NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Friday, November 03, 2017 4:17 PM
To: RAI@nuscalepower.com
Cc: NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Rivera-Varona, Aida; Kent, Lauren; Murray, Demetrius
Subject: Request for Additional Information No. 277 RAI No. 8747 (18)
Attachments: Request for Additional Information No. 277 (eRAI No. 8747).pdf

Attached please find NRC staff's request for additional information concerning review of the NuScale Design Certification Application.

Please submit your technically correct and complete response within 60 days of the date of this RAI to the NRC Document Control Desk.

If you have any questions, please contact me.

Thank you.

Gregory Cranston, Senior Project Manager
Licensing Branch 1 (NuScale)
Division of New Reactor Licensing
Office of New Reactors
U.S. Nuclear Regulatory Commission
301-415-0546

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From: Cranston, Gregory

Created By: Gregory.Cranston@nrc.gov

Recipients:
"NuScaleDCRaisPEm Resource" <NuScaleDCRaisPEm.Resource@nrc.gov>
Tracking Status: None
"Lee, Samuel" <Samuel.Lee@nrc.gov>
Tracking Status: None
"Chowdhury, Prosanta" <Prosanta.Chowdhury@nrc.gov>
Tracking Status: None
"Rivera-Varona, Aida" <Aida.Rivera-Varona@nrc.gov>
Tracking Status: None
"Kent, Lauren" <Lauren.Kent@nrc.gov>
Tracking Status: None
"Murray, Demetrius" <Demetrius.Murray@nrc.gov>
Tracking Status: None
"RAI@nuscalepower.com" <RAI@nuscalepower.com>
Tracking Status: None

Post Office: R4PWMSMRS03.nrc.gov

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Request for Additional Information No. 277 (eRAI No. 8747)

Issue Date: 11/03/2017
Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 18 - Human Factors Engineering
Application Section: 18

QUESTIONS

18-8

Regulatory Basis

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 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. This regulatory basis applies to all questions in this request for additional information (RAI).

Acceptance Criteria

NUREG-0711, Review Criterion 8.4.2(2), states in part, "The applicant should provide an overview of the HSI, covering the technical bases demonstrating that they constitute a state-of-the-art HSI design supporting personnel performance."

Application

The Human Factors Engineering Human-System Interface Design Results Summary Report (HD RSR), Section 2.1, "Human-System Interface Design Process Overview," provides an overview of the HSI design process and lists four steps in the HSI design process. Steps 1 and 2 in Section 2.1 are the same.

Evaluation

The staff would like to understand if there are indeed four distinct steps, or if there are only three steps.

Question

Please revise the HD RSR, Section 2.1, either to delete Step 2 or to identify the activities performed as part of Step 2.

18-9

Acceptance Criteria

NUREG-0711, Section 13.3, "Applicant Products and Submittals," states, "The applicant should provide for review an IP for monitoring human performance after the plant becomes operational."

Application

The Human Factors Engineering Program Management Plan (HFE PMP), Table 4-2, "Human factors engineering element documentation", states, "Human performance monitoring is the responsibility of a COL applicant. No implementation plan or RSR [results summary report] is submitted as part of design

certification application." FSAR Tier 2, Section 18.12, "Human Performance Monitoring," includes COL Item 18.12-1 for the COL applicant to develop the human performance monitoring program.

However, the HFE PMP, Section 6.11, "Human Performance Monitoring," says, " An HPM IP is produced as part of the NuScale HFE program as guidance for the COL applicant over the life of the plant."

Evaluation

The staff would like to understand whether NuScale intends to submit a human performance monitoring implementation plan as part of the design certification application.

Question

Please clarify whether NuScale intends to submit a human performance monitoring implementation plan as part of the design certification application.

- If NuScale intends to provide a human performance monitoring implementation plan, then please state when it will be provided and remove COL Item 18.12-1 from the DCD.

If NuScale does not intend to provide a human performance monitoring implementation plan, then please revise the HFE PMP, Section 6.11, to align with the information in the FE PMP, Table 4-2.

18-10

Acceptance Criteria

NUREG-0711, Review Criteria 6.4(4), says, "The applicant's staffing analysis should determine the number and qualifications of operations personnel for the full range of plant conditions and tasks, including operational tasks (under normal, abnormal, and emergency conditions), plant maintenance, plant surveillance, and testing."

Relevant Background Information

On June 23, 2016, and August 30, 2016, Category 1 public meetings were held at the NRC Headquarters with representatives of the NRC staff and NuScale to discuss the NRC staff's response to the letter from NuScale to the NRC dated June 8, 2016, titled, "Regulatory Process for Addressing Licensed Operator Staffing Regulations in the NuScale Design Certification," (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16168A463). The letter states, "NuScale anticipates licensees referencing the NuScale design to use control room configurations—numbers of operators per reactor and number of reactors operated from a control room—that differ from existing large reactors and the requirements stated at 10 CFR 50.54(m). While the requirements for minimum licensed operator staffing are a license condition, and thus applicable to a licensee, NuScale will seek to resolve the matter in the NuScale design certification (DC)."

The NRC staff response was documented in Enclosure 1 of the meeting summary dated September 13, 2016 (ADAMS Accession No. ML16252A258). In Enclosure 1, the staff listed text to be included in the design certification application, including "a statement that the minimum staffing requirements are located in the Design Certification Rule Part 52 Appendix" in DCD Tier 1, section for human factors engineering, and a discussion of why an exemption is not necessary for NuScale in Part 7 of the design certification application. Also, Enclosure 1 stated NuScale should include a proposed staffing table and appropriate table notes in Part 7.

Application

1. The staff reviewed DCD Tier 1, Section 3.15 , "Human Factors Engineering," and did not find a statement that the minimum staffing requirements are located in the Design Certification Rule Part 52 Appendix.

2. The staff reviewed Part 7, Section 6, "The staff reviewed Part 7, Section 6, "10 CFR 50.54(m), Control Room Staffing," and did not find a discussion of why an exemption is not necessary for NuScale.

3. The staff reviewed the staffing table and table notes provided in Part 7, Section 6, "The staff reviewed Part 7, Section 6, "10 CFR 50.54(m), Control Room Staffing." Note 2 on the proposed staffing table includes a statement that "a nuclear power unit is considered to be operating when it is fueled, in an operating bay, and has the ability to communicate with a support system as defined by the unit's technical specifications."

Part 4, "Generic Technical Specifications," Section 5.2.2, "Facility Staff," of the design certification application includes a similar table with one table note that says, "For the purposes of this table, a MODULE is considered to be operating when it is in MODE 1, 2, or 3."

4. The proposed staffing table provided in Part 7, Section 6.1.3, "Requested Action," says that the minimum number of operators is the same regardless of whether there are one to twelve units operating. Part 6, Section 6.2.1, "Technical Basis," says, "The NuScale-proposed staffing requirements are consistent with NUREG-0800, Chapter 18; NUREG-0711, Revision 3; NUREG-1791; and NUREG/CR-6838, February 2004 (endorsed in NUREG-0711) for the review criteria of plant staffing levels that require an exemption from 10 CFR 50.54."

RP-0516-49116, "Control Room Staffing Plan Validation Results," describes the method used to perform the staffing plan validation (SPV) described in NUREG-1791 and the results of results of NuScale' SPV. RP-0516-49116, “Abstract ,” says, “This report has been developed to describe the results of staffing plan validation testing performed to evaluate licensed operator workload in challenging high workload situations within a NuScale 12-unit control room environment…The results of the analysis…confirm that up to 12 NuScale power modules and the associated plant facilities may be operated safely and reliably by a minimum staffing contingent of three licensed reactor operators and three licensed senior reactor operators from a single control room during normal, abnormal, and emergency conditions.”

5. Part 4, "Generic Technical Specifications," Section 5.2.2.c. states, “…a licensed reactor operator or senior reactor operator shall be present at the controls at all times.” Part 7, Section 6.1.3(3) also states, “a licensed reactor operator or senior reactor operator shall be present at the controls at all times.”

6. Part 4, "Generic Technical Specifications," Section 5.2.2 uses the word “MODULES” in the proposed minimum staffing table. The proposed staffing table in Part 7, Section 6 uses the phrase “nuclear power units.”

Evaluation

1. The staff would like to understand why the DCD Tier 1, Section 3.15 does not include a statement that the minimum staffing requirements are located in the Design Certification Rule Part 52 Appendix.

2. The staff would like to understand why Part 7, Section 6 does not include a discussion of why an exemption is not necessary for NuScale.

3. The staff would like to understand the phrase in Note 2 of the proposed staffing table in Part 7, Section 6 that says, "...has the ability to communicate with a support system as defined by the unit's technical specifications," and how this statement relates to Note 1 of the staffing table included in Section 5.2.2 of Part 4, "Generic Technical Specifications,” which says, “For the purposes of this table, a MODULE is considered to be operating when it is in MODE 1, 2, or 3."

4. For the SPV, 12 units were simulated in the control room simulator and high workload scenarios were administered in order to demonstrate that the proposed minimum staffing level was acceptable under high workload conditions. However, human performance can also be affected negatively when workload is too low. The staff would like to understand whether workload analyses have been or will be done to evaluate whether workload is above an acceptable lower limit when fewer than 12 units exist at a plant.

5. The staff would like to understand what is considered “at the controls” for a NuScale plant. As defined in 10 CFR 50.2, “Definitions,” the word “controls” when used with respect to nuclear reactors means apparatus and mechanisms, the manipulation of which directly affects the reactivity or power level of the reactor.

6. The staff would like to understand whether “units” and “MODULES” are synonymous.

Questions

1. Please explain why DCD Tier 1, Section 3.15 does not include the statement, or revise DCD Tier 1, Section 3.15, to include a statement that the minimum staffing requirements are located in the Design Certification Rule Part 52 Appendix.

2. Please explain why Part 7, Section 6 does not include a discussion of why an exemption is not necessary for NuScale, or revise Part 7, Section 6 to include a discussion of why an exemption is not necessary for NuScale.

3. Please explain what is meant by "support systems as defined by the unit's technical specifications," and how this statement relates to the note provided with the staffing table included in Section 5.2.2 of Part 4, "Generic Technical Specifications."

4. Please explain whether low workload has been or will be evaluated for the case where fewer than 12 units are operated from a single control room in order to justify that the minimum staffing level is appropriate for one to 12 modules.

5. Please explain what is considered “at the controls” for a NuScale plant.

6. Please explain whether “units” and “modules” are synonymous.

18-11

Acceptance Criteria

NUREG-0711, Section 11.3, “Applicant Products and Submittals,” says, “The applicant should provide either an IP [implementation plan] or a completed RSR [results summary report]. If the applicant submits an IP, it should describe the complete methodology for conducting V&V… At a minimum, the RSR should include the following: a description of the methodology, if an NRC approved IP was not used…If the methodology was described in an IP that the NRC staff previously reviewed, the contents of the RSR should be consistent with the approved methodology and the applicant should discuss the rationale for any deviations from it.”

Relevant Background Information

The public meeting summary dated April 11, 2016 (ADAMS Accession No. ML16060A220), summarizes the discussion between the NRC staff and NuScale on human factors engineering topics. In this meeting the staff said they would docket and commence the review of the NuScale design certification application if NuScale submitted an IP for the verification and validation (V&V) activity, and the V&V RSR should be submitted no later than the start of Phase 4 of the DC review.

Application

NuScale provided a V&V IP with the design certification application. FSAR Tier 2, Chapter 1, Table 1.6-2, identifies the human factors engineering RSRs and IPs that are incorporated by reference in the FSAR Tier 2, Chapter 18. Table 1.6-2 identifies that the V&V IP is incorporated by reference in the FSAR Tier 2, Chapter 18.

However, FSAR Tier 2, Section 18.1.3.5, “Human Factors Engineering Documentation,” says,

An IP is prepared for each HFE element…and submitted for NRC review. The IP for a given element describes the methodology for conducting that element. Upon completion of the associated HFE activities, RSRs are prepared for the following HFE elements: …human factors verification and validation (Section 18.10). The RSRs for these elements contain the results and the latest methodology, and supersede the previously-submitted IPs.

Evaluation

The staff is currently reviewing the V&V methodology in the V&V IP. The staff would like to understand whether NuScale intends to supersede the V&V IP when the verification and validation (V&V) RSR is submitted.

- If NuScale does intend to supersede the V&V IP when the V&V RSR is submitted, then the V&V IP will not be part of the FSAR. Therefore, FSAR Tier 2, Chapter 1, Table 1.6-2, will need to be revised to remove the V&V IP as a document that is incorporated by reference in the FSAR.

  Also, the V&V RSR will need to include a description of the V&V methodology at a level of detail that will allow the staff to determine how the review criteria in NUREG-0711, Section 11, have been addressed.

- If NuScale does not intend to supersede the V&V IP when the V&V RSR is submitted, then the V&V IP will remain part of the FSAR. The V&V RSR will not need to include a detailed description of the V&V methods unless the methods actually used during V&V activities differ from those described in the V&V IP.

  Additionally, FSAR Tier 2, Chapter 1, Table 1.6-2, will need to be revised to include the V&V RSR.

Question

Please state whether NuScale intends to supersede the V&V IP when the V&V RSR is submitted.