NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Monday, July 23, 2018 9:10 AM
To: NuScaleDCRaisPEm Resource
Cc: Chowdhury, Prosanta
Subject: Request for Additional Information No. 432 eRAI No. 9415 (18)
Attachments: Request for Additional Information No. 432 (eRAI No. 9415).pdf

Attached please find NRC staff's request for additional information (RAI) 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.

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301-415-0546

Hearing Identifier: NuScale_SMR_DC_RAI_Public
Email Number: 529

Mail Envelope Properties (BN1PR09MB0258D4ED771A459B9046A2EE90560)

Subject: Request for Additional Information No. 432 eRAI No. 9415 (18)
Sent Date: 7/23/2018 9:10:27 AM
Received Date: 7/23/2018 9:10:32 AM
From: Cranston, Gregory

Created By: Gregory.Cranston@nrc.gov

Recipients:
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Tracking Status: None

Post Office: BN1PR09MB0258.namprd09.prod.outlook.com

Files	Size	Date & Time
MESSAGE	566	7/23/2018 9:10:32 AM
Request for Additional Information No. 432 (eRAI No. 9415).pdf	89502	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Request for Additional Information No. 432 (eRAI No. 9415)

Issue Date: 04/23/2018
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

18-46

Regulatory Basis

10 CFR 52.47(b)(1) requires a design certification application to contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and should operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations.

The NRC uses 10 CFR 50.34(f)(2)(iii) as the basis to regulate the human factors aspects of a main control room design. This regulation indicates that designers of plants must apply state-of-the-art human factors principles when designing the main control room. Chapter 18 of the standard review plan (NUREG-0800) and NUREG-0711 direct NRC staff regarding the review of human factors considerations in the design of nuclear power plant control rooms. NUREG-0711 identifies design implementation as one of the twelve elements of an acceptable human factors program and provides acceptance criteria that staff use to review an applicant's design implementation (DI) implementation plan (IP).

Background Information

Design Implementation Objectives

The human factors design process described in NUREG-0711 considers design implementation to be one of the 12 elements necessary in a state-of-the-art human factors program. The design implementation element objectives found in Section 12.2 of NUREG-0711 are paraphrased below:

1. Verify that the as-built design conforms to the verified and validated design resulting from the human factors engineering (HFE) design process

2. Verify that the implementation of changes to the design consider the effects on human performance.

NuScale provided Revision 1 of "Human Factors Engineering Design Implementation Implementation Plan" for review with the design certification application.

Draft Standard ITAAC

A letter from NRC to NuScale dated April 8, 2016 (ML16096A121) contains a set of draft standard ITAAC that could be used in the design certification application. However, NRC staff note that the draft standard ITAAC specific to Human Factors (H01 and H02 in this document) may have been intended for a design certification application utilizing design acceptance criteria (DAC) for the human factors design. Revisions may be necessary to achieve ITAAC appropriate for the NuScale application. NuScale is not using DAC, and the design certification will include the NuScale standard plant MCR design, which is configured for the operation of 12 modules from one control room. NuScale committed to revising DCD Tier 1, Table 3.15-1, "Human Factors Engineering Inspections, Tests, Analyses, and Acceptance Criteria", in response to RAI No. 8781 (ML17172A712) resulting in one ITAAC for human factors engineering (HFE).

Description of the Issues

For the sake of clarity, staff will use the following terminology:

· **As-designed**: Refers to the HSI design described in the HSI RSR which will be the input to the HFE V&V process

· **As-designed, as modified by the V&V**: refers to the HSI design that includes all design changes necessary to resolve human engineering deficiencies (HEDs) that came out of the V&V process. The as-designed, as modified design is the output of the V&V, which includes the HED resolution processes. NuScale has committed to submitting the V&V results summary report prior to Phase 4 of the design certification review (ADAMS Accession No. ML16099A270).

· **As-designed, as modified by the DI**: refers to the design that incorporates the resolution of ultimately resolves any HEDs identified during the DI activities. This is the design that should match the "as-built" main control room design. The "as-designed, as modified by the V&V" design is the input to this process.

1. The wording in the ITAAC currently requires verifying the as-built HSI design to the as-designed HSI, as modified by the integrated system validation (ISV) report, which means comparing the as-built design to the design specifications for the standard, generic, 12-unit control room design validated during ISV (one part of the V&V process). However, after V&V, and prior to construction of the control room, a COL holder may make changes to the HSI design, control room configuration, and plant system design. The evaluation of those changes is one of the DI activities discussed in NUREG-0711, Section 12.4.1. The as-built control room HSI and configuration should therefore be verified to be consistent with the design that was validated, as modified by the DI activities.

If the wording in the ITAAC is not clarified, there could be confusion while implementing important changes to the design that occur during DI activities, and there may also be delays in closing the ITAAC. This confusion may inhibit necessary changes to the design caused by updates to the PRA (which may cause changes to important human actions and may affect procedures and training), site specific design features, and any other changes to the design that occur after the V&V is complete but before plant startup.

2. Section 4, "Addressing Important Human actions," of the DI IP is written as though important human actions will be entirely addressed during V&V for the standard plant. However, it is possible that as the COL's PRA evolves, additional risk-important human actions (RIHAs) may be identified that should be evaluated. Also, Section 2.0, "Design Implementation Assessments," says the as-built configuration is compared to the design documents used for ISV; however, as-built configuration should also be compared to the design documents modified during DI.

3. The DI IP describes a method for resolving and closing out HEDs. It appears that in some cases, unresolved design issues may no longer be tracked and the mechanism for communicating them with a COL holder is unclear.

An appropriate process is necessary to ensure that the COL holder will appropriately consider and implement the correct scope of activities during the design implementation process. Staff have reviewed the process described in the related documents and additional information is necessary to clarify and possibly modify the processes to ensure adequate outcomes. Please provide additional information responding to the questions below.

Question 1 – Revisions to the ITAAC: Clarification of Scope

Please explain how the acceptance criteria of the HFE ITAAC in DCD Tier 1, Table 3.15-1, Revision 1, is sufficient to address design changes that may result following V&V and prior to construction. If it is not sufficient, please revise the ITAAC in DCD Tier 1, Table 3.15-1 to ensure that the as-built HSIs are consistent with the as-designed configuration of the MCR HSI as modified by design implementation activities.

Question 2 – Clarification of COL Applicant Role with DI IP & ITAAC

NUREG-0711, section 12.3 "Applicant Products and Submittals" states:

NUREG-0711 indicates that an RSR should be provided when the activities described in an implementation plan are complete. Given the nature of DI activities, staff expects that it is the responsibility of the COL holder to provide the RSR or make it available for review. However, this is not made explicit in the application.

Please clarify the strategy used to ensure that the full scope of the design implementation activities will be properly conducted and documented by the COL, and that the final results will ultimately be documented in a manner consistent with NUREG-0711, Sections 12.3 and 12.4. Clarify how the role of the COL applicant will be communicated to them using just the ITAAC or revise the application to provide appropriate COL action item(s) or additional ITAAC.

Please revise the DI IP, Sections 2 and 4 to account for changes that may occur after V&V and before plant startup.

Question 3 – Closure of HEDs that are not resolved

NUREG-0711 Criterion 12.4.1(3) states "*The applicant should verify that all HFE-related issues in the issue-tracking system are adequately addressed."*

Section 3.0 of "Human Factors Engineering Design Implementation Implementation Plan," Rev. 1, addresses the use of the Human Factors Engineering Issues Tracking System (HFEITS) for documenting and tracking Human Engineering Discrepancies (HEDs) that were generated in the human factors process and will be resolved during DI. Section 3.0 indicates that some HEDs "may be on-going due to anticipated technology or other advancements; however, all HEDs are closed prior to DI completion."

It is clear from Section 3.0 that the intent is to close all HEDs by the time that the DI RSR is complete. However, it also indicates that in some cases, it may not be advantageous to resolve HEDs by the end of DI. It is unclear how any remaining issues will ultimately be tracked and resolved by an eventual COL applicant based on Section 3.0 because all HEDs will be closed, regardless whether the issue is "on-going" or not.

Please clarify how on-going issues (which may include validation of site specific differences, scalability of the design, unit differences, modifications to the design that occurred after the V&V, operating experience from other operating NuScale plants, etc.) will be corrected by COL applicants if they are no longer documented or tracked. Also describe how it is determined which on-going issues can be closed without resolution.