



May 21, 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. 393 (eRAI No. 9401) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 393 (eRAI No. 9401)," dated March 20, 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 Enclosure to this letter contains NuScale's response to the following RAI Question from NRC eRAI No. 9401:

- 18-34

This letter and the enclosed response 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
Samuel Lee, NRC, OWFN-8G9A
Prosanta Chowdhury NRC, OWFN-8G9A

Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9401



RAIO-0518-60077

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9401

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

eRAI No.: 9401

Date of RAI Issue: 03/20/2018

NRC Question No.: 18-34

Title 10 of the *Code of Federal Regulations* (10 CFR) 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 FSAR, Tier 2, Section 18.0, "Human Factors Engineering - Overview," indicates that the HFE program incorporates the applicable guidance provided in NUREG-0711, Revision 3.

Chapter 18, "Human Factors Engineering," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," lists NUREG-0711, "Human Factors Engineering Program Review Model," and NUREG-0700, "Human-System Interface Design Review Guidelines," as the sources of acceptance criteria the staff uses to evaluate whether an applicant meets the regulation.

NUREG-0711, Section 8.4.4.5(1) states that

The applicant should describe how the HSI provides a design capability for remote shutdown of the reactor outside the MCR. [10 CFR Part 50, Appendix A, GDC 19]

DCD Tier 2, Section 7.1.1.2.3, "Remote Shutdown Station," states that the Remote Shutdown Station (RSS) provides an alternate location to monitor the NuScale Power Module (NPM) status and to operate the Module Control System (MCS) and Plant Control System (PCS) during a Main Control Room (MCR) evacuation. The MCS equipment in the RSS provides a set of MCS and PCS displays identical to the MCS and PCS displays in the MCR for the process variables necessary to monitor safe shutdown of each NPM.



HSI RSR Section 4.6.3, "Locations outside of the Module Control System," states that the HSIs in the locations out of the MCR (Technical Support Center (TSC), Emergency Operations Facility (EOF) and the RSS) are all MCR derivatives and that these HSIs are for information display only, which the staff interprets to mean that no control functions are provided in any of the emergency response facilities. While the staff recognizes that the RSS is not an emergency response facility, the staff believes that this sentence contradicts the information in DCD Tier 2, Section 7 which states that NPM can be operated via MCS and PCS displays in the RSS. Additionally, the title of this Section 4.6.3, may contain an error since the section concerns the MCS.

1. Please describe whether and what specific HSIs are available in the RSS, and as appropriate how multiple modules can be monitored and controlled in the RSS using the HSIs that are available.
2. Please revise HSI RSR Section 4.6.3 so that it is consistent with the information in DCD Tier 2 Section 7 regarding operation/control of NPM at the RSS or explain why it does not need to be changed.

NuScale Response:

Response to Item 1:

The suite of HSI display pages used to provide the alarms, indications, procedures and touch controls to the main control room (MCR) are available in the RSS. The operators will be provided a set of MCS and PCS displays identical to the MCS and PCS displays in the MCR which include the process variables necessary to monitor the safe shutdown of multiple modules via the navigation schema designed by NuScale.

Response to Item 2:

RP-0316-17619, Human-System Interface Design Result Summary Report, Section 4.6.3, has been revised to be consistent with the information in DCD Tier 2 Section 7 regarding operation/control of the NPM at the RSS. In addition, the title for Section 4.6.3 was revised to "Locations Outside of the Main Control Room".

Impact on DCA:

RP-0316-17619, Human-System Interface Design Results Summary Report, has been revised as described in the response above and as shown in the markup provided in this response.

{{

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

13. Computer-Based procedure platform

Procedures are provided to guide operators in all aspects of plant operations at a NuScale plant. Traditional paper-based procedures will be available. The use of computer-based procedures facilitates mobility and enhances operator use. NuScale computer-based procedures are designed in accordance with the guidance in Section 8 of Reference 6.1.2 and Section 1 of D I&C ISG-05 2008.

NuScale investigated several types of computer-based procedure techniques so that the unique need of the plant is satisfied. Complete electronic versions of the paper copies are available on a tablet via the computer-based procedure system. This will help operators outside of the MCR to have mobile versions of all the procedures. The operators inside of the MCR will also have access to this system via a tablet as well as paper-based procedures for back-up purposes.

Note I: Neither the computer-based procedure system, nor the paper-based procedures are part of this RSR discussion.

{{

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

All three versions (i.e., paper, electronic and embedded) of the procedures are available for ISV testing.

4.6.3 Locations outside of the Main Control Room~~Module Control System~~

The suite of HSI display pages used to provide the alarms, indications, procedures and touch controls to the MCR are available in the RSS. The operators will be provided a set of MCS and PCS displays identical to the MCS and PCS displays in the MCR which include the process variables necessary to monitor safe shutdown of multiple modules via the navigation schema designed by NuScale.

The RSS provides an alternate location to monitor the NuScale Power Module (NPM) status and to operate the MCS and PCS following a MCR evacuation. The MCS equipment in the RSS provides a set of MCS and PCS displays identical to the MCS and PCS displays in the MCR for the process variables necessary to monitor safe shutdown of each NPM. SDI displays are not provided in the RSS as there is no manual control of safety-related equipment allowed from the RSS. The only differences between the I&C system control/monitoring between the MCR and RSS is:

- No SDI displays provided in RSS.
- No manual actuation switches provided in RSS.
- No nonsafety-enable switch provided in RSS (hence, no ability to control safety-related components).
- No override switches provided in RSS.
- Two MCR isolation switches (one per division) are provided in the RSS to isolate the MCR manual actuation and nonsafety-enable switches.

The HSI of the TSC, the EOF, and LCS are all derivatives (i.e., operated from the same platform and connected to the same I&C distributed control system) of the MCR HSI. The HSI in the TSC and EOF are for information display only. No control functions are provided in any of the emergency response facilities. ~~The HSIs in the locations outside of the MCR (TSC, EOF, and the RSS) are all MCR derivatives (i.e., operated from the same platform and connected to the same I&C distributed control system). These HSIs are for information display only meaning no control functions are provided in any of the emergency response facilities.~~

4.6.4 Local Control Stations Design

The HSIs on the VDU-based LCSs are MCR derivatives. For vendor-supplied LCSs, the NuScale HFE program scope is limited to ensuring that those interfaces adhere as closely as possible to Reference 6.2.2. Inputs from the vendor-supplied LCSs are replicated on the VDU-based HSI on an as-needed basis.

4.7 Degraded I&C and Human-System Interface Conditions

The NuScale plant is controlled with fewer operator actions than current PWRs due to the number of passive safety features, fail-safe components, and the high degree of automation.

The NuScale plant HSI is designed to accommodate specific types of I&C and HSI system failures. Procedures govern operator identification of and response to the various failure modes.