Validation Implementation Plan, has been



revised to include integrated systems validation (ISV) simulator performance testing and scenario-based testing details contained in Sections 9.2 and 9.3 of the ISV Test Plan.

Impact on DCA:

RP-0914-8543, HFE Verification and Validation Implementation Plan, has been revised as described in the response above and as shown in the markup provided with this response.

4.3.4 Environmental Fidelity

The test bed is representative of the actual NuScale plant with regard to environmental features such as lighting, noise, temperature, humidity, and ventilation characteristics. In cases where the test bed cannot accurately simulate the environment, the ISV captures human factors engineering issue tracking system (HFEITS) entries for evaluation and resolution.

4.3.5 Data Completeness Fidelity

In the test bed, information and data provided to personnel represent the complete set of plant systems monitored and controlled from that facility.

4.3.6 Data Content Fidelity

The test bed represents a high degree of data content fidelity. The alarms, controls, indications, procedures, and automation presented are based on an underlying plant model that accurately reflects the engineering design of the NuScale plant. The model also accurately provides input to the HSI, such that the information matches what is presented during operations.

4.3.7 Data Dynamics Fidelity

The test bed represents a high degree of data dynamic fidelity. The plant model provides input to the HSI in a manner such that information flow and control responses occur accurately and in a correct response time. Information is provided to personnel with the same anticipated delays as would occur in the plant.

4.3.8 Remote Human-System Interfaces Containing Important Human Actions

NuScale has no IHAs that are conducted outside of the MCR. In the event that a remote IHA is determined in a later design stage, the test bed uses mockups to verify human performance requirements for IHAs conducted at HSIs remote from the MCR. The simulation or mockup considers, for example, transit times, use of personal protective equipment, and delays associated with the need for operator precision (self-checking).

4.3.9 Test Bed Conformance

The test bed is verified [by performance testing](#) to conform to required characteristics before validation tests are conducted.

4.3.10 ISV Simulator Performance Testing

The purpose of ISV Simulator performance testing is to ensure simulator performance is sufficiently complete and accurate to meet the requirements recommended in NUREG-0711, "Human Factors Engineering Program Review Model" as it pertains to simulators used during ISV activities. NUREG-0711 recommends that the simulator used for ISV should have fidelity and functionality compliant with industry standard "ANSI/ANS-3.5-2009, Nuclear Power Plant Simulators for Use in Operator Training and

Examination". ANSI/ANS-3.5 is intended to provide standards used to train licensed operators at an operating facility and not to conduct ISV testing. Therefore, the ISV Simulator Performance Testing uses selected criteria in a similar manner to the concept already used within the ANSI/ANS-3.5 Appendix C standard to establish criteria for part-task and limited-scope simulators.

The following criteria are used to evaluate ISV Simulator performance:

- real time and repeatability testing
- limits of simulation testing
- normal evolution testing
- malfuction testing
- steady state testing

Prior to the start of ISV, the ISV simulator will have completed ISV Simulator performance testing to validate overall performance. The ISV Simulator performance testing provides a comprehensive evaluation of overall simulator performance, while Scenario-Based Testing provides a detailed review of the simulator response to the individual ISV scenarios.

4.3.11 Scenario-Based Testing

The testing is conducted by determining a set of key parameters to be evaluated and ensuring those parameters behave as expected for the developed ISV scenarios. ANSI/ANS-3.5-2009 was referenced for a draft list to select steady state and transient parameters.

The scenarios are then conducted in real time, to ensure the completion of the objectives and termination point is reached. The procedures are executed as described in the current task analysis. The "freeze" feature may only be used during testing to obtain additional data and shall have no effect on the simulator parameters or resuming of the scenario for the test to be considered valid.

The following criteria are used to evaluate the simulator performance while running the ISV scenarios:

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

4.4 Plant Personnel

Individual operating crews participating in the ISV may be previously licensed commercial reactor or senior reactor operators, operators with Navy nuclear experience, or design engineering staff members familiar with the NuScale Power plant design. The personnel participating in ISV are trained, qualified, and are assigned to roles commensurate with their experience, skill, and knowledge level.

Personnel who constitute the ISV operating crews are not part of the HFE V&V team or HFE design team. Operating crew makeup is not varied from scenario to scenario and remains consistent throughout the validation (i.e., crew members are not rotated between operating crews).

To control crew bias, individual crew members are distributed across crews with consideration for:

- age distribution
- gender distribution
- education level distribution



RAIO-0618-60468

Enclosure 3:

Affidavit of Zackary W. Rad, AF-0618-60523

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 method by which NuScale develops its human factors verification and validation.

NuScale has performed significant research and evaluation to develop a basis for this method 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. 429, eRAI 9396. 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 June 18, 2018.



Zackary W. Rad