



December 20, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
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SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 509 (eRAI No. 9608) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 509 (eRAI No. 9608)," dated October 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 Enclosure to this letter contains NuScale's response to the following RAI Question from NRC eRAI No. 9608:

- 14.03.08-1

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 Carrie Fosaaen at 541-452-7126 or at cfosaaen@nuscalepower.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Zackary W. Rad", written over a horizontal line.

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

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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9608



Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9608

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

eRAI No.: 9608

Date of RAI Issue: 10/23/2018

NRC Question No.: 14.03.08-1

This is a follow-up to RAI 9303, Question 12.03-52

Regulatory Basis

10 CFR 52.47(b)(1), requires that the application contain the 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 facility that incorporates the design certification (DC) has been constructed and will be operated in conformity with the DC, the provisions of the Atomic Energy Act (AEA), and NRC regulations.

Appendix A to 10 CFR Part 50— "General Design Criteria (GDC) for Nuclear Power Plants," Criterion 61—"Fuel storage and handling and radioactivity control," requires systems which may contain radioactivity to be designed with suitable shielding for radiation protection and with appropriate containment, confinement, and filtering systems.

GDC Criterion 60— "Control of releases of radioactive materials to the environment," requires that the nuclear power unit design include means to control suitably the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, including anticipated operational occurrences.

The Acceptance Criteria of DSRS Section 12.3-12.4, "Radiation Protection Design Features," contains a number of criteria related to the radiation protection design, including:

Systems, Structures and Components (SSC) that are described in the application, should be designed to maintain radiation exposures to operating and maintenance personnel ALARA.



Structures housing radioactive waste processing systems or components should be classified using the guidance for potential exposure to site personnel found in RG 1.143.

In addition, DSRS Section 14.3.8 indicates that the reviewer should ensure that Tier 1 identifies and describes, commensurate with their safety significance, those SSCs that provide radiation shielding, confinement or containment of radioactivity, ventilation of airborne contamination, or radiation (or radioactivity concentration) monitoring for normal operations and during accidents.

Background

In a letter issued by the NRC to NuScale, "NuScale Letter on Draft Standard ITAAC," and "Draft Standardized DCA ITAAC Tables - Enclosure to NuScale Letter on Draft Standard ITAAC," dated April 8, 2016 (ADAMS Accession Nos. ML16096A132 and ML16097A123), the staff described the ITAAC that are applicable to the staff review of the NuScale application. These standard ITAAC included:

R07 "As-Built Inspection and Reconciliation Analysis," to verify that the structures, systems, and components of the non-Seismic Category I radioactive waste system are designed and constructed to the standards of RG 1.143 to withstand the design loads without loss of structural integrity.

In Tier 2, Sections 11.2, 11.3, and 11.4, the applicant addresses compliance with RG 1.143 and provides the design criteria for which the components of the radwaste systems are to be designed. In the response to RAI 9303, Question 12.03-52, the applicant provided several reasons for not including an ITAAC for verifying that the radwaste systems are designed in accordance with those criteria. These reasons included that the radwaste systems were not safety-related or risk significant, that they did not support safety or risk-significant functions, and because the DCD included several other ITAAC related to the radwaste systems and the radwaste building. These include ITAAC that mitigate the release of radioactivity by initiating the closure of valves upon detection of a high radiation signal. However, these ITAAC do not ensure that the systems are built to the proper criteria. The staff agrees that the radwaste systems are not safety-related, however, they contain some of the most radioactive components in the plant, besides the core and spent fuel. An ITAAC ensuring that the systems are built properly will provide the staff with reasonable assurance that a radwaste system failure will not result in a significant radiological release or worker exposure event. Therefore, the staff does not believe that the response includes adequate justification for excluding the ITAAC.



Key Issue

DCD Tier 1, Chapter 1 "Certified Design Descriptions and Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)," does not contain ITAAC corresponding to R07, with respect to verifying that the as-built SSCs containing radioactive waste meet the design criteria, consistent with the guidance contained within RG 1.143, provided for demonstrating compliance with the provisions of 10 CFR Part 20 related to the protection of the health and safety of members of the public and protection of occupational radiation workers.

Question

Please provide the specified ITAAC (R07) to ensure that the as-built components of the radwaste systems meet the appropriate design criteria or describe an equivalent way that will ensure that the radwaste systems will be built as designed.

NuScale Response:

Background

The NRC-proposed ITAAC R07 is listed below in standard three-column format with the proposed corresponding Tier 2 section 14.3 discussion.

R07	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
	The [XXX system] non-Seismic Category I [RW-XX] equipment, constructed to the standards of RG 1.143, will withstand design loads without loss of structural integrity.	An inspection and reconciliation analysis will be performed of the as-built [XXX system] non-Seismic Category I [RW-XX] equipment.	The deviations between the drawings used for construction and the as-built [RW-XX] equipment listed in [Table x.x.x-x] have been reconciled and the [XXX system] non-Seismic Category I [RW-XX] equipment will maintain its structural integrity under designs loads
<p>Tier 2 Section 14.3 Discussion</p> <p>[Section XX] provides a discussion of the [XXX system], which is non-Seismic Category I [RW-XX] and is designed and constructed to the standards of RG 1.143 to withstand the design loads without loss of structural integrity. RG 1.143 Table 1 “Codes and Standards for the Design of SSC in Radwaste Facilities,” describes the design codes and standards expected to be met to demonstrate that the health and safety of members of the public and workers at the facility will be protected for the operational conditions described within RG 1.143 Table 2 “Natural Phenomena and Internal/External Man-Induced Hazard Design Criteria for Safety Classification” and Table 3 “Design Load Combinations.”</p> <p>[The design should specify which structures are designed to meet the criteria specified in RG 1.143, including the associated RW classification.]</p> <p>An ITAAC inspection and reconciliation analysis is performed for the [XXX system] non-Seismic Category I [RW-XX] equipment to verify that the equipment will maintain its structural integrity under designs loads.</p>			

ITAAC R07 was not contained in a Nuclear Energy Institute (NEI) letter to Mr. Michael E. Mayfield, Director, Division of Advanced Reactors and Rulemaking dated May 27, 2015, with subject of the letter, “Submittal of NEI 15-02, Draft A of Revision 0, Industry Guideline for the Development of Tier 1 and ITAAC Under 10 CFR Part 52, dated May 2015.” The NEI letter contained Appendix B-Standardized ITAAC for Design Certification applications which listed the



industry-proposed standardized ITAAC to be generally applicable to LWR design certification applications. The proposed ITAAC was a culmination of numerous NRC public meetings with the industry to discuss the standardization of ITAAC.

The NRC-proposed ITAAC R07 was initially submitted in an attachment to an NRC letter to NuScale on April 8, 2016 (ADAMS ML16097A123). In a follow-up public meeting with NuScale on July 20, 2016 to discuss the NRC-proposed standardized ITAAC, NuScale informed the NRC that they had evaluated the NRC-proposed R07 ITAAC, and would not incorporate the ITAAC in NuScale's DCA because it did not meet first principles. The NRC meeting summary of the July 20, 2016 meeting was issued on August 10 (ML16216A178). The July 20, 2016 NuScale presentation slides were submitted on July 7, 2016 to the NRC (ML16193A048).

In response to RAI 9303, question 12.03-52, NuScale provided justification for not including the NRC-proposed ITAAC R07 in the NuScale DCA. The following summary response is duplicated from eRAI No. 9303 question 12.03-52 response (ML18149A643):

- The NuScale radioactive waste systems do not have any safety-related or risk-significant functions.
- The NuScale radioactive waste systems do not support the safety or risk-significant functions of another system.
- The radioactive waste systems do not contain top-level design features, as described in FSAR Section 14.3.2.1.1, for shielding that protects the health and safety of workers.
- The health and safety of the public is protected by ITAAC that ensure high radiation will be contained within the RWB. The related ITAAC verifies the following top-level design features:
 - High radiation liquid in the LRWS is automatically isolated from the environment by containing the liquid in the LRWS.
 - High radiation gas in the GRWS is automatically isolated from the environment by containing the gas in the GRWS.
 - High radiation gas in the RWB is contained and precluded from leakage to the outside environment by keeping the RWB pressure negative relative to the outside environment.
 - The as-built RW-IIa RWB maintains its structural integrity under the design basis loads.

RAI 9608 Description of NRC Justification for NRC-proposed ITAAC R07

The RAI provides the following justification for ITAAC R07: “An ITAAC ensuring that the systems are built properly will provide the staff with reasonable assurance that a radwaste system failure will not result in a significant radiological release or worker exposure event.”

NuScale disagrees with this justification for proposed ITAAC R07 for the following reasons:

- A requirement that the radwaste systems “are built properly” is ambiguous. The justification does not meet the first principles contained in NEI 15-02.
- The justification contradicts itself. The NRC-proposed ITAAC R07 justification requires that a given system is “built properly” to ensure the given system will not result in a significant radiological release or worker exposure when the same system fails.

Analysis of Proposed ITAAC R07 Scope and Closure Requirements

NuScale provides, in this response, justification why the NRC-proposed ITAAC R07 is unnecessary and would not provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification (DC) is built and will operate in accordance with the DC, the provisions of the Atomic Energy Act, and the U.S. NRC regulations.

The following discussion contains reasons why the NRC-proposed ITAAC R07 should not be included in the NuScale DCA and describes the difficulty in determining the scope of the RAI and the potential COL issues encountered if ITAAC R07 was incorporated in the NuScale DCA. The discussion includes (1) the scope of the equipment to be verified, and (2) the method of verification of the acceptance criteria.

ITAAC R07 Scope Issues:

The ITAAC provides confusing criteria for ITAAC scope.

1. The ITAAC Design Commitment stipulates the required population of equipment to be verified by ITAAC R07 is: “The [XXX system] non-Seismic Category I [RW-XX] equipment, constructed to the standards of RG 1.143”. Per RG 1.143 Section 5 there are three classification of radwaste equipment: RW-IIa, RW-IIb and RW-IIc. *Therefore, the phrase “constructed to the standards of RG 1.143” in the design commitment is redundant and unnecessary*, because all equipment designated as RW-IIa, RW-IIb, and RW-IIc must be designed and constructed the standards of RG 1.143. Therefore, the scope of ITAAC R07 is all equipment classified as RW-IIa, RW-IIb, and RW-IIc equipment.

2. In an NRC public meeting on August 16, 2018 to discuss RAI 9303, NuScale identified the issue with referring to RG 1.143 in the NRC-proposed ITAAC R07 contained in RAI 9303. NuScale's concern was that RG 1.143 would become codified guidance by inclusion in Tier 1. One of the first principles of NEI 15-02 is to not include regulatory guidance in Tier 1. RG 1.143 Table 1, Codes and Standard for the Design of SSC in Radwaste Facilities references ACI, AISC, ASTM, AWS, AISC, AISI, ASTM, AWS, ANSI, API, TEMA, SMACNA, NEMA , NFPA, and ASME Section II, VIII, IX codes. In the August 16, 2018 public meeting, the NRC staff agreed to not referencing RG 1.143 in the ITAAC.
3. The ITA for ITAAC R07 stipulates "An inspection and reconciliation analysis will be performed of the as-built [XXX system] non-Seismic Category I [RW-XX] equipment." Therefore, the as-built inspection scope of ITAAC R07 is all equipment classified as RW-IIa, RW-IIb, and RW-IIc equipment. This conclusion is the same conclusion as item 1 above.
4. The Acceptance Criteria for ITAAC R07 stipulates "The deviations between the drawings used for construction and the as-built [RW-XX] equipment listed in [Table x.x.x-x] have been reconciled." It can only be assumed the list of equipment in the Tier 1 Table x.x.x-x is all equipment classified as RW-IIa, RW-IIb and RW-IIc equipment and therefore scope of equipment to be considered in the ITAAC acceptance criteria is all equipment classified as RW-IIa, RW-IIb, and RW-IIc. The number of entries in this table would far exceed the size of any table currently in NuScale Tier 1.
5. RG 1.143 Table 1, Codes and Standards for the Design of SSC in Radwaste Facilities, stipulates codes and standards to be applied to radwaste facility piping. It is unclear if the NRC intended that the Tier 1 table referenced in ITAAC R07 acceptance criteria would include radwaste piping. If so, the line numbers of all RW-IIa, RW-IIb, and RW-IIc piping line numbers would be itemized in the Tier 1 table along with the RW-IIa, RW-IIb, and RW-IIc equipment.
6. It is unclear in the ITAAC wording, but it is reasonable to assume that ITAAC R07 intends to address RW-IIa, RW-IIb, and RW-IIc equipment located on a vendor skid, i.e. is the equipment on a vendor skid within the scope of ITAAC R07 and listed in the Tier 1 table?
7. Similar to item 5 above, it is unclear if the NRC intended that the Tier 1 table referenced in ITAAC R07 acceptance criteria include radwaste piping on a vendor skid. If so, the

line numbers of all RW-IIa, RW-IIb, and RW-IIc skid piping line numbers would be itemized in the Tier 1 table along with the RW-IIa, RW-IIb, and RW-IIc equipment.

8. **Summary of issues related to ITAAC R07 Scope.** Although ITAAC R07 is ambiguous, it appears that the scope of the NRC-proposed ITAAC R07 includes all LRWS, GRWS, and SRWS equipment and piping classified as RW-IIa, RW-IIb, and RW-IIc. At a minimum, this scope would include all RW-IIa, RW-IIb, and RW-IIc valves, tanks, pressure vessels, pumps and piping. Conduit and cable trays would also have to be included in the ITAAC scope if they are classified as RW-IIa, RW-IIb and RW-IIc. Each RW-IIa, RW-IIb, and RW-IIc piece of equipment, all piping line segments, conduit (as necessary) and cable trays (as necessary) would be listed in a Tier 1 table. After DCA approval any modification to the LRWS, GRWS or SRWS that adds or deletes the equipment or piping in the Tier 1 tables would require a LAR because it would require a change to Tier 1 certified design material for nonsafety, non risk-significant equipment.

ITAAC R07 Acceptance Criterion Issues:

1. The ITAAC R07 acceptance criterion stipulates “The deviations between the drawings used for construction and the as-built [RW-XX] equipment listed in [Table x.x.x-x] have been reconciled”. The acceptance criteria would require that all construction drawings for all LRWS, GRWS, and SRWS equipment, piping, conduit, and cable trays classified as RW-IIa, RW-IIb, and RW-IIc be as-built, and reconciled and provided as evidence that the ITAAC acceptance criteria was satisfied.
2. The ITAAC R07 acceptance criterion makes no provisions for what type of drawing must be as-built and reconciled. Thus, the population of potential in-scope construction drawing would include *any* construction drawing that lists any of the items in the Tier 1 table associated with ITAAC R07. Each of these drawings must be as-built, reconciled and provided as evidence that ITAAC R07 acceptance criteria was met. It is unreasonable to list all of the drawing types that would be within the scope of ITAAC R07, but a very small sample is provided to demonstrate the magnitude of the ITAAC R07 scope:
 - a. equipment layout drawings,
 - b. elevation drawings showing the placement of equipment,
 - c. piping isometrics,
 - d. vendor drawings used to install vendor equipment,

- e. welding drawings,
 - f. conduit drawings,
 - g. cable tray drawings,
 - h. drawings that indicate detailed pump seal injection piping,
 - i. drawings that show the connection of instruments to equipment listed in the Tier 1 table,
 - j. drawings that show the orientation of valves,
 - k. drawings that show the torque values of valves.
3. The ITAAC R07 acceptance criterion requires the COL to stipulate “the [XXX system] non-Seismic Category I [RW-XX] equipment will maintain its structural integrity under designs loads” after completing the as-built inspection and reconciliation of applicable construction drawings. There is no basis in RG 1.143 for the COL to make this assertion because RG 1.143 makes no such assertion. In fact, neither RG 1.143 nor any of its referenced codes and standards in RG 1.143 Table 1 use the phrase “structural integrity.” Thus, regardless of the inspections performed on as-built equipment, there would be no technical basis for the COL to assert equipment will maintain its structural integrity.
4. **Summary of issues related to ITAAC R07 acceptance criteria.** The acceptance criteria is ambiguous and contradictory which then could lead to various interpretations of the "data" to be used to satisfy the ITAAC's acceptance criteria.

Summary of response

NuScale disagrees that the NRC-proposed ITAAC R07 is needed for the above stated and cited reasons.

Impact on DCA:

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