October 10, 2019

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 Supplemental Response to NRC Request for Additional Information No. 522 (eRAI No. 9681) on the NuScale Design Certification Application

REFERENCES:
1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 522 (eRAI No. 9681)," dated July 15, 2019
2. NuScale Power, LLC Response to NRC "Request for Additional Information No. 522 (eRAI No.9681)," dated July 19, 2019

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) supplemental response to the referenced NRC Request for Additional Information (RAI).

The Enclosure to this letter contains NuScale's supplemental response to the following RAI Question from NRC eRAI No. 9681:

- 14.03-3

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 Nadja Joergensen at 541-452-7338 or at njoergensen@nuscalepower.com.

Sincerely,

Michael Melton
Manager, Licensing
NuScale Power, LLC

Distribution: Gregory Cranston, NRC, OWFN-8H12
Samuel Lee, NRC, OWFN-8H12
Cayetano Santos, NRC, OWFN-8H12
Michael Dudek, NRC, OWFN-8H12

Enclosure 1: NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9681

Enclosure 1:

NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9681

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

eRAI No.: 9681
Date of RAI Issue: 05/30/2019

NRC Question No.: 14.03-3

Please see the attachment to this Request for Additional Information.

Title 10, Section 52.47(b)(1) of the Code of Federal Regulations (CFR) requires that a design certification application 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 facility that incorporates the design certification has been constructed and will operate in accordance with the design certification, the provisions of the Atomic Energy Act of 1954, as amended (AEA), and the NRC's rules and regulations. For the ITAAC to be "sufficient," (1) the inspections, tests, and analyses (ITA) must clearly identify those activities necessary to demonstrate that the acceptance criteria (AC) are met; (2) the AC must state clear design or performance objectives demonstrating that the Tier 1 design commitments (DCs) are satisfied; (3) the ITA and AC must be consistent with each other and the Tier 1 DC; (4) the ITAAC must be capable of being performed and satisfied prior to fuel load; and (5) the ITAAC, as a whole, must provide reasonable assurance that, if the ITAAC are satisfied, the facility has been constructed and will be operated in accordance with the design certification, the AEA, and the NRC's rules and regulations.

The staff has reviewed all DCD Rev 2, Tier 1 ITAAC tables and Chapter 1 of Tier 1 against these objectives, and in light of NRC guidance, Commission policy, and lessons learned from plants that are currently under construction that are in the process of implementing ITAAC. Based on this review, the staff has compiled the attached list of proposed ITAAC wording changes. The applicant is requested to make these changes in the Tier 1 ITAAC tables and in Chapter 1 of Tier 1, or otherwise show that the ITAAC comply with 10 CFR 52.47(b)(1). Additionally, the applicant is requested to address the following items, or otherwise show that the ITAAC comply with 10 CFR 52.47(b)(1):

1. ITAAC 29 in Table 2.5-7 verifies that the MCR isolation switches are located in the remote shutdown station but it does not verify the functionality of the switches. Please explain how ITAAC 29 verifies that the MCR isolation switches actually isolate the manual MCR switches from the MPS in case of fire. If ITAAC 29 does not verify the functionality of the MCR isolation switches, please explain what changes to the existing ITAAC in Tier 1 would be necessary to verify the functionality of the MCR isolation switches through ITAAC. If the applicant believes that ITAAC are not necessary to verify the functionality of the MCR isolation switches, please explain this and please explain why an ITAAC is, nonetheless, necessary to verify the location of the MCR isolation switches.

2. The design commitments listed in the design descriptions of DCA Part 2, Tier 1 are not consistent with the design commitments in the corresponding ITAAC tables. Although not identified in the attachment, the design commitments in the design descriptions of DCA Part 2, Tier 1 should be revised to be consistent with the design commitment in the ITAAC tables.

Additional explanations for the basis of the staff's proposed revisions in the attachment are provided below:

1. Tier 1, Section 1.1: Propose adding a definition of "approved design" to clarify what this term refers to. Without a definition, it is not clear who the approver is or when the design is considered approved (at certification or when the ITAAC is closed?). To provide clarity and flexibility, the staff proposes to define the "approved design" in terms of the updated final safety analysis report.

2. Tier 1, Section 1.2.4: Propose adding explanatory material consistent with past design certifications as applied to the NuScale design.

3. ITAAC 12 in Table 2.1-4: To resolve the use of the ambiguous word, "approximately" in the AC.

4. ITAAC 22 in Table 2.1-4: To clarify the applicability of the ITAAC to the assemblies and to add consideration of overload currents.

5. ITAAC 1 and 2 in Table 2.3-1: To make the scope of the ITA and AC consistent with the DC.

6. ITAAC 3, 4, and 6 in Table 2.5-7: To clarify the applicability of physical separation, electrical isolation, and communications independence in the DC and ITAAC.

7. ITAAC 15 in Table 2.5-7: To clarify the DC and make the DC consistent with the AC.

8. ITAAC 21 in Table 2.5-7: To clarify the DC and resolve an inconsistency between the DC and AC.

9. ITAAC 2, 3, and 4 in Table 2.7-2: The DCs for ITAAC 2 to 4 relate to a single Chemical Volume and Control System (CVCS) high radiation signal, but the AC for each ITAAC cover all 3 CVCS radiation signals. The proposed changes consolidate ITAAC 2 to 4 so that the scope of the DC matches the scope of the AC.

10. ITAAC 1 in Table 3.4-1: To resolve an inconsistency between the DC and AC.

11. ITAAC 4 in Table 3.4-1: The DC is actually an ITA. The staff's proposed revisions correct this.

12. ITAAC 2 in Table 3.5-1: To remove an unnecessary conditional statement in the DC and to clarify what the "approved" analysis is.

13. ITAAC 3 in Table 3.7-1: To clarify in the AC the alternative shutdown capability referred to in the DC.

14. ITAAC 4, 5, and 6 in Table 3.9-2: See explanation for ITAAC 2, 3, and 4 in Table 2.7-2.

15. ITAAC 8 and 9 in Table 3.9-2: See explanation for ITAAC 2, 3, and 4 in Table 2.7-2.

16. ITAAC 1, 2, and 3 in Table 3.10-1: To resolve inconsistencies between the DC and AC.

17. ITAAC 7 in Table 3.10-1: The DC is actually an ITA. The staff's proposed revisions correct this and make it consistent with the AC.

18. ITAAC 8 in Table 3.10-1: This ITAAC could be deleted if the proposed revisions to ITAAC 7 in Table 3.10-1 are incorporated as shown in the attachment since the scope of the revised ITAAC 7 would encompass the scope of ITAAC 8.

19. ITAAC 10 in Table 3.10-1: To resolve inconsistencies between the DC and AC.

20. ITAAC 5 in Table 3.11-2: To remove unnecessary and ambiguous qualifying language in the AC.

21. ITAAC 2 in Table 3.12-2: To remove unnecessary and ambiguous qualifying language in the AC.

22. ITAAC 7 and 8 in Table 3.16-1: To make the scope of the ITAAC consistent among the DC, ITA, and AC.

23. ITAAC 9 in Table 3.16-1: To clarify the scope of the ITA.

24. ITAAC 10 in Table 3.16-1: To make the scope of the ITA and AC consistent with the DC.

25. ITAAC 2, 3, and 4 in Table 3.17-2: See explanation for ITAAC 2, 3, and 4 in Table 2.7-2.

26. ITAAC 2 and 3 in Table 3.18-2: See explanation for ITAAC 2, 3, and 4 in Table 2.7-2.

NuScale Response:

Staff provided observations and comments regarding the NuScale response to request for additional information (RAI) 9681. Each of the comments and observations are listed below, and are immediately followed by the actions taken by NuScale to address them.

Table 2.1-4 ITAAC #12

RAI 9681 response added the language requested except for the phrase, "the objectives of" in the design commitment (DC). This phrase was included in the acceptance criteria (AC). The design commitment in Section 2.1 is also lacking this phrase.

The DC for ITAAC 02.01.12 was revised to align with the AC. Both the DC and AC now include the phrase "with the objectives of the RPV surveillance program." The DC in Section 2.1 was also revised to exactly match the revised Inspections, Test, Analyses, and Acceptance Criteria (ITAAC) DC.

Table 2.2-3 ITAAC #1

The phrase "listed in Table 2.2-1" was added to the AC but it appears to be in the wrong location. The wrong "system" appears to have been deleted in the AC.

The AC for ITAAC 02.02.01 was revised to correct both errors.

Table 2.3-1 ITAAC #2

Per RAI response, staff comment in the AC was not incorporated because "The acceptance criteria was not revised to add pressure instrumentation. The acceptance criteria already specifies 'CES inlet pressure instrumentation (PIT-1001/PIT-1019)' " The AC is still unclear. Staff requests revised ITAAC language. DC - "The CES inlet pressure instrumentation supports RCS leakage detection" ITA - "A test will be performed of the CES inlet pressure instrumentation" AC - "The CES inlet pressure instrumentation detects a pressure increase which correlates to a detection of an unidentified RCS leakage rate of one gpm within one hour"

During the public meeting to discuss the NRC Staff's observations and comments, NuScale explained that the requested changes would introduce inconsistencies between the revised ITAAC language and ITAAC 02.03.01. To prevent these inconsistencies, both ITAAC 02.03.01 and ITAAC 02.03.02 were revised to incorporated the requested changes.

Table 2.5-7 ITAAC #1

There appear to be several cases in which the text for design commitments listed in Section 2.5.1 do not match DC text in ITAAC table (see design commitments for 1i, viii, ix). The text for design commitments listed in Section 2.5.1 are listed in a different order than the DC in the ITAAC Table.

Design Commitments in both Section 2.5.1 and Table 2.5-7 were revised to ensure alignment of the text. Additionally, the order of the DCs in Section 2.5.1 was modified to match the order in Table 2.5-7.

Table 2.5-7 ITAAC #21

Response to RAI 9681 incorporates this as item number xiii in ITAAC #1 in Table 2.5-7. The DC uses the term "separation channels." The AC uses the term "separation groups." Consistent terms should be used. Staff requests that the DC be revised to "The MPS is capable of performing its safety-related functions when any one of its separation groups is out of service."

The term "separation channels" was changed to "separation groups" in the DC for ITAAC 02.05.01xiii. and the corresponding Design Commitment in Section 2.5.1.

Table 3.1-2 ITAAC #1

The DC is mathematically inconsistent with the AC because "does not exceed" and "is less than" do not mean the same thing. If the measured value equals the assumed value, then the DC is met, but the AC is not. Staff requests revised ITAAC language. DC - "The air exfiltration out of the CRE is less than or equal to the assumptions used to size the CRHS inventory and supply flow rate." AC - "The air exfiltration measured by tracer gas testing is less than or equal to the CRE air infiltration rate assumed in the dose analysis."

The phrase "does not exceed" was revised to "is less than or equal to" in the DC for ITAAC 03.01.01 and the corresponding DC in Section 3.3.1. Additionally, the AC for ITAAC 03.01.01 was revised to modify "less than" to "less an equal to".

Table 3.9-2 ITAAC #2

There is a slight discrepancy between the DC in the ITAAC Table and the design commitment listed in Section 3.9.1. In the table the DC states ". . CRHS automatically respond to the high-radiation signals . . . " whereas in Section 3.9.1 it states ". . CRHS automatically respond to the CRVS high radiation signals. . . "

The ITAAC 03.09.02 DC was revised to align with the corresponding DC in Section 3.9.1.

Table 3.9-2 ITAAC #10

In the AC for other ITAAC (e.g., ITAAC #7 and #8 in Table 3.9-2), NuScale replaced "a" real or simulated signal with "the" real or simulated signal. However, for this ITAAC this change was not made.

The article "a" was revised to "the" in the ITAAC 03.09.10 AC.

<u>Table 3.14-2 ITAAC #1</u>

The change to "Seismic Qualification Report" was suggested by NRC staff in RAI 9681. The edit should have been applied throughout the ITAAC (i.e. 02.08.01 and the rest of 03.14.01) and was suggested to ensure consistency with ASME QME-1 terminology and to be clear in what the AC required.

The AC of ITAAC 02.08.01 and 03.14.01 were revised to incorporate the requested change. Additionally, the corresponding ITAAC discussions in Tier 2 Tables 14.3-1 and 14.3-2 were revised to align with the revised AC.

<u>Table 3.17-2 ITAAC #2</u>

This ITAAC refers to Table 3.17-1. In Table 3.17-1 "BPDS" should be identified in the second row, under the column for "Variable Monitored"

The entry for "0A condensate polishing system regeneration skid waste effluent" in Table 3.17-1 was revised to "BPDS 0A condensate polishing system regeneration skid waste effluent". Additionally, the Table 3.18-1 entry for "0B condensate polishing system regeneration skid waste effluent" was revised to "BPDS 0B condensate polishing system regeneration skid waste effluent" for consistency.

<u>Table 14.3-2</u>

In Table 14.3-2 the entry for ITAAC number 03.14.08 references Section 5.4.2 twice for the decay heat removal system (DHRS); however, it is DCA Part 2, Tier 2, Section 5.4.3, that covers the DHRS. Per the public meeting on 9/4/19, staff understands that NuScale plans to move this ITAAC back to Table 2.8-2.

The Table 14.3-2 discussion for ITAAC 03.14.08 was revised to correctly reference Section 5.4.3 in both instances. As noted, several ITAAC were transferred from Tier 1 Chapter 2 to Tier 1 Chapter 3 as part of the initial RAI 9681 response, but have restored to their original location

as part of this supplemental response. The following ITAAC, associated DCs, and Tier 2 Table 14.3-1 discussions were reinstated:

- Table 2.1-4, ITAAC 02.01.22
- Table 2.8-2, ITAAC 02.08.03
- Table 2.8-2, ITAAC 02.08.05
- Table 2.8-2, ITAAC 02.08.06
- Table 2.8-2, ITAAC 02.08.08

The following ITAAC, associated DCs, and Tier 2 Table 14.3-2 discussions were removed:

- Table 3.14-2, ITAAC 03.14.04
- Table 3.14-2, ITAAC 03.14.05
- Table 3.14-2, ITAAC 03.14.06
- Table 3.14-2, ITAAC 03.14.07
- Table 3.14-2, ITAAC 03.14.08

Table 14.3-3h

In Tables 2.8-1 and 14.3-3h, both titled “Module Specific Mechanical and Electrical/I&C Equipment,” under Control Rod Drive System, Rod Position Indication (RPI) Coils it states there are 24 total, but should this be 32 total (16 control rod assemblies x 2 RPI trains/assembly)?

The Rod Position Indication (RPI) Coils entries in Tables 2.8-1 and 14.3-3h were revised from "24 total" to "32 total".

An additional change was made to Radioactive Waste Building ITAAC 03.12.03 and its associated ITAAC discussion in Tier 2 Table 14.3-2. The changes made to the ITA and AC establish consistency with similar Reactor Building and Control Building ITAAC, 03.11.06 and 03.13.04, respectively.

Changes were also made to test abstracts in the Initial Test Program. The changes include:

- Table 14.2-47, Emergency Core Cooling System Test #47, System Level Test #47-1, was revised to remove test objectives and acceptance criteria associated with containment vessel pressure and temperature. These parameters are not required to demonstrate the functional operability of the emergency core cooling system as a whole, and were therefore deleted.

- Table 14.2-107, Remote Shutdown Workstation Test #107, was restored at the request of the Staff. This change permits future reviewers to more easily identify how the remote shutdown station functionality is demonstrated via factory and site acceptance testing.

Changes were made to Table 14.3-2 ITAAC No. 03.11.14 and ITAAC No. 03.12.01 to include additional relevant requirements in the discussion section.

Impact on DCA:

Tier 1 Chapters 2 and 3, and Tier 2 Chapter 14 Sections 14.2 and 14.3 have been revised as described in the response above and as shown in the markup provided in this response.

RAI 09.01.04-1, RAI 09.05.01-6, RAI 14.03-3, RAI 14.03-3S1, RAI 14.03.02-1, RAI 14.03.02-2, RAI 14.03.03-1, RAI 14.03.03-6, RAI 14.03.03-7, RAI 14.03.03-8, RAI 14.03.07-1, RAI 14.03.08-1S1, RAI 14.03.09-1, RAI 14.03.09-2, RAI 14.03.09-3, RAI 14.03.12-2, RAI 14.03.12-3, RAI 18-46S1

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference(1)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.01.01	CRH	Testing is performed on the CRE in accordance with RG 1.197, “Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors,” Revision 0, to demonstrate that air exfiltration from the CRE is controlled. RG 1.197 allows two options for CRE testing; either integrated testing (tracer gas testing) or component testing. Section 6.4 Control Room Habitability, describes the testing requirements for the CRE habitability program. Section 6.4 provides the maximum air exfiltration allowed from the CRE. In accordance with Table 14.2-18, a preoperational test using the tracer gas test method demonstrates that the air exfiltration from the CRE does not exceed the assumed unfiltered leakage rate provided in Table 6.4-1: Control Room Habitability System Design Parameters for the dose analysis. Tracer gas testing in accordance with ASTM E741 will be performed to measure the unfiltered in-leakage into the CRE with the control room habitability system (CRHS) operating.			X		
03.01.02	CRH	The CRHS valves are tested by remote operation to demonstrate the capability to perform their function to transfer open and transfer closed under preoperational temperature, differential pressure, and flow conditions. In accordance with Table 14.2-18, a preoperational test demonstrates that each CRHS valve listed in Tier 1 Table 3.1-1 (Table 14.3-4a) strokes fully open and fully closed by remote operation under preoperational test conditions. Preoperational test conditions are established that approximate design-basis temperature, differential pressure, and flow conditions to the extent practicable, consistent with preoperational test limitations.			X		

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[(1)] (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.11.04	RXB	Section 12.3, Radiation Protection Design Features, provides the design bases for radiation shielding, including type, form and material properties utilized in specific locations. Radiation shielding is provided to meet the radiation zone and access requirements for normal operation and post-accident conditions, and to demonstrate compliance with 10 CFR 50.49, GDC 4, ~~and~~ PDC 19, GDC 61, 10 CFR 50.34(f)(2)(vii), and other relevant requirements. Compartment walls, ceilings, and floors, or other barriers provide shielding. An ITAAC inspection is performed of the RXB radiation barriers to verify wall materials and thicknesses. The required thicknesses are specified in Table 12.3-6. Attenuation capabilities are determined based on wall materials and thicknesses, and an analysis and report will conclude that attenuation capabilities are greater than or equal to the approved design.			X		
03.11.05	RXB	Section 12.3.2.2, Design Considerations, provides the design bases for radiation shielding. Radiation shielding is provided to meet the radiation zone requirements for normal operation and control room access requirements for post-accident conditions. Radiation attenuating doors must meet or exceed the radiation attenuation capability of the wall within which they are installed. An ITAAC inspection is performed to verify that the RXB radiation attenuating doors are installed in their design location and have a radiation attenuation capability that meets or exceeds that of the wall within which they are installed in accordance with the approved door schedule design.			X		

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[1] (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.11.08	RXB	Section 3.6, Protection against Dynamic Effects Associated with Postulated Rupture of Piping, provides the design bases and criteria for the analysis required to demonstrate that safety-related SSC are not impacted by the adverse effects of a high-and moderate-energy pipe failure within the plant. An ITAAC inspection is performed to verify that the as-built protective features located in the RXB outside the reactor pool bay credited in the reconciled Pipe Break Hazards Analysis Report (such as pipe whip restraints, pipe whip or jet impingement barriers, jet impingement shields, or guard pipe) have been installed in accordance with design drawings of sufficient detail to show the existence and location of the protective hardware. The as-built inspection is intended to verify that changes to postulated pipe failure locations and protective features or protected equipment made during construction do not adversely affect the safety-related functions of the protected equipment.	X	X			
03.12.01	RWB	Section 12.3, Radiation Protection Design Features, provides the design bases for radiation shielding, including type, form and material properties utilized in specific locations. Radiation shielding is provided to meet the radiation zone requirement for normal operation and post-accident conditions and to demonstrate conformance with GDC 61, RG 4.21, ~~and~~ RG 8.8, and other relevent requirements. Compartment walls, ceilings, and floors, or other barriers provide shielding. An ITAAC inspection is performed of the RWB radiation barriers to verify wall materials and thicknesses. The required thicknesses are specified in Table 12.3-7. Attenuation capabilities are determined based on wall materials and thicknesses, and an analysis and report will conclude that attenuation capabilities are greater than or equal to the approved design.			X		

- The Nuscale Power Module ASME Code Class 1, 2, and 3 components listed in Table 2.1-2 conform to the rules of construction of ASME Code Section III.

RAI 14.03-3

- The Nuscale Power Module ASME Code Class CS components listed in Table 2.1-2 conform to the rules of construction of ASME Code Section III.
- Safety-related structures, systems, and components (SSC) are protected against the dynamic and environmental effects associated with postulated failures in high- and moderate-energy piping systems.

RAI 14.03-3

- The Nuscale Power Module ASME Code Class 2 piping systems listed in Table 2.1-1 and interconnected equipment nozzles are evaluated for leak-before-break (LBB).

RAI 14.03.03-8

- The RPV beltline material has a Charpy upper-shelf energy of 75 ft-lb minimum.
- The CNV serves as an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment.

RAI 14.03-3

- Closure times for CIVs listed in Table 2.1-3 limit potential releases of radioactivity.

RAI 14.03-3

- The length of piping listed in Table 2.1-1 shall be minimized between the containment penetration and the associated outboard CIVs.

RAI 08.01-1S1, RAI 14.03-3

- The CNTS containment electrical penetration assemblies listed in Table 2.1-3 are sized to power their design loads.

RAI 14.03-3, RAI 14.03-3S1

- The RPV is provided with surveillance capsule holders to hold a capsule containing RPV material surveillance specimens at locations where the capsules will be exposed to a neutron flux consistent with the objectives of the RPV surveillance program.

RAI 14.03-3

- The remotely-operated CNTS containment isolation valves listed in Table 2.1-2 change position under design-basis temperature, differential pressure, and flow conditions.

RAI 14.03-3

- The ECCS valves listed in Table 2.1-2 change position under design-basis temperature, differential pressure, and flow conditions.

RAI 14.03-3

- The DHRS valves listed in Table 2.1-2 change position under design-basis temperature, differential pressure, and flow conditions.

RAI 14.03-3

- The CNTS hydraulic-operated valves listed in Table 2.1-2 fail to (or maintain) their safety-related position on loss of electrical power under design-basis temperature, differential pressure, and flow conditions.

RAI 14.03-3

- The ECCS RRVs and RVVs listed in Table 2.1-2 fail to (or maintain) their safety-related position on loss of electrical power to their corresponding trip valves under design-basis temperature, differential pressure, and flow conditions.

RAI 14.03-3

- The DHRS hydraulic-operated valves listed in Table 2.1-2 fail to (or maintain) their safety-related position on loss of electrical power under design-basis temperature, differential pressure, and flow conditions.

RAI 14.03-3

- The CNTS check valves listed in Table 2.1-2 change position under design-basis temperature, differential pressure, and flow conditions.

RAI 14.03-3S1

- Each CNTS containment electrical penetration assembly listed in Table 2.1-3 is rated either (i) to withstand fault and overload currents for the time required to clear the fault from its power source, or (ii) to withstand the maximum fault and overload current for its circuits without a circuit interrupting device.

RAI 14.03-3, RAI 14.03.07-1

- The NPM lifting fixture supports its rated load.

RAI 14.03.07-1

- The NPM lifting fixture is constructed to provide assurance that a single failure does not result in the uncontrolled movement of the lifted load.

RAI 14.03.03-5S3

- The ECCS valves, CIVs, and DHRS actuation valves listed in Table 2.1-2, and their associated hydraulic lines, are installed such that each valve can perform its safety function.

2.1.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.1-4 contains the inspections, tests, and analyses for the NPM.

RAI 06.02.06-22, RAI 06.02.06-23, RAI 08.01-1, RAI 08.01-1S1, RAI 08.01-2, RAI 14.03-3, RAI 14.03-3S1, RAI 14.03.03-3S1, RAI 14.03.03-4S1, RAI 14.03.03-5S3, RAI 14.03.03-6S1, RAI 14.03.03-7S1, RAI 14.03.03-8, RAI 14.03.03-11S1, RAI 14.03.07-1

Table 2.1-4: NuScale Power Module Inspections, Tests, Analyses, and Acceptance Criteria

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.	The NuScale Power Module ASME Code Class 1, 2 and 3 piping systems listed in Table 2.1-1 comply with ASME Code Section III requirements.	An inspection will be performed of the NuScale Power Module ASME Code Class 1, 2 and 3 as-built piping system Design Reports for systems listed in Table 2.1-1 required by ASME Code Section III.	The ASME Code Section III Design Reports (NCA-3550) exist and conclude that the NuScale Power Module ASME Code Class 1, 2 and 3 as-built piping systems listed in Table 2.1-1 meet the requirements of ASME Code Section III.
2.	The NuScale Power Module ASME Code Class 1, 2, and 3 components listed in Table 2.1-2 conform to the rules of construction of ASME Code Section III.	An inspection will be performed of the NuScale Power Module ASME Code Class 1, 2, and 3 as-built component Data Reports for components listed in Table 2.1-2 required by ASME Code Section III.	ASME Code Section III Data Reports for the NuScale Power Module ASME Code Class 1, 2, and 3 components listed in Table 2.1-2 and interconnecting piping exist and conclude that the requirements of ASME Code Section III are met.
3.	The NuScale Power Module ASME Code Class CS components listed in Table 2.1-2 conform to the rules of construction of ASME Code Section III.	An inspection will be performed of the NuScale Power Module ASME Code Class CS as-built component Data Reports for components listed in Table 2.1-2 required by ASME Code Section III.	ASME Code Section III Data Reports for the NuScale Power Module ASME Code Class CS components listed in Table 2.1-2 exist and conclude that the requirements of ASME Code Section III are met.
4.	Safety-related SSC are protected against the dynamic and environmental effects associated with postulated failures in high- and moderate-energy piping systems.	An inspection and analysis will be performed of the as-built high- and moderate-energy piping systems and protective features for the safety-related SSC.	Protective features are installed in accordance with the as-built Pipe Break Hazard Analysis Report and safety-related SSC are protected against or qualified to withstand the dynamic and environmental effects associated with postulated failures in high- and moderate-energy piping systems.
5.	The NuScale Power Module ASME Code Class 2 piping systems listed in Table 2.1-1 and interconnected equipment nozzles are evaluated for LBB.	An analysis will be performed of the ASME Code Class 2 as-built piping systems listed in Table 2.1-1 and interconnected equipment nozzles.	The as-built LBB analysis for the ASME Code Class 2 piping systems listed in Table 2.1-1 and interconnected equipment nozzles is bounded by the as-designed LBB analysis.
6.	The RPV beltline material has a Charpy upper-shelf energy of 75 ft-lb minimum.	A vendor test will be performed of the Charpy V-Notch specimen of the RPV beltline material.	An ASME Code Certified Material Test Report exists and concludes that the initial RPV beltline material Charpy upper-shelf energy is 75 ft-lb minimum.
7.	The CNV serves as an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment.	A leakage test will be performed of the pressure containing or leakage-limiting boundaries, and CIVs.	The leakage rate for local leak rate tests (Type B and Type C) for pressure containing or leakage-limiting boundaries and CIVs meets the requirements of 10 CFR Part 50, Appendix J.
8.	Closure times for CIVs listed in Table 2.1-3 limit potential releases of radioactivity.	A test will be performed of the automatic CIVs listed in Table 2.1-3.	Each CIV listed in Table 2.1-3 travels from the full open to full closed position in less than or equal to the time listed in Table 2.1-3 after receipt of a containment isolation signal.

Table 2.1-4: NuScale Power Module Inspections, Tests, Analyses, and Acceptance Criteria (Continued)

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
9.	The length of piping listed in Table 2.1-1 shall be minimized between the containment penetration and the associated outboard CIVs.	An inspection will be performed of the as-built piping listed in Table 2.1-1 between containment penetrations and associated outboard CIVs.	The length of piping between each containment penetration and its associated outboard CIV is less than or equal to the length identified in Table 2.1-1.
10.	The CNTS containment electrical penetration assemblies listed in Table 2.1-3 are sized to power their design loads.	i. An analysis will be performed of the CNTS as-designed containment electrical penetration assemblies listed in Table 2.1-3. ii. An inspection will be performed of CNTS as-built containment electrical penetration assemblies listed in Table 2.1-3.	i. An electrical rating report exists that defines and identifies the required design electrical rating to power the design loads of each CNTS containment electrical penetration assembly listed in Table 2.1-3. ii. The electrical rating of each CNTS containment electrical penetration assembly listed in Table 2.1-3 is greater than or equal to the required design electrical rating as specified in the electrical rating report.
11.	Not used.	Not used.	Not used.
12.	The RPV is provided with surveillance capsule holders to hold a capsule containing RPV material surveillance specimens at locations where the capsules will be exposed to a neutron flux consistent with the objectives of the RPV surveillance program.	An inspection will be performed of the as-built RPV surveillance capsule holders.	Four surveillance capsule holders are installed in the RPV beltline region at locations where the capsules will be exposed to a neutron flux consistent with the objectives of the RPV surveillance program.
13.	The remotely-operated CNTS containment isolation valves listed in Table 2.1-2 change position under design-basis temperature, differential pressure, and flow conditions.	A test will be performed of the remotely-operated CNTS containment isolation valves listed in Table 2.1-2 under preoperational temperature, differential pressure, and flow conditions.	Each remotely-operated CNTS containment isolation valve listed in Table 2.1-2 strokes fully open and fully closed by remote operation under preoperational temperature, differential pressure, and flow conditions.
14.	The ECCS valves listed in Table 2.1-2 change position under design-basis temperature, differential pressure, and flow conditions.	A test will be performed of the ECCS valves listed in Table 2.1-2 under preoperational temperature, differential pressure, and flow conditions.	Each ECCS valve listed in Table 2.1-2 strokes fully open and fully closed by remote operation under preoperational temperature, differential pressure, and flow conditions.
15.	The DHRS valves listed in Table 2.1-2 change position under design-basis temperature, differential pressure, and flow conditions.	A test will be performed of the DHRS valves listed in Table 2.1-2 under preoperational temperature, differential pressure, and flow conditions.	Each DHRS valve listed in Table 2.1-2 strokes fully open and fully closed by remote operation under preoperational temperature, differential pressure, and flow conditions.
16.	Not used.	Not used.	Not used.
17.	Not used.	Not used.	Not used.

Table 2.1-4: NuScale Power Module Inspections, Tests, Analyses, and Acceptance Criteria (Continued)

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
18.	The CNTS hydraulic-operated valves listed in Table 2.1-2 fail to (or maintain) their safety-related position on loss of electrical power under design-basis temperature, differential pressure, and flow conditions.	A test will be performed of the CNTS hydraulic-operated valves listed in Table 2.1-2 under preoperational temperature, differential pressure, and flow conditions.	Each CNTS hydraulic-operated valve listed in Table 2.1-2 fails to (or maintains) its safety-related position on loss of motive power under preoperational temperature, differential pressure, and flow conditions.
19.	The ECCS RRVs and RVVs listed in Table 2.1-2 fail to (or maintain) their safety-related position on loss of electrical power to their corresponding trip valves under design-basis temperature, differential pressure, and flow conditions.	A test will be performed of the ECCS RRVs and RVVs listed in Table 2.1-2 under preoperational temperature, differential pressure, and flow conditions.	Each ECCS RRV and RVV listed in Table 2.1-2 fails to (or maintains) its safety-related position on loss of electrical power to its corresponding trip valve under preoperational temperature, differential pressure, and flow conditions.
20.	The DHRS hydraulic-operated valves listed in Table 2.1-2 fail to (or maintain) their safety-related position on loss of electrical power under design-basis temperature, differential pressure, and flow conditions.	A test will be performed of the DHRS hydraulic-operated valves listed in Table 2.1-2 under preoperational temperature, differential pressure, and flow conditions.	Each DHRS hydraulic-operated valve listed in Table 2.1-2 fails to (or maintains) its safety-related position on loss of motive power under preoperational temperature, differential pressure, and flow conditions.
21.	The CNTS check valves listed in Table 2.1-2 change position under design-basis temperature, differential pressure, and flow conditions.	A test will be performed of the CNTS check valves listed in Table 2.1-2 under preoperational temperature, differential pressure, and flow conditions.	Each CNTS check valve listed in Table 2.1-2 strokes fully open and closed (under forward and reverse flow conditions, respectively) under preoperational temperature, differential pressure, and flow conditions.
22.	Each CNTS containment electrical penetration assembly listed in Table 2.1-3 is rated either (i) to withstand fault and overload currents for the time required to clear the fault from its power source, or (ii) to withstand the maximum fault and overload current for its circuits without a circuit interrupting device.~~Not used.~~	An analysis will be performed of each CNTS as-built containment electrical penetration assembly listed in Table 2.1-3.~~Not used.~~	For each CNTS containment electrical penetration assembly listed in Table 2.1-3, either (i) a circuit interrupting device coordination analysis exists and concludes that the current carrying capability for the CNTS containment electrical penetration assembly is greater than the analyzed fault and overload currents for the time required to clear the fault from its power source, or (ii) an analysis of the CNTS containment electrical penetration maximum fault and overload current exists and concludes the fault and overload current is less than the current carrying capability of the CNTS containment electrical penetration.~~Not used.~~
23.	The CNV serves as an essentially leaktight barrier against the uncontrolled release of radioactivity to the environment.	A preservice design pressure leakage test of the CNV will be performed.	No water leakage is observed at CNV bolted flange connections.

RAI 14.03-3, RAI 14.03-3S1

Table 2.2-3: Chemical and Volume Control System Inspections, Tests, Analyses, and Acceptance Criteria

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1	The chemical and volume control system ASME Code Class 3 piping listed in Table 2.2-1 complies with the ASME Code Section III.	An inspection will be performed of the chemical and volume control system ASME Code Class 3 as-built piping Design Report required by ASME Code Section III for piping listed in Table 2.2-1.	The ASME Code Section III Design Report (NCA-3550) exists and concludes that the chemical and volume control systemlisted in Table 2.2-1 ASME Code Class 3 as-built piping systemlisted in Table 2.2-1 meets the requirements of ASME Code Section III.
2	The chemical and volume control system ASME Code Class 3 components listed in Table 2.2-2 conform to the rules of construction of ASME Code Section III	An inspection will be performed of the chemical and volume control system ASME Code Class 3 as-built component Data Reports required by ASME Code Section III for components listed in Table 2.2-2.	ASME Code Section III Data Reports for the chemical and volume control system ASME Code Class 3 components listed in Table 2.2-2 and interconnecting piping exist and conclude that the requirements of ASME Code Section III are met.
3	The chemical and volume control system ASME Code Class 3 air-operated demineralized water system supply isolation valves listed in Table 2.2-2 change position under design-basis temperature, differential pressure, and flow conditions.	A test will be performed of the chemical and volume control system ASME Code Class 3 air-operated demineralized water system supply isolation valves listed in Table 2.2-2 under preoperational temperature, differential pressure, and flow conditions.	Each chemical and volume control system ASME Code Class 3 air-operated demineralized water system supply isolation valve listed in Table 2.2-2 strokes fully open and fully closed by remote operation under preoperational temperature, differential pressure, and flow conditions.
4	Not used.	Not used.	Not used.
5	The chemical and volume control system ASME Code Class 3 air-operated demineralized water system supply isolation valves listed in Table 2.2-2 perform their function to fail to (or maintain) their position on loss of motive power under design-basis temperature, differential pressure, and flow conditions.	A test will be performed of the chemical and volume control system ASME Code Class 3 air-operated demineralized water system supply isolation valves listed in Table 2.2-2 under preoperational temperature, differential pressure and flow conditions.	Each chemical and volume control system ASME Code Class 3 air-operated demineralized water system supply isolation valve listed in Table 2.2-2 its function to fail to (or maintain) its position performs on loss of motive power under preoperational temperature, differential pressure, and flow conditions.

2.3 Containment Evacuation System

2.3.1 Design Description

System Description

The scope of this section is the containment evacuation system (CES). Water vapor and non-condensable gases are removed from the containment vessel by the CES. The water vapor is collected and condensed into the CES sample vessel where it is monitored using level and temperature instrumentation. The CES pressure instrumentation and sample vessel level instrumentation is used to quantify and trend leak rates in the containment. The CES is a nonsafety-related system. Each NuScale Power Module (NPM) has its own module-specific CES. The Reactor Building houses all CES equipment.

The CES performs the following nonsafety-related system functions that are verified by Inspections, Tests, Analyses, and Acceptance Criteria:

- The CES supports the reactor coolant system (RCS) by providing RCS leak detection monitoring capability.

Design Commitments

RAI 14.03-3S1

- The CES sample vessel level instrumentation supports RCS leakage detection.
- The CES inlet pressure instrumentation supports RCS leakage detection.

2.3.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.3-1 contains the inspections, tests, and analyses for the CES.

RAI 14.03-3, RAI 14.03-3S1

Table 2.3-1: Containment Evacuation System Inspections, Tests, Analyses, and Acceptance Criteria

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.	The CES sample vessel level instrumentation supports RCS leakage detection.	A test will be performed of the CES sample vessel level instrumention.	The CES sample vessel level instrumentation detects a level increase in the CES sample vesseltank, which correlates to a detection of an unidentified RCS leakage rate of one gpm within one hour.
2.	The CES inlet pressure instrumentation supports RCS leakage detection.	A test will be performed of the CES inlet pressure instrumentation.	The CES inlet pressure instrumentation detects a pressure increase in the CES inlet pressure instrumentation, which correlates to a detection of an unidentified RCS leakage rate of one gpm within one hour.

The primary purpose of the SDIS is to provide accurate, complete and timely information pertinent to MPS status and information displays. The SDIS provides display panels of MPS post-accident monitoring variables to support manually controlled protective actions if required.

The SDIS performs the following nonsafety-related system function that is verified by Inspections, Tests, Analyses, and Acceptance Criteria:

- The SDIS supports the main control room (MCR) by providing displays of PAM Type B and Type C variables.

Design Commitments

RAI 14.03-3S1

- The MPS design and software are implemented using a quality process composed of the following system designsoftware lifecycle phases, with each phase having outputs whichthat satisfy the requirements of that phase:
  - system concept phase
  - system requirements phase
  - system design phase
  - system implementation phase
  - system test phase
  - system installation and checkout phase
- Protective measures are provided to restrict modifications to the MPS tunable parameters.

RAI 14.03-3S1

- Communications independence exists between Separation Groups A, B, C, and D of the Class 1E MPS.

RAI 14.03-3S1

- Communications independence exists between Divisions I and II of the Class 1E MPS.

RAI 14.03-3S1

- The MPS automatically initiates a reactor trip signal for reactor trip functions listed in Table 2.5-1.

RAI 14.03-3S1

- The MPS automatically initiates an ESF actuation signal for ESF functions listed in Table 2.5-2.

RAI 14.03-3S1

- The MPS automatically actuates a reactor trip.

RAI 14.03-3S1

- The MPS manually actuates a reactor trip.

RAI 14.03-3S1

- The reactor trip logic fails to a safe state such that loss of electrical power to a MPS separation group results in a trip state for that separation group.

RAI 14.03-3S1

- The ESFs logic fails to a safe state such that loss of electrical power to a MPS separation group results in a safe state listed in Table 2.1-3.

RAI 14.03-3S1

- The MPS interlocks listed in Table 2.5-4 automatically establish an operating bypass for the specified reactor trip or ESF actuations when the interlock condition is met, and the operating bypass is automatically removed when the interlock condition is no longer satisfied.

RAI 14.03-3S1

- The MPS permissives listed in Table 2.5-4 allow the manual bypass of the specified reactor trip or ESF actuations when the permissive condition is met, and the operating bypass is automatically removed when the permissive condition is no longer satisfied.

RAI 14.03-3S1

- The O-1 Override listed in Table 2.5-4 is established when the manual override switch is active and the RT-1 interlock is established. The Override switch must be manually taken out of Override when the O-1 Override is no longer needed.

RAI 14.03-3S1

- The MPS is capable of performing its safety-related functions when any one of its separation groups is out of service.

RAI 14.03-3S1

- The reactor trip breakers (RTBs) are installed and arranged as shown in Figure 2.5-2 in order to successfully accomplish the reactor trip function.

RAI 14.03-3S1

- Two of the four separation groups and one of the two divisions of RTS and ESFAS will utilize a different programmable technology.

RAI 14.03-3

- Physical separation exists (i) between each separation group of the MPS Class 1E instrumentation and control current-carrying circuits, (ii) between each division of the MPS Class 1E instrumentation and control current-carrying circuits, and (iii) between Class 1E instrumentation and control current-carrying circuits and non-Class 1E instrumentation and control current-carrying circuits.

RAI 14.03-3

- Electrical isolation exists (i) between each separation group of the MPS Class 1E instrumentation and control circuits, (ii) between each division of the MPS Class 1E instrumentation and control circuits, and (iii) between Class 1E instrumentation and control circuits and non-Class 1E instrumentation and control circuits to prevent the propagation of credible electrical faults.
- Electrical isolation exists between the highly reliable DC power system-module-specific (EDSS-MS) subsystem non-Class 1E circuits and connected MPS 1E circuits to prevent the propagation of credible electrical faults.

RAI 14.03-3, RAI 14.03-3S1

- ~~Communications independence exists between Separation Groups A, B, C, and D of the Class 1E MPS.~~

RAI 14.03-3, RAI 14.03-3S1

- ~~Communications independence exists between Divisions I and II of the Class 1E MPS.~~
- Communications independence exists between the Class 1E MPS and non-Class 1E digital systems.

RAI 14.03-3, RAI 14.03-3S1

- ~~The MPS automatically initiates a reactor trip signal for reactor trip functions listed in Table 2.5-1.~~

RAI 14.03-3, RAI 14.03-3S1

- ~~The MPS automatically initiates an ESF actuation signal for ESF functions listed in Table 2.5-2.~~

RAI 14.03-3S1

- ~~The MPS automatically actuates a reactor trip.~~

RAI 14.03-3

- The MPS automatically actuates the ESF equipment to perform its safety-related function listed in Table 2.5-2.

RAI 14.03-3S1

- ~~The MPS manually actuates a reactor trip.~~

RAI 14.03-3

- The MPS manually actuates the ESF equipment to perform its safety-related function listed in Table 2.5-2.

RAI 14.03-3S1

- ~~The reactor trip logic fails to a safe state such that loss of electrical power to an MPS separation group or division results in a trip state for that separation group or division.~~

RAI 14.03-3, RAI 14.03-3S1

- ~~The ESFs logic fails to a safe state such that loss of electrical power to an MPS separation group or division results in a safe state listed in Table 2.1-3.~~

RAI 14.03-3S1

- An MPS signal, once initiated (automatically or manually), results in an intended sequence of protective actions that continue until completion, and requires deliberate operator action in order to return the safety systems to normal.

RAI 14.03-3S1

- The MPS response times from sensor output through equipment actuation for the reactor trip functions and ~~engineered safety feature~~ESF functions are less than or equal to the value required to satisfy the design basis safety analysis response time assumptions.

RAI 14.03-3, RAI 14.03-3S1

- ~~The MPS interlocks listed in Table 2.5-4 automatically establish an operating bypass for the specified reactor trip or ESF actuations when the interlock condition is met, and the operating bypass is automatically removed when the interlock condition is no longer satisfied.~~

RAI 14.03-3, RAI 14.03-3S1

- ~~The MPS permissives listed in Table 2.5-4 allow the manual bypass of the specified reactor trip or ESF actuations when the permissive condition is met, and the operating bypass is automatically removed when the permissive condition is no longer satisfied.~~

RAI 14.03-3, RAI 14.03-3S1

- ~~The O-1 Override listed in Table 2.5-4 is established when the manual override switch is active and the RT-1 interlock is established. The Override switch must be manually taken out of Override when the O-1 Override is no longer needed.~~

RAI 14.03-3, RAI 14.03-3S1

- The MPS is capable of performing its safety-related functions when any one of its separation channels is out of service.

RAI 14.03-3S1

- The MPS operational bypasses are indicated in the MCR.

RAI 14.03-3S1

- The MPS maintenance bypasses are indicated in the MCR.
- The MPS self-test features detect faults in the system and provide an alarm in the MCR.
- The PAM Type B and Type C displays are indicated on the SDIS displays in the MCR.
- The controls located on the operator workstations in the MCR operate to perform important human actions (IHAs).

RAI 14.03-3, RAI 14.03-3S1

- The reactor trip breakers (RTBs) are installed and arranged as shown in Figure 2.5-2 in order to successfully accomplish the reactor trip function.

RAI 14.03-3S1

- Two of the four separation groups and one of the two divisions of RTS and ESFAS will utilize a different programmable technology.

2.5.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.5-7 contains the inspections, tests, and analyses for the MPS and SDIS.

RAI 14.03-3, RAI 14.03-3S1

Table 2.5-7: Module Protection System and Safety Display and Indication System Inspections, Tests, Analyses, and Acceptance Criteria

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.	i. The MPS design and software are implemented using a quality process composed of the following system design lifecycle phases, with each phase having outputs which satisfy the requirements of that phase. i.a. System Concept Phase i.b. System Requirements Phase i.c. System Design Phase i.d. System Implementation Phase i.e. System Test Phase i.f. System Installation and Checkout Phase	i.a. An analysis will be performed of the output documentation of the System Concept Phase. i.b. An analysis will be performed of the output documentation of the System Requirements Phase. i.c. An analysis will be performed of the output documentation of the System Design Phase. i.d. An analysis will be performed of the output documentation of the System Implementation Phase. i.e. An analysis will be performed of the output documentation of the System Test Phase. i.f. An analysis will be performed of the output documentation of the System Installation and Checkout Phase.	i.a. The output documentation of the MPS Concept Phase satisfies the requirements of the System Concept Phase. i.b. The output documentation of the MPS Requirements Phase satisfies the requirements of the System Requirements Phase. i.c. The output documentation of the MPS Design Phase satisfies the requirements of the System Design Phase. i.d. The output documentation of the MPS Implementation Phase satisfies the requirements of the System Implementation Phase. i.e. The output documentation of the MPS Test Phase satisfies the requirements of the System Test Phase. i.f. The output documentation of the MPS Installation and Checkout Phase satisfies the requirements of the System Installation and Checkout Phase.
	ii. Protective measures are provided to restrict modifications to the MPS tunable parameters.	ii. Test will be performed on the access control features associated with MPS tunable parameters.	ii. Protective measures restrict modification to the MPS tunable parameters without proper configuration and authorization.
	iii.a. Communications independence exists between Separation Groups A, B, C, and D of the Class 1E MPS. iii.b. Communications independence exists between Divisions I and II of the Class 1E MPS.	iii. A test will be performed of the Class 1E MPS.	iii.a. Communications independence between Separation Groups A, B, C, and D of the Class 1E MPS is provided. iii.b. Communications independence between Division I and II of the Class 1E MPS is provided.
	iv. The MPS automatically initiates a reactor trip signal for reactor trip functions listed in Table 2.5-1.	iv. A test will be performed of the MPS.	iv. Reactor trip signal is automatically initiated for each reactor trip function listed in Table 2.5-1.
	v. The MPS automatically initiates an ESF actuation signal for ESF functions listed in Table 2.5-2.	v. A test will be performed of the MPS.	v. An ESF actuation signal is automatically initiated for each ESF function listed in Table 2.5-2.
	vi. The MPS automatically actuates a reactor trip.	vi. A test will be performed of the MPS.	vi. The RTBs open upon an injection of a single simulated MPS reactor trip signal.
	vii. The MPS manually actuates a reactor trip.	vii. A test will be performed of the MPS.	vii. The RTBs open when a reactor trip is manually initiated from the main control room.

Table 2.5-7: Module Protection System and Safety Display and Indication System Inspections, Tests, Analyses, and Acceptance Criteria (Continued)

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
	viii. The reactor trip logic fails to a safe state such that loss of electrical power to a MPS separation group results in a trip state for that separation group.	viii. A test will be performed of the MPS.	viii. Loss of electrical power in a separation group results in a trip state for that separation group.
	ix. The ESFs logic fails to a safe state such that loss of electrical power to a MPS separation group results in a safe state listed in Table 2.1-3.	ix. A test will be performed of the MPS.	ix. Loss of electrical power in a separation group results in the safe state listed in Table 2.1-3.
	x. The MPS interlocks listed in Table 2.5-4 automatically establish an operating bypass for the specified reactor trip or ESF actuations when the interlock condition is met, and the operating bypass is automatically removed when the interlock condition is no longer satisfied.	x. A test will be performed of the MPS.	x. The MPS interlocks listed in Table 2.5-4 automatically establish an operating bypass for the specified reactor trip or ESF actuations when the interlock condition is met. The operating bypass is automatically removed when the interlock condition is no longer satisfied.
	xi. The MPS permissives listed in Table 2.5-4 allow the manual bypass of the specified reactor trip or ESF actuations when the permissive condition is met, and the operating bypass is automatically removed when the permissive condition is no longer satisfied.	xi. A test will be performed of the MPS.	xi. The MPS permissives listed in Table 2.5-4 allow the manual bypass of the specified reactor trip or ESF actuations when the permissive condition is met. The operating bypass is automatically removed when the permissive condition is no longer satisfied.
	xii. The O-1 Override listed in Table 2.5-4 is established when the manual override switch is active and the RT-1 interlock is established. The Override switch must be manually taken out of Override when the O-1 Override is no longer needed.	xii. A test will be performed of the MPS.	xii. The O-1 Override listed in Table 2.5-4 is established when the manual override switch is active and the RT-1 interlock is established. The Override switch must be manually taken out of Override when the O-1 Override is no longer needed.
	xiii. The MPS is capable of performing its safety-related functions when any one of its separation groups~~channels~~ is out of service.	xiii. A test will be performed of the MPS.	xiii. The MPS performs its safety-related functions if any one of its separation groups is out of service.
	xiv. The RTBs are installed and arranged as shown in Figure 2.5-2 in order to successfully accomplish the reactor trip function.	xiv. An inspection will be performed of the as-built RTBs, including the connections for the shunt and undervoltage trip mechanism and auxiliary contacts.	xiv. The RTBs have the proper connections for the shunt and undervoltage trip mechanisms and auxiliary contacts, and are arranged as shown in Figure 2.5-2 to successfully accomplish the reactor trip function.

Table 2.5-7: Module Protection System and Safety Display and Indication System Inspections, Tests, Analyses, and Acceptance Criteria (Continued)

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5.	Electrical isolation exists between the EDSS-MS subsystem non-Class 1E circuits and connected MPS Class 1E circuits to prevent the propagation of credible electrical faults.	i. A type test, analysis, or a combination of type test and analysis will be performed of the Class 1E isolation devices. ii. An inspection will be performed of the MPS Class 1E as-built circuits.	i. The Class 1E circuit does not degrade below defined acceptable operating levels when the non-Class 1E side of the isolation device is subjected to the maximum credible voltage, current transients, shorts, grounds, or open circuits. ii. Class 1E electrical isolation devices are installed between the EDSS-MS Subsystem non-Class 1E circuits and connected MPS Class 1E circuits.
6.	Not used.	Not used.	Not used.
7.	Communications independence exists between the Class 1E MPS and non-Class 1E digital systems.	A test will be performed of the Class 1E MPS.	Communications independence between the Class 1E MPS and non-Class 1E digital systems is provided.
8.	Not used.	Not used.	Not used.
9.	Not used.	Not used.	Not used.
10.	Not used.	Not used.	Not used.
11.	The MPS automatically actuates the ~~engineered safety feature~~ESF equipment to perform its safety-related function listed in Table 2.5-2.	A test will be performed of the MPS.	The ESF equipment automatically actuates to perform its safety-related function listed in Table 2.5-2 upon an injection of a single simulated MPS signal.
12.	Not used.	Not used.	Not used.
13.	The MPS manually actuates the ESF equipment to perform its safety-related function listed in Table 2.5-2.	A test will be performed of the MPS.	The MPS actuates the ESF equipment to perform its safety-related function listed in Table 2.5-2 when manually initiated.
14.	Not used.	Not used.	Not used.
15.	Not used.	Not used.	Not used.
16.	An MPS signal once initiated (automatically or manually), results in an intended sequence of protective actions that continue until completion, and requires deliberate operator action in order to return the safety systems to normal.	A test will be performed of the MPS reactor trip and engineered safety features signals.	i. Upon initiation of a real or simulated MPS reactor trip signal listed in Table 2.5-1, the RTBs open, and the RTBs do not automatically close when the MPS reactor trip signal clears. ii. Upon initiation of a real or simulated MPS engineered safety feature actuation signal listed in Table 2.5-2, the ESF equipment actuates to perform its safety-related function and continues to maintain its safety-related position and perform its safety-related function when the MPS engineered safety feature actuation signal clears.
17.	The MPS response times from sensor output through equipment actuation for the reactor trip functions and ESF functions are less than or equal to the value required to satisfy the design basis safety analysis response time assumptions.	A test will be performed of the MPS.	The MPS reactor trip functions listed in Table 2.5-1 and ESFs functions listed in Table 2.5-2 have response times that are less than or equal to the design basis safety analysis response time assumptions.

Table 2.5-7: Module Protection System and Safety Display and Indication System Inspections, Tests, Analyses, and Acceptance Criteria (Continued)

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
18.	Not used.	Not used.	Not used.
19.	Not used.	Not used.	Not used.
20.	Not used.	Not used.	Not used.
21.	Not used.	Not used.	Not used.
22.	MPS operational bypasses are indicated in the MCR.	A test will be performed of the MPS.	Each operational MPS manual or automatic bypass is indicated in the MCR.
23.	MPS maintenance bypasses are indicated in the MCR.	A test will be performed of the MPS.	Each maintenance bypass is indicated in the MCR.
24.	The MPS self-test features detect faults in the system and provide an alarm in the ~~main control room~~MCR.	A test will be performed of the MPS.	A report exists and concludes that: • Self-testing features verify that faults requiring detection are detected. • Self-testing features verify that upon detection, the system responds according to the type of fault. • Self-testing features verify that faults are detected and responded within a sufficient timeframe to ensure safety function is not lost. • The presence and type of fault is indicated by the MPS alarms and displays.
25.	The PAM Type B and Type C displays are indicated on the SDIS displays in the MCR.	An inspection will be performed for the ability to retrieve the as-built PAM Type B and Type C displays on the SDIS displays in the MCR.	The PAM Type B and Type C displays listed in Table 2.5-5 are retrieved and displayed on the SDIS displays in the MCR.
26.	The controls located on the operator workstations in the MCR operate to perform IHAs.	A test will be performed of the controls on the operator workstations in the MCR.	The IHAs controls provided on the operator workstations in the MCR perform the functions listed in Table 2.5-6.
27.	Not used.	Not used.	Not used.
28.	Not used.	Not used.	Not used.

2.8 Equipment Qualification

2.8.1 Design Description

System Description

The scope of this section is equipment qualification (EQ) of equipment specific to each NuScale Power Module. Equipment qualification applies to safety-related electrical and mechanical equipment and safety-related digital instrumentation and controls equipment.

RAI 14.03.03-6, RAI 14.03.03-7

Additionally, this section applies to a limited population of module-specific, nonsafety-related equipment that has augmented Seismic Category I or environmental qualification requirements. The nonsafety-related equipment in this section has one of the following design features:

RAI 14.03.03-6, RAI 14.03.03-7

- Nonsafety-related mechanical and electrical equipment located within the boundaries of the NuScale Power Module that has an augmented Seismic Category I or environmental qualification design requirement.

RAI 14.03.03-6, RAI 14.03.03-7

- Nonsafety-related mechanical and electrical equipment that performs a credited function in Chapter 15 analyses (secondary main steam isolation valves (MSIV), feedwater regulating valves (FWRV) and secondary feedwater check valves).

Design Commitments

RAI 14.03-3, RAI 14.03.03-6, RAI 14.03.03-7

- The module-specific Seismic Category I equipment listed in Table 2.8-1, including its associated supports and anchorages, withstands design basis seismic loads without loss of its function(s) during and after a safe shutdown earthquake (SSE).

RAI 08.01-1S1, RAI 14.03-3, RAI 14.03.03-6, RAI 14.03.03-7

- The module-specific electrical equipment located in a harsh environment listed in Table 2.8-1, including associated connection assemblies, withstand the design basis harsh environmental conditions experienced during normal operations, anticipated operational occurrences (AOOs), design basis accidents (DBAs), and post-accident conditions, and performs its function for the period of time required to complete the function.

RAI 14.03-3S1

- The non-metallic parts, materials, and lubricants used in module-specific mechanical equipment listed in Table 2.8-1 perform their function up to the end of their qualified life in the design basis harsh environmental conditions (both internal service conditions and external environmental conditions) experienced during normal operations, AOOs, DBAs, and post-accident conditions.

RAI 14.03-3

- The Class 1E computer-based instrumentation and control systems listed in Table 2.8-1 located in a mild environment withstand design basis mild environmental conditions without loss of safety-related functions.

RAI 14.03-3S1

- The Class 1E digital equipment listed in Table 2.8-1 performs its safety-related function when subjected to the design basis electromagnetic interference, radio frequency interference, and electrical surges that would exist before, during, and following a DBA.

RAI 14.03-3S1

- The valves listed in Table 2.8-1 are functionally designed and qualified to perform their safety-related function under the full range of fluid flow, differential pressure, electrical, temperature, and fluid conditions up to and including DBA conditions.

RAI 14.03-3

- The safety-related relief valves listed in Table 2.8-1 provide overpressure protection.

RAI 14.03-3S1

- The DHRS condensers listed in Table 2.8-1 have the capacity to transfer their design heat load.

RAI 08.01-1S1, RAI 14.03-3

- The containment system (CNTS) containment electrical penetration assemblies listed in Table 2.8-1, including associated connection assemblies, withstand the design basis harsh environmental conditions experienced during normal operations, AOOs, DBAs, and post-accident conditions, and performs its function for the period of time required to complete the function.

2.8.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8-2 contains the inspections, tests, and analyses for equipment qualification – module-specific equipment.

RAI 06.02.04-2, RAI 08.01-1S1, RAI 14.03-3S1, RAI 14.03.03-2, RAI 14.03.03-6, RAI 14.03.03-7

Table 2.8-1: Module Specific Mechanical and Electrical/I&C Equipment

Description	Location	EQ Environment	Qualification Program	Seismic Category I	Class 1E	EQ Category[1]
Containment System						
CNTS I&C Division I Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNTS I&C Division II Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNTS PZR Heater Power #1 Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNTS PZR Heater Power #2 Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNTS I&C Channel A Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	Yes	A
CNTS I&C Channel B Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	Yes	A
CNTS I&C Channel C Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	Yes	A
CNTS I&C Channel D Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	Yes	A
CNTS CRD Power Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNTS RPI Group #1 Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNTS RPI Group #2 Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
MS #1 CIV (MSIV #1)	RXB - Top of Module	Harsh	Electrical Mechanical	Yes	Yes	A B
MS #2 CIV (MSIV #2)	RXB - Top of Module	Harsh	Electrical Mechanical	Yes	Yes	A B
MS line #1 Bypass Valve (MSIV Bypass #1)	RXB - Top of Module	Harsh	Electrical Mechanical	Yes	Yes	A B
MS line #2 Bypass Valve (MSIV Bypass #2)	RXB - Top of Module	Harsh	Electrical Mechanical	Yes	Yes	A B
FW #1 CIV (FWIV #1)	RXB - Top of Module	Harsh	Electrical Mechanical	Yes	Yes	A B

Table 2.8-1: Module Specific Mechanical and Electrical/I&C Equipment (Continued)

Description	Location	EQ Environment	Qualification Program	Seismic Category I	Class 1E	EQ Category[(1)]
SG2 Steam Supply CIV/ MS Bypass Isolation Valve Close Position Sensors (2 Total)	RXB - Top of Module	Harsh	Electrical	Yes	No	A
SG2 Steam Supply CIV/ MS Bypass Isolation Valve Open Position Sensors (2 Total)	RXB - Top of Module	Harsh	Electrical	Yes	No	A
Steam Generator System						
SG Tubes and Tube Supports	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Steam Plenums (4 Total)	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Feedwater Plenums (4 Total)	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Flow Restrictors	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Thermal Relief Valves (2 Total)	RXB - Inside Containment	Harsh	Mechanical	Yes	N/A	B
Control Rod Drive System						
Rod Position Indication (RPI) Coils (~~24~~32 Total)	RXB - Inside Containment	Harsh	Electrical	Yes	No	B
Control Rod Drive Shafts	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Control Rod Drive Latch Mechanism	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
CRDM Pressure Boundary (Latch Housing, Rod Travel Housing, Rod Travel Housing Plug)	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Control Rod Assembly						
All components	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Neutron Source Assembly						
Primary and secondary neutron source rodlets	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Spider body, hub or coupling housing	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Reactor Coolant System						
Reactor Vessel Internals	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Reactor Safety Valve Position Indicators (4 Total)	RXB - Inside Containment	Harsh	Electrical	Yes	No	B
Reactor Safety Valves (2 Total)	RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	N/A	A
Narrow Range Pressurizer Pressure Elements (4 Total)	RXB - Inside Containment	Harsh	Electrical	Yes	Yes	A
Wide Range RCS Pressure Elements (4 Total)	RXB - Inside Containment	Harsh	Electrical	Yes	Yes	A
PZR/RPV Level Elements (4 Total)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical	Yes	Yes	A
Narrow Range RCS Hot Leg Temperature Elements (12 Total)	RXB - Inside Containment	Harsh	Electrical	Yes	Yes	A

RAI 08.01-1S1, RAI 14.03-3, RAI 14.03-3S1, RAI 14.03.03-6, RAI 14.03.03-7

Table 2.8-2: Equipment Qualification Inspections, Tests, Analyses, and Acceptance Criteria

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.	The module-specific Seismic Category I equipment listed in Table 2.8-1, including its associated supports and anchorages, withstands design basis seismic loads without loss of its function(s) during and after an SSE.	i. A type test, analysis, or a combination of type test and analysis will be performed of the module-specific Seismic Category I equipment listed in Table 2.8-1, including its associated supports and anchorages. ii. An inspection will be performed of the module-specific Seismic Category I as-built equipment listed in Table 2.8-1, including its associated supports and anchorages.	i. A ~~s~~Seismic ~~q~~Qualification Report~~record form~~ exists and concludes that the module-specific Seismic Category I equipment listed in Table 2.8-1, including its associated supports and anchorages, will withstand the design basis seismic loads and perform its function(s) during and after an SSE. ii. The module-specific Seismic Category I equipment listed in Table 2.8-1, including its associated supports and anchorages, is installed in its design location in a Seismic Category I structure in a configuration bounded by the equipment's ~~s~~Seismic ~~q~~Qualification Report~~record form~~.
2.	The module-specific electrical equipment located in a harsh environment listed in Table 2.8-1, including associated connection assemblies, withstand the design basis harsh environmental conditions experienced during normal operations, AOOs, DBAs, and post-accident conditions and performs its function for the period of time required to complete the function.	i. A type test or a combination of type test and analysis will be performed of the module-specific electrical equipment listed in Table 2.8-1, including associated connection assemblies. ii. An inspection will be performed of the module-specific as-built electrical equipment listed in Table 2.8-1, including associated connection assemblies.	i. An EQ record form exists and concludes that the module-specific electrical equipment listed in Table 2.8-1, including associated connection assemblies, perform their function under the environmental conditions specified in the EQ record form for the period of time required to complete the function. ii. The module-specific electrical equipment listed in Table 2.8-1, including associated connection assemblies, are installed in their design location in a configuration bounded by the EQ record form.
3.	The non-metallic parts, materials, and lubricants used in module-specific mechanical equipment listed in Table 2.8-1 perform their function up to the end of their qualified life in the design basis harsh environmental conditions (both internal service conditions and external environmental conditions) experienced during normal operations, AOOs, DBAs, and post-accident conditions.~~Not used.~~	A type test or a combination of type test and analysis will be performed of the non-metallic parts, materials, and lubricants used in module-specific mechanical equipment listed in Table 2.8-1.~~Not used.~~	A qualification record form exists and concludes that the non-metallic parts, materials, and lubricants used in module-specific mechanical equipment listed in Table 2.8-1 perform their function up to the end of their qualified life under the design basis harsh environmental conditions (both internal service conditions and external environmental conditions) specified in the qualification record form.~~Not used.~~

Table 2.8-2: Equipment Qualification Inspections, Tests, Analyses, and Acceptance Criteria (Continued)

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.	The Class 1E computer-based instrumentation and control systems listed in Table 2.8-1 located in a mild environment withstand design basis mild environmental conditions without loss of safety-related functions.	i. A type test or a combination of type test and analysis will be performed of the Class 1E computer-based instrumentation and control systems listed in Table 2.8-1 located in a mild environment. ii. An inspection will be performed of the Class 1E as-built computer-based instrumentation and control systems listed in Table 2.8-1 located in a mild environment.	i. An EQ record form exists and concludes that the Class 1E computer-based instrumentation and control systems listed in Table 2.8-1 located in a mild environment perform their function under the environmental conditions specified in the EQ record form. ii. The Class 1E computer-based instrumentation and control systems listed in Table 2.8-1 located in a mild environment are installed in their design location in a configuration bounded by the EQ record form.
5.	The Class 1E digital equipment listed in Table 2.8-1 performs its safety-related function when subjected to the design basis electromagnetic interference, radio frequency interference, and electrical surges that would exist before, during, and following a DBA.~~Not used.~~	A type test, analysis, or a combination of type test and analysis will be performed of the Class 1E digital equipment listed in Table 2.8-1.~~Not used.~~	An EQ record form exists and concludes that the Class 1E digital equipment listed in Table 2.8-1 withstands the design basis electromagnetic interference, radio frequency interference, and electrical surges that would exist before, during, and following a DBA without loss of safety-related function.~~Not used.~~
6.	The valves listed in Table 2.8-1 are functionally designed and qualified to perform their safety-related function under the full range of fluid flow, differential pressure, electrical, temperature, and fluid conditions up to and including DBA conditions.~~Not used.~~	A type test or a combination of type test and analysis will be performed of the valves listed in Table 2.8-1.~~Not used.~~	A Qualification Report exists and concludes that the valves listed in Table 2.8-1 are capable of performing their safety-related function under the full range of fluid flow, differential pressure, electrical, temperature, and fluid conditions up to and including DBA conditions.~~Not used.~~
7.	The safety-related relief valves listed in Table 2.8-1 provide overpressure protection.	i. A vendor test will be performed of each safety-related relief valve listed in Table 2.8-1. ii. An inspection will be performed of each safety-related as-built relief valve listed in Table 2.8-1.	i. An American Society of Mechanical Engineers Code Section III Data Report exists and concludes that the relief valves listed in Table 2.8-1 meet the valve's required set pressure, capacity, and overpressure design requirements. ii. Each relief valve listed in Table 2.8-1 is provided with an American Society of Mechanical Engineers Code Certification Mark that identifies the set pressure, capacity, and overpressure.

Table 2.8-2: Equipment Qualification Inspections, Tests, Analyses, and Acceptance Criteria (Continued)

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8.	The DHRS condensers listed in Table 2.8-1 have the capacity to transfer their design heat load.~~Not used.~~	A type test or a combination of type test and analysis will be performed of the DHRS condensers listed in Table 2.8-1.~~Not used.~~	A report exists and concludes that the DHRS condensers listed in Table 2.8-1 have a heat removal capacity sufficient to transfer their design heat load.~~Not used.~~
9.	The CNTS containment electrical penetration assemblies listed in Table 2.8-1, including associated connection assemblies, withstand the design basis harsh environmental conditions experienced during normal operations, AOOs, DBAs, and postaccident conditions and performs its function for the period of time required to complete the function.	i. A type test or a combination of type test and analysis will be performed of the CNTS containment electrical penetration assemblies listed in Table 2.8-1 including associated connection assemblies. ii. An inspection will be performed of the containment CNTS electrical penetration assembles listed in Table 2.8-1, including associated connection assemblies.	i. An EQ record form exists and concludes that the CNTS electrical penetration assemblies listed in Table 2.8-1, including associated connection assemblies, performs their function under the environmental conditions specified in the EQ record form for the period of time required to complete the function. ii. The CNTS electrical penetration assemblies listed in Table 2.8-1, including associated connection assemblies, are installed in their design location in a configuration bounded by the EQ record form.

3.1 Control Room Habitability

3.1.1 Design Description

System Description

The scope of this section is the control room habitability system (CRHS). The CRHS provides clean breathing air to the control room envelope and maintains a positive control room pressure during high radiation or loss of offsite power conditions for habitability and control of radioactivity. The CRHS is a nonsafety-related system which supports up to 12 NuScale Power Modules (NPMs). The Control Building houses all CRHS equipment.

The CRHS performs the following nonsafety-related system function that is verified by Inspections, Tests, Analyses, and Acceptance Criteria:

- The CRHS supports the Control Building by providing clean breathing air to the main control room (MCR) and maintains a positive control room pressure during high radiation or loss of normal AC power conditions.

Design Commitments

RAI 14.03-3S1

- The air exfiltration out of the control room envelope (CRE) ~~does not exceed~~is less than or equal to the assumptions used to size the CRHS inventory and the supply flow rate.

RAI 14.03-3

- The CRHS valves listed in Table 3.1-1 change position under design basis temperature, differential pressure, and flow conditions.

RAI 14.03-3

- The CRHS solenoid-operated valves listed in Table 3.1-1 perform their function to fail open on loss of motive power under design basis temperature, differential pressure, and flow conditions.
- The CRE heat sink passively maintains the temperature of the CRE within an acceptable range for the first 72 hours following a design basis accident (DBA).
- The CRHS maintains a positive pressure in the MCR relative to the adjacent areas.

3.1.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 3.1-2 contains the inspections, tests, and analyses for the CRHS.

Table 3.1-1: Control Room Habitability System Mechanical Equipment

Equipment Name	Failure Position
Air supply isolation solenoid valves (2 Total)	Open
CRE pressure relief isolation valves (2 Total)	Open

RAI 14.03-3, RAI 14.03-3S1

Table 3.1-2: Control Room Habitability System Inspections, Tests, Analyses, and Acceptance Criteria

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1	The air exfiltration out of the CRE does not exceedis less than or equal to the assumptions used to size the CRHS inventory and the supply flow rate.	A test will be performed of the CRE.	The air exfiltration measured by tracer gas testing is less than or equal to the CRE air infiltration rate assumed in the dose analysis.
2	The CRHS valves listed in Table 3.1-1 change position under design basis temperature, differential pressure, and flow conditions.	A test will be performed of the CRHS valves listed in Table 3.1-1 under preoperational temperature, differential pressure, and flow conditions.	Each CRHS valve listed in Table 3.1-1 strokes fully open and fully closed by remote operation under preoperational temperature, differential pressure, and flow conditions.
3	The CRHS solenoid-operated valves listed in Table 3.1-1 perform their function to fail open on loss of motive power under design basis temperature, differential pressure, and flow conditions.	A test will be performed of the CRHS solenoid-operated valves listed in Table 3.1-1 under preoperational temperature, differential pressure and flow conditions.	Each CRHS solenoid-operated valve listed in Table 3.1-1 performs its function to fail open on loss of motive power under preoperational temperature, differential pressure, and flow conditions.
4	The CRE heat sink passively maintains the temperature of the CRE within an acceptable range for the first 72 hours following a DBA.	An analysis will be performed of the as-built CRE heat sinks.	A report exists and concludes that the CRE heat sink passively maintains the temperature of the CRE within an acceptable range for the first 72 hours following a DBA.
5	The CRHS maintains a positive pressure in the MCR relative to adjacent areas.	A test will be performed of the CRHS.	The CRHS maintains a positive pressure of greater than or equal to 1/8 inches water gauge in the CRE relative to adjacent areas, while operating in DBA alignment.

RAI 14.03-3, RAI 14.03-3S1

Table 3.9-2: Radiation Monitoring - NuScale Power Modules 1-12 Inspections, Tests, Analyses, and Acceptance Criteria

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1	The CRVS automatically responds to the CRVS high-radiation signals upstream of the CRVS filter unit listed in Table 3.9-1 to mitigate a release of radioactivity.	A test will be performed of the CRVS high-radiation signals listed in Table 3.9-1.	Upon initiation of the real or simulated CRVS high-radiation signals upstream of the CRVS filter unit listed in Table 3.9-1, the CRVS automatically aligns/actuates the identified components to the positions identified in the table.
2	The CRVS and the CRHS automatically respond to the CRVS high-radiation signals downstream of the CRVS filter unit listed in Table 3.9-1 to mitigate a release of radioactivity.	A test will be performed of the CRVS high-radiation signals listed in Table 3.9-1.	Upon initiation of the real or simulated CRVS high-radiation signals downstream of the CRVS filter unit listed in Table 3.9-1, the CRVS and the CRHS automatically align/actuate the identified components to the positions identified in the table.
3	The RBVS automatically responds to the RBVS high-radiation signals listed in Table 3.9-1 to mitigate a release of radioactivity.	A test will be performed of the RBVS high-radiation signals listed in Table 3.9-1.	Upon initiation of the real or simulated RBVS high-radiation signals listed in Table 3.9-1, the RBVS automatically aligns/actuates the identified components to the positions identified in the table.
4	The GRWS automatically responds to the GRWS high-radiation signals listed in Table 3.9-1 to mitigate a release of radioactivity.	A test will be performed of the GRWS high-radiation signals listed in Table 3.9-1.	Upon initiation of the real or simulated GRWS high-radiation signals listed in Table 3.9-1, the GRWS automatically aligns/actuates the identified components to the positions identified in the table.
5	Not Used.	Not Used.	Not Used.
6	Not Used.	Not Used.	Not Used.
7	The LRWS automatically responds to the LRWS high-radiation signals listed in Table 3.9-1 to mitigate a release of radioactivity.	A test will be performed of the LRWS high-radiation signals listed in Table 3.9-1.	Upon initiation of the real or simulated LRWS high-radiation signals listed in Table 3.9-1, the LRWS automatically aligns/actuates the identified components to the positions identified in the table.
8	The ABS automatically responds to the ABS high-radiation signals listed in Table 3.9-1 to mitigate a release of radioactivity.	A test will be performed of the ABS high-radiation signals listed in Table 3.9-1.	Upon initiation of the real or simulated ABS high-radiation signals listed in Table 3.9-1, the ABS automatically aligns/actuates the identified components to the positions identified in the table.
9	Not Used.	Not Used.	Not Used.
10	The PSCS automatically responds to the PSCS high-radiation signal listed in Table 3.9-1 to mitigate a release of radioactivity.	A test will be performed of the PSCS high-radiation signal listed in Table 3.9-1.	Upon initiation of thea real or simulated PSCS high-radiation signal listed in Table 3.9-1, the PSCS automatically aligns/actuates the identified components to the positions identified in the table.

3.14 Equipment Qualification - Shared Equipment

3.14.1 Design Description

System Description

The scope of this section is equipment qualification (EQ) of equipment shared by NuScale Power Modules 1 through 12~~, and a limited set of one-time module specific analyses~~.

RAI 09.01.03-1S1, RAI 14.03-3, RAI 14.03.03-6, RAI 14.03.03-7

This section applies to the safety-related reactor pressure vessel (RPV) support stand and Reactor Building (RXB) over-pressurization vents, and a limited population of common, nonsafety-related equipment that has augmented Seismic Category I or environmental qualification requirements. The nonsafety-related equipment in this section provides one of the following nonsafety-related functions:

RAI 14.03.03-6, RAI 14.03.03-7

- Provides physical support of irradiated fuel (fuel handling machine, spent fuel storage racks, reactor building crane, and module lifting adapter).

RAI 14.03-3

- Provides a path for makeup water to the ultimate heat sink (UHS).
- Provides containment of the UHS water.
- Monitors UHS water level.

RAI 14.03.08-1S1

Additionally, this section applies to the nonsafety-related, RW-IIa components and piping used for processing gaseous radioactive waste.

Design Commitments

RAI 14.03-3, RAI 14.03.03-6, RAI 14.03.03-7

- The common, Seismic Category I equipment listed in Table 3.14-1, including its associated supports and anchorages, withstands design basis seismic loads without loss of its function(s) during and after a safe shutdown earthquake.

RAI 14.03-3, RAI 14.03.03-6, RAI 14.03.03-7

- The common electrical equipment listed in Table 3.14-1 located in a harsh environment, including its connection assemblies, withstands the design basis harsh environmental conditions experienced during normal operations, anticipated operational occurrences, design basis accidents, and post-accident conditions, and performs its function for the period of time required to complete the function.

RAI 14.03-3, RAI 14.03.08-1S1

- The RW-IIa components and piping used for processing gaseous radioactive waste listed in Table 3.14-1 are constructed to the standards of RW-IIa.

RAI 14.03-3, RAI 14.03-3S1

- ~~Each containment system (CNTS) containment electrical penetration assembly listed in Table 2.1-3 is rated either (i) to withstand fault and overload currents for the time required to clear the fault from its power source, or (ii) to with withstand the maximum fault and overload current for its circuits without a circuit interrupting device.~~

RAI 14.03-3, RAI 14.03-3S1

- The non-metallic parts, materials, and lubricants used in module-specific mechanical equipment listed in Table 2.8-1 perform their function up to the end of their qualified life in the design basis harsh environmental conditions (both internal service conditions and external environmental conditions) experienced during normal operations, anticipated operational occurrences (AOOs), design basis accidents (DBAs), and post-accident conditions.

RAI 14.03-3, RAI 14.03-3S1

- The Class 1E digital equipment listed in Table 2.8-1 performs its safety-related function when subjected to the design basis electromagnetic interference, radio frequency interference, and electrical surges that would exist before, during, and following a DBA.

RAI 14.03-3, RAI 14.03-3S1

- The valves listed in Table 2.8-1 are functionally designed and qualified to perform their safety-related function under the full range of fluid flow, differential pressure, electrical, temperature, and fluid conditions up to and including DBA conditions.

RAI 14.03-3, RAI 14.03-3S1

- The decay heat removal system (DHRS) condensers listed in Table 2.8-1 have the capacity to transfer their design heat load.

3.14.2 Inspections, Tests, Analyses, and Acceptance Criteria

RAI 14.03-3S1

Table 3.14-2 contains the inspections, tests, and analyses for EQ -- shared equipment.

RAI 14.03-3, RAI 14.03-3S1, RAI 14.03.03-6, RAI 14.03.03-7, RAI 14.03.08-1S1

Table 3.14-2: Equipment Qualification - Shared Equipment ITAAC

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.	The common Seismic Category I equipment listed in Table 3.14-1, including its associated supports and anchorages, withstands design basis seismic loads without loss of its function(s) during and after a safe shutdown earthquake.	i. A type test, analysis, or a combination of type test and analysis will be performed of the common Seismic Category I equipment listed in Table 3.14-1, including its associated supports and anchorages.	i. A ~~s~~Seismic ~~q~~Qualification Report~~record form~~ exists and concludes that the common Seismic Category I equipment listed in Table 3.14-1, including its associated supports and anchorages, will withstand the design basis seismic loads and perform its function during and after a safe shutdown earthquake.
		ii. An inspection will be performed of the common Seismic Category I as-built equipment listed in Table 3.14-1, including its associated supports and anchorages.	ii. The common Seismic Category I equipment listed in Table 3.14-1, including its associated supports and anchorages, is installed in its design location in a Seismic Category I structure in a configuration bounded by the equipment's ~~s~~Seismic ~~q~~Qualification Report~~record form~~.
2.	The common electrical equipment listed in Table 3.14-1 located in a harsh environment, including its connection assemblies, withstands the design basis harsh environmental conditions experienced during normal operations, anticipated operational occurrences, DBA, and post-accident conditions and performs its function for the period of time required to complete the function.	i. A type test or a combination of type test and analysis will be performed of the common electrical equipment listed in Table 3.14-1, including its connection assemblies.	i. An equipment qualification record form exists and concludes that the common electrical equipment listed in Table 3.14-1, including its connection assemblies, performs its function under the environmental conditions specified in the equipment qualification record form for the period of time required to complete the function.
		ii. An inspection will be performed of the common as-built electrical equipment listed in Table 3.14-1, including its connection assemblies.	ii. The common electrical equipment listed in Table 3.14-1, including its connection assemblies, is installed in its design location in a configuration bounded by the EQ record form.
3.	The RW-IIa components and piping used for processing gaseous radioactive waste listed in Table 3.14-1 are constructed to the standards of RW-IIa.	i. An inspection and reconciliation analysis will be performed of the as-built RW-IIa components and piping used for processing gaseous radioactive waste listed in Table 3.14-1.	i. A report exists and concludes that the as-built RW-IIa components and piping used for processing gaseous radioactive waste listed in Table 3.14-1 meet the RW-IIa design criteria.

Table 3.14-2: Equipment Qualification - Shared Equipment ITAAC (Continued)

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
~~4.~~	~~Each CNTS containment electrical penetration assembly listed in Table 2.1-3 is rated either (i) to withstand fault and overload currents for the time required to clear the fault from its power source, or (ii) to withstand the maximum fault and overload current for its circuits without a circuit interrupting device.~~	~~An analysis will be performed of each CNTS as-built containment electrical penetration assembly listed in Table 2.1-3.~~	~~For each CNTS containment electrical penetration assembly listed in Table 2.1-3, either (i) a circuit interrupting device coordination analysis exists and concludes that the current carrying capability for the CNTS containment electrical penetration assembly is greater than the analyzed fault and overload currents for the time required to clear the fault from its power source, or (ii) an analysis of the CNTS containment electrical penetration maximum fault and overload current exists and concludes the fault and overload current is less than the current carrying capability of the CNTS containment electrical penetration.~~
~~5.~~	~~The non-metallic parts, materials, and lubricants used in module-specific mechanical equipment listed in Table 2.8-1 perform their function up to the end of their qualified life in the design basis harsh environmental conditions (both internal service conditions and external environmental conditions) experienced during normal operations, AOOs, DBAs, and post-accident conditions.~~	~~A type test or a combination of type test and analysis will be performed of the non-metallic parts, materials, and lubricants used in module-specific mechanical equipment listed in Table 2.8-1.~~	~~A qualification record form exists and concludes that the non-metallic parts, materials, and lubricants used in module-specific mechanical equipment listed in Table 2.8-1 perform their function up to the end of their qualified life under the design basis harsh environmental conditions (both internal service conditions and external environmental conditions) specified in the qualification record form.~~
~~6.~~	~~The Class 1E digital equipment listed in Table 2.8-1 performs its safety-related function when subjected to the design basis electromagnetic interference, radio frequency interference, and electrical surges that would exist before, during, and following a DBA.~~	~~A type test, analysis, or a combination of type test and analysis will be performed of the Class 1E digital equipment listed in Table 2.8-1.~~	~~An EQ record form exists and concludes that the Class 1E digital equipment listed in Table 2.8-1 withstands the design basis electromagnetic interference, radio frequency interference, and electrical surges that would exist before, during, and following a DBA without loss of safety-related function.~~
~~7.~~	~~The valves listed in Table 2.8-1 are functionally designed and qualified to perform their safety-related function under the full range of fluid flow, differential pressure, electrical, temperature, and fluid conditions up to and including DBA conditions.~~	~~A type test or a combination of type test and analysis will be performed of the valves listed in Table 2.8-1.~~	~~A Qualification Report exists and concludes that the valves listed in Table 2.8-1 are capable of performing their safety-related function under the full range of fluid flow, differential pressure, electrical, temperature, and fluid conditions up to and including DBA conditions.~~
~~8.~~	~~The DHRS condensers listed in Table 2.8-1 have the capacity to transfer their design heat load.~~	~~A type test or a combination of type test and analysis will be performed of the DHRS condensers listed in Table 2.8-1.~~	~~A report exists and concludes that the DHRS condensers listed in Table 2.8-1 have a heat removal capacity sufficient to transfer their design heat load.~~

RAI 14.03-3S1

Table 3.17-1: Radiation Monitoring - Automatic Actions for NuScale Power Modules 1 - 6

Variable Monitored	Actuated Component(s)	Component Action(s)
CFDS containment drain separator gaseous discharge to Reactor Building heating ventilation and air conditioning system	1. CFDS containment drain separator gaseous discharge isolation valve	1. Close
BPDS 0A condensate polishing system regeneration skid waste effluent	1. North chemical waste water sump pump A 2. North chemical waste water sump pump B 3. North chemical water sump to BPDS collection tank flow control valve 4. North chemical water sump to liquid radioactive waste system (LRWS) isolation valve	1. Stop 2. Stop 3. Close 4. Close
BPDS north turbine building floor drains	1. North waste water sump pump A 2. North waste water sump pump B 3. North waste water sump to BPDS collection tank flow control valve 4. North waste water sump to LRWS isolation valve	1. Stop 2. Stop 3. Close 4. Close
BPDS auxiliary blowdown cooler condensate	1. North waste water sump pump A 2. North waste water sump pump B 3. North waste water sump to BPDS collection tank flow control valve 4. North waste water sump to LRWS isolation valve	1. Stop 2. Stop 3. Close 4. Close

RAI 14.03-3S1

Table 3.18-1: Radiation Monitoring - Automatic Actions For NuScale Power Modules 7 - 12

Variable Monitored	Actuated Component(s)	Component Action(s)
CFDS containment drain separator gaseous discharge to Reactor Building heating ventilation and air conditioning system	1. CFDS containment drain separator gaseous discharge isolation valve	1. Close
BPDS 0B condensate polishing system regeneration skid waste effluent	1. South chemical waste water sump pump A 2. South chemical waste water sump pump B 3. South chemical water sump to BPDS collection tank flow control valve 4. South chemical water sump to liquid radioactive waste system (LWRS) isolation valve	1. Stop 2. Stop 3. Close 4. Close
BPDS south turbine building floor drains	1. South waste water sump pump A 2. South waste water sump pump B 3. South waste water sump to BPDS collection tank flow control valve 4. South waste water sump to liquid radioactive waste system isolation valve	1. Stop 2. Stop 3. Close 4. Close

RAI 03.02.02-7, RAI 06.02.06-22, RAI 06.02.06-23, RAI 08.01-1S1, RAI 08.01-2, RAI 10.02-3, RAI 10.02.03-1, RAI 10.02.03-2, RAI 14.03-3, RAI 14.03-3S1, RAI 14.03.03-3S1, RAI 14.03.03-4S1, RAI 14.03.03-5S3,RAI 14.03.03-6, RAI 14.03.03-6S1, RAI 14.03.03-7, RAI 14.03.03-7S1, RAI 14.03.03-8, RAI 14.03.03-9, RAI 14.03.03-9S1, RAI 14.03.07-1

Table 14.3-1: Module-Specific Structures, Systems, and Components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[1]

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
02.01.01	NPM	As required by ASME Code Section III NCA-1210, each ASME Code Class 1, 2 and 3 component (including piping systems) of a nuclear power plant requires a Design Report in accordance with NCA-3550. NCA-3551.1 requires that the drawings used for construction be in agreement with the Design Report before it is certified and be identified and described in the Design Report. It is the responsibility of the N Certificate Holder to furnish a Design Report for each component and support, except as provided in NCA-3551.2 and NCA-3551.3. NCA-3551.1 also requires that the Design Report be certified by a registered professional engineer when it is for Class 1 components and supports, Class CS core support structures, Class MC vessels and supports, Class 2 vessels designed to NC-3200 (NC-3131.1), or Class 2 or Class 3 components designed to Service Loadings greater than Design Loadings. A Class 2 Design Report shall be prepared for Class 1 piping NPS 1 or smaller that is designed in accordance with the rules of Subsection NC. NCA-3554 requires that any modification of any document used for construction, from the corresponding document used for design analysis, shall be reconciled with the Design Report. An ITAAC inspection is performed of the NuScale Power Module ASME Code Class 1, 2 and 3 as-built piping system Design Report to verify that the requirements of ASME Code Section III are met.	X				

Table 14.3-1: Module-Specific Structures, Systems, and Components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[(1)] (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
02.01.21	NPM	The CNTS safety-related check valves are tested to demonstrate the capability to perform their function to transfer open and transfer closed (under forward and reverse flow conditions, respectively) under preoperational temperature, differential pressure, and flow conditions. Check valves are tested in accordance with the requirements of the ASME OM Code, ISTC-5220, Check Valves. In accordance with Table 14.2-43, a preoperational test demonstrates that the CNTS check valves listed in Tier 1 Table 2.1-2 (Table 14.3-3b) strokes fully open and closed under forward and reverse flow conditions, respectively. Preoperational test conditions are established that approximate design basis temperature, differential pressure and flow conditions to the extent practicable, consistent with preoperational test limitations.	X				
02.01.22	NPM	~~Not used.~~The CNTS electrical penetrations listed in Tier 1 Table 2.1-3 may be one of two types, one with or without a circuit interrupting device. An ITAAC confirms that each type of penetration is evaluated to confirm it can withstand its maximum fault current. A circuit interrupting device coordination analysis confirms and concludes in a report that the as-built containment electrical penetration assembly listed in Tier 1 Table 2.1-3 that has a circuit interrupting device can withstand fault currents for the time required to clear the fault from its power source. 8.3.1.2.5 Containment Electrical Penetration Assemblies discusses electrical penetration assemblies that are not equipped with protection devices whose maximum fault current in these circuits would not damage the electrical penetration assembly if that fault current was available indefinitely. An analysis of a CNTS as-built containment penetration without a circuit interrupting device confirms and concludes in a report that the maximum fault current is less than the current carrying capability of the CNTS containment electrical penetration.	X				

Table 14.3-1: Module-Specific Structures, Systems, and Components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[1] (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
02.08.01	EQ	Section 3.10, Seismic and Dynamic Qualification of Mechanical and Electrical Equipment, presents information to demonstrate that the Seismic Category I equipment, including its associated supports and anchorages, is qualified by type test, analysis, or a combination of type test and analysis to perform its function under the design basis seismic loads during and after an SSE. The qualification method employed for the Seismic Category I equipment is the same as the qualification method described for that type of equipment in Section 3.10. This method conforms to IEEE-344-2004 and ASME QME-1-2007 (or later editions), as accepted by the NRC staff in RG 1.100 Revision 3 (or later revision), with specific revision years and numbers as presented in Section 3.10. The scope of equipment for this design commitment is module-specific, safety-related equipment, and module-specific, nonsafety-related equipment that has one of the following design features: • Nonsafety-related mechanical and electrical equipment located within the boundaries of the NuScale Power Module that has an augmented Seismic Category I design requirement. • Nonsafety-related mechanical and electrical equipment that performs a credited function in Chapter 15 analyses (secondary main steam isolation valves (MSIV), feedwater regulating valves (FWRV) and secondary feedwater check valves.) The ITAAC verifies that: (1) a ~~s~~Seismic ~~q~~Qualification Report~~record form~~ exists for each Seismic Category I component type, and (2) the ~~s~~Seismic ~~q~~Qualification Report~~record form~~ concludes that the Seismic Category I equipment listed in Tier 1 Table 2.8-1 (Table 14.3-3h), including its associated supports and anchorages, performs its function under the seismic design basis load conditions specified in the ~~s~~Seismic ~~q~~Qualification Report~~record form~~. After installation in the plant, an ITAAC inspection is performed to verify that the Seismic Category I equipment listed in Tier 1 Table 2.8-1 (Table 14.3-3h), including its associated supports and anchorages, is installed in its design location in a Seismic Category I structure in a configuration bounded by the ~~s~~Seismic ~~q~~Qualification Report~~record form~~.	X				

Table 14.3-1: Module-Specific Structures, Systems, and Components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[1] (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
02.08.03	EQ	~~Not used.~~Section 3.11 presents information to demonstrate that the non-metallic parts, materials, and lubricants used in mechanical equipment located in a harsh environment are qualified using a type test or a combination of type test and analysis to perform their function up to the end of their qualified life in design basis harsh environmental conditions experienced during normal operations, anticipated operational occurrences, DBAs, and post-accident conditions. Environmental conditions include both internal service conditions and external environmental conditions for the nonmetallic parts, materials, and lubricant. The qualification method employed for the equipment is the same as the qualification method described for that type of equipment in Section 3.11. The scope of equipment for this design commitment is module-specific, safety-related mechanical equipment, and module-specific, nonsafety-related mechanical equipment that performs a credited function in Chapter 15 analyses (secondary main steam isolation valves (MSIV), feedwater regulating valves (FWRV) and secondary feedwater check valves). The ITAAC verifies that: (1) an equipment qualification record form or ASME QME-1 report exists for the non-metallic parts, materials, and lubricants used in mechanical equipment designated for a harsh environment, and (2) the qualification record form concludes that the non-metallic parts, materials, and lubricants used in mechanical equipment listed in Tier 1 Table 2.8-1 perform their intended function up to the end of its qualified life under the design basis environmental conditions (both internal service conditions and external environmental conditions) specified in the qualification record form.	X				

Table 14.3-1: Module-Specific Structures, Systems, and Components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[(1)] (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
02.08.05	EQ	~~Not used.~~Section 3.11, Environmental Qualification of Mechanical and Electrical Equipment, presents information to demonstrate that the Class 1E digital equipment is qualified using a type test, analysis, or a combination of type test and analysis to perform its safety-related function when subjected to electromagnetic interference, radio frequency interference, and electrical surges that would exist before, during, and following a DBA. The qualification method employed for Class 1E digital equipment is the same as the qualification method described for that type of equipment in Section 3.11. The ITAAC verifies that: (1) an equipment qualification record form exists for the Class 1E digital equipment listed in Tier 1 Table 2.8-1, and (2) the equipment qualification record form concludes that the Class 1E digital equipment withstands the design basis electromagnetic interference, radio frequency interference, and electrical surges that would exist before, during, and following a DBA without loss of safety-related function.	X				
02.08.06	EQ	~~Not used.~~Section 3.9.6.1, Functional Design and Qualification of Pumps, Valves, and Dynamic Restraints, and Section 3.10.2, Methods and Procedures for Qualifying Mechanical and Electrical Equipment and Instrumentation, discuss that the functional qualification of safety-related valves is performed in accordance with ASME QME-1-2007 (or later edition), as accepted in RG 1.100 Revision 3 (or later revision), with specific revision years and numbers as presented in Section 3.9.6.1. The qualification method employed for the valves agrees with the qualification method described in Section 3.10.2. The ITAAC verifies that: (1) a Qualification Report exists for the safety-related valves listed in Tier 1 Table 2.8-1, and (2) the Qualification Report concludes that safety-related valves are capable of performing their safety-related function under the full range of fluid flow, differential pressure, electrical conditions, temperature conditions, and fluid conditions up to and including DBA conditions.	X				

Table 14.3-1: Module-Specific Structures, Systems, and Components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[1] (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
02.08.07	EQ	Section 3.9.3.2, Design and Installation of Pressure Relief Devices, discusses that relief valves provide overpressure protection in accordance with the ASME Code Section III. The ITAAC verifies that: (1) the test for each relief valve listed in Tier 1 Table 2.8-1 (Table 14.3-3h) meets the set pressure, capacity, and overpressure design requirements; and (2) each relief valve listed in Tier 1 Table 2.8-1 (Table 14.3-3h) is provided with an ASME Code Certification Mark that identifies the valve's set pressure, capacity, and overpressure.	X				
02.08.08	EQ	~~Not used.~~Section 5.4.3, Decay Heat Removal System, discusses that the DHRS passive condensers provide the safety-related function of transferring their design heat load from the DHRS during shutdown. After manufacture of the DHRS passive condensers, a type test or a combination of type test and analysis is performed to validate that the DHRS passive condensers are capable of meeting the specified heat transfer performance requirements. Section 5.4.3 discusses the design heat transfer capability of the DHRS passive condensers. The ITAAC verifies that the safety-related passive condensers listed in Tier 1 Table 2.8-1 have a heat removal capacity sufficient to transfer their design heat load.	X				

RAI 09.01.04-1, RAI 09.05.01-6, RAI 14.03-3, RAI 14.03-3S1, RAI 14.03.02-1, RAI 14.03.02-2, RAI 14.03.03-1, RAI 14.03.03-6, RAI 14.03.03-7, RAI 14.03.03-8, RAI 14.03.07-1, RAI 14.03.08-1S1, RAI 14.03.09-1, RAI 14.03.09-2, RAI 14.03.09-3, RAI 14.03.12-2, RAI 14.03.12-3, RAI 18-46S1

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference(1)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.01.01	CRH	Testing is performed on the CRE in accordance with RG 1.197, "Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors," Revision 0, to demonstrate that air exfiltration from the CRE is controlled. RG 1.197 allows two options for CRE testing; either integrated testing (tracer gas testing) or component testing. Section 6.4 Control Room Habitability, describes the testing requirements for the CRE habitability program. Section 6.4 provides the maximum air exfiltration allowed from the CRE. In accordance with Table 14.2-18, a preoperational test using the tracer gas test method demonstrates that the air exfiltration from the CRE does not exceed the assumed unfiltered leakage rate provided in Table 6.4-1: Control Room Habitability System Design Parameters for the dose analysis. Tracer gas testing in accordance with ASTM E741 will be performed to measure the unfiltered in-leakage into the CRE with the control room habitability system (CRHS) operating.			X		
03.01.02	CRH	The CRHS valves are tested by remote operation to demonstrate the capability to perform their function to transfer open and transfer closed under preoperational temperature, differential pressure, and flow conditions. In accordance with Table 14.2-18, a preoperational test demonstrates that each CRHS valve listed in Tier 1 Table 3.1-1 (Table 14.3-4a) strokes fully open and fully closed by remote operation under preoperational test conditions. Preoperational test conditions are established that approximate design-basis temperature, differential pressure, and flow conditions to the extent practicable, consistent with preoperational test limitations.			X		

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference(1) (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.14.01	EQ	Section 3.10, Seismic and Dynamic Qualification of Mechanical and Electrical Equipment, presents information to demonstrate that the Seismic Category I equipment, including its associated supports and anchorages, is qualified by type test, analysis, or a combination of type test and analysis to perform its function under the design basis seismic loads during and after an SSE. The qualification method employed for the Seismic Category I equipment is the same as the qualification method described for that type of equipment in Section 3.10. This method conforms to IEEE-344-2004 and ASME QME-1-2007 (or later editions), as accepted by the NRC staff in RG 1.100 Revision 3 (or later revision), with specific revision years and numbers as presented in Section 3.10. The scope of equipment for this design commitment is the common, safety-related equipment, and the common, nonsafety-related equipment that provides one of the following nonsafety-related functions: • Provides physical support of irradiated fuel (fuel handling machine, spent fuel storage racks, reactor building crane, and module lifting adapter) • Provides a path for makeup water to the UHS • Provides containment of UHS water • Monitors UHS water level The ITAAC verifies that: (1) a ~~s~~Seismic ~~q~~Qualification Report~~record form~~ exists for each Seismic Category I component type, and (2) the seismic qualification record form concludes that the Seismic Category I equipment listed in Tier 1 Table 3.14-1 (Table 14.3-4e), including its associated supports and anchorages, performs its function under the seismic design basis load conditions specified in the ~~s~~Seismic ~~q~~Qualification Report~~record form~~. After installation in the plant, an ITAAC inspection is performed to verify that the Seismic Category I equipment listed in Tier 1 Table 3.14-1 (Table 14.3-4e), including its associated supports and anchorages, is installed in its design location in a Seismic Category I structure in a configuration bounded by the ~~s~~Seismic ~~q~~Qualification Report~~record form~~.	X				

RAI 14.03-S1

Table 14.2-47: Emergency Core Cooling System Test # 47

Preoperational test is required to be performed for each NuScale Power Module.		
The emergency core cooling system (ECCS) is described in Section 6.3, and the functions verified by this test are:		
System Function	**System Function Categorization**	**Function Verified by Test #**
1. The ECCS supports the reactor coolant system (RCS) by opening the ECCS reactor vent valves and reactor recirculation valves when their respective trip valve is actuated by the module protection system (MPS).	safety-related	Test #47-1 Module Protection System Test #63-6
2. The ECCS supports the RCS by providing recirculated coolant from the containment to the reactor pressure vessel (RPV) for the removal of core heat.	safety-related	Test #47-1 Module Protection System Test #63-6
The ECCS functions verified by other tests are:		
System Function	**System Function Categorization**	**Function Verified by Test #**
1. The ECCS supports the RCS by providing low temperature overpressure protection (LTOP) for maintaining the reactor coolant pressure boundary.	safety-related	Module Protection System Test #63-6
2. The ECCS supports the containment system (CNTS) by providing a portion of the containment boundary for maintaining containment integrity.	safety-related	Containment System Test #43-1
3. The ECCS supports MPS by providing post accident monitoring instrument information signals.	nonsafety related	Safety Display and Indication System Test #66-2
Prerequisites Verify an instrument calibration has been completed, with approved records and within all calibration due dates, for all instruments required to perform this test.		
Component Level Tests		
None		
System Level Test #47-1 Test 47-1 is performed at hot functional testing concurrently with Turbine Generator System Test #33-1 (reference Table 14.2-33) and MPS Test #63-6 to allow testing of ECCS actuation at normal operating pressure and elevated temperatures. Test #33-1 heats the RCS from ambient conditions to the highest temperature achievable by module heatup system (MHS) heating. These hot functional testing conditions provide the highest differential pressure and temperature conditions that can be achieved prior to fuel load.		
Test Objective	**Test Method**	**Acceptance Criteria**
~~i.~~Verify collapsed liquid level remains above the top of the core during ECCS actuation. ~~ii. Containment vessel (CNV) pressure remains below the design pressure limit during ECCS actuation.~~ ~~iii. Containment temperature remains below the design temperature limit during ECCS actuation.~~	Ensure the RCS is at normal operating pressure and at maximum temperature achievable by warming the RCS using MHS heating. i. Manually initiate ECCS from the main control room (MCR). ii. Allow RPV riser level and CNV level to become relatively stable.	~~i.~~RPV riser level remains above the top of the core. ~~ii. CNV pressure remains below design pressure identified in Table 6.2-1.~~ ~~iii. CNV temperature remains below design temperature identified in Table 6.2-1.~~

RAI 04.06-2, RAI 14.03-S1

Table 14.2-107: Remote Shutdown Workstation Test # 107~~Not Used~~

The remote shutdown station (RSS) is described in Section 7.1.1.2.3. Testing associated with the RSS occurs during the performance of factory acceptance testing (FAT) and site acceptance testing (SAT) as described below.
The RSS provides an alternate location to monitor the NuScale Power Module status and operate the module control system (MCS) and plant control system (PCS) during a main control room (MCR) evacuation. The ability to activate the nonsafety MCS and PCS displays and controls at the RSS will be verified during SAT. The ability to isolate the safety-related MCR module protection system (MPS) manual switches using the MCR isolation switches in the RSS as described in Section 7.2.12 will be verified during MPS FAT and SAT. Refer to Table 14.2-61: Module Control System Test #61 and Table 14.2-62: Plant Control System Test #62 for details regarding MCS and PCS FAT and SAT.

RAI 03.09.02-10, RAI 04.06-2, RAI 14.03-3S1

Table 14.2-109: List of Test Abstracts

Test Number	System Abbreviation	Test Abstract
1	SFPCS	Spent Fuel Pool Cooling System
2	PCUS	Pool Cleanup System
3	RPCS	Reactor Pool Cooling System
4	PSCS	Pool Surge Control System
5	UHS	Ultimate Heat Sink
6	PLDS	Pool Leakage Detection System
7	RCCWS	Reactor Component Cooling Water System
8	CHWS	Chilled Water System
9	ABS	Auxiliary Boiler System
10	CWS	Circulating Water System
11	SCWS	Site Cooling Water System
12	PWS	Potable Water System
13	UWS	Utility Water System
14	DWS	Demineralized Water System
15	NDS	Nitrogen Distribution System
16	SAS	Service Air System
17	IAS	Instrument Air System
18	CRHS	Control Room Habitability System
19	CRVS	Normal Control Room HVAC System
20	RBVS	Reactor Building HVAC System
21	RWBVS	Radioactive Waste Building HVAC System
22	TBVS	Turbine Building HVAC System
23	RWDS	Radioactive Waste Drain System
24	BPDS	Balance-of-Plant Drain System
25	FPS	Fire Protection System
26	FDS	Fire Detection System
27	MSS	Main Steam System
28	FWS	Feedwater System
29	FWTS	Feedwater Treatment System
30	CPS	Condensate Polishing System
31	HVDS	Feedwater Heater Vents and Drains System
32	CARS	Condenser Air Removal System
33	TGS	Turbine Generator System
34	TLOSS	Turbine Lube Oil Storage System
35	LRWS	Liquid Radioactive Waste System
36	GRWS	Gaseous Radioactive Waste System
37	SRWS	Solid Radioactive Waste System
38	CVCS	Chemical and Volume Control System
39	BAS	Boron Addition System
40	MHS	Module Heatup System
41	CES	Containment Evacuation System
42	CFDS	Containment Flooding and Drain System
43	CNTS	Containment System
44	N/A	Not Used
45	N/A	Not Used
46	RCS	Reactor Coolant System
47	ECCS	Emergency Core Cooling System
48	DHRS	Decay Heat Removal System
49	ICIS	In-core Instrumentation System

Table 14.2-109: List of Test Abstracts (Continued)

Test Number	System Abbreviation	Test Abstract
99	N/A	Steam Generator Level Control
100	N/A	Ramp Change in Load Demand
101	N/A	Step Change in Load Demand
102	N/A	Loss of Feedwater Heater
103	N/A	100 Percent Load Rejection
104	N/A	Reactor Trip from 100 Percent Power
105	N/A	Island Mode Test for the First NuScale Power Module
106	N/A	Island Mode Test for Multiple NuScale Power Modules
107	N/A	~~Not Used~~Remote Shutdown Workstation
108	N/A	NuScale Power Module Vibration

RAI 14.03-3, RAI 14.03-3S1

Table 3.12-2: Radioactive Waste Building ITAAC

No.	Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1	The RWB includes radiation shielding barriers for normal operation and post-accident radiation shielding.	An inspection and analysis will be performed of the as-built RWB radiation shielding barriers.	A report exists and concludes the radiation attenuation capability of RWB radiation shielding barriers is greater than or equal to the required attenuation capability of the approved design.
2	The RWB includes radiation attenuating doors for normal operation and for post-accident radiation shielding. These doors have a radiation attenuation capability that meets or exceeds that of the wall within which they are installed.	An inspection will be performed of the as-built RWB radiation attenuating doors.	The RWB radiation attenuating doors are installed in their design location and have a radiation attenuation capability that meets or exceeds that of the wall within which they are installed.
3	The RWB is an RW-IIa structure and maintains its structural integrity under the design basis loads.	A reconciliation analysis will be performed of the as-built RW-IIa RWB under the actual design basis loads.~~An inspection and analysis will be performed of the as-built RW-IIa RWB.~~	A design summary report exists and concludes that (1) the as-built RWB maintains its structural integrity in accordance with the approved design under the actual design basis loads, and (2) the in-structure responses for the as-built RWB are enveloped by those in the approved design.~~the deviations between the drawings used for construction and the as-built RW-IIa RWB have been reconciled and that the as-built RW-IIa RWB maintains its structural integrity under the design basis loads.~~

RAI 09.01.04-1, RAI 09.05.01-6, RAI 14.03-3, RAI 14.03-3S1, RAI 14.03.02-1, RAI 14.03.02-2, RAI 14.03.03-1, RAI 14.03.03-6, RAI 14.03.03-7, RAI 14.03.03-8, RAI 14.03.07-1, RAI 14.03.08-1S1, RAI 14.03.09-1, RAI 14.03.09-2, RAI 14.03.09-3, RAI 14.03.12-2, RAI 14.03.12-3, RAI 18-46S1

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference(1)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.01.01	CRH	Testing is performed on the CRE in accordance with RG 1.197, “Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors,” Revision 0, to demonstrate that air exfiltration from the CRE is controlled. RG 1.197 allows two options for CRE testing; either integrated testing (tracer gas testing) or component testing. Section 6.4 Control Room Habitability, describes the testing requirements for the CRE habitability program. Section 6.4 provides the maximum air exfiltration allowed from the CRE. In accordance with Table 14.2-18, a preoperational test using the tracer gas test method demonstrates that the air exfiltration from the CRE does not exceed the assumed unfiltered leakage rate provided in Table 6.4-1: Control Room Habitability System Design Parameters for the dose analysis. Tracer gas testing in accordance with ASTM E741 will be performed to measure the unfiltered in-leakage into the CRE with the control room habitability system (CRHS) operating.			X		
03.01.02	CRH	The CRHS valves are tested by remote operation to demonstrate the capability to perform their function to transfer open and transfer closed under preoperational temperature, differential pressure, and flow conditions. In accordance with Table 14.2-18, a preoperational test demonstrates that each CRHS valve listed in Tier 1 Table 3.1-1 (Table 14.3-4a) strokes fully open and fully closed by remote operation under preoperational test conditions. Preoperational test conditions are established that approximate design-basis temperature, differential pressure, and flow conditions to the extent practicable, consistent with preoperational test limitations.			X		

Table 14.3-2: Shared/Common Structures, Systems, and Components and Non-Structures, Systems, and components Based Design Features and Inspections, Tests, Analyses, and Acceptance Criteria Cross Reference[1] (Continued)

ITAAC No.	System	Discussion	DBA	Internal/External Hazard	Radiological	PRA & Severe Accident	FP
03.12.03	RWB	The RW-IIa RWB and its design basis loads are discussed in Section 3.8.4.1.3, Radioactive Waste Building. Design basis loads for RW-IIa structures as listed in RG 1.143.~~Guidance for the content and structure of the as-built design report is provided in Standard Review Plan Section 3.8.4, Appendix C.~~ ~~The scope of this ITAAC is a reconciliation of deviations between the issued for construction drawings that implement the seismic and dynamic analyses and the as-built structures. The design report provides criteria for the reconciliation. Design basis loads for RW-IIa structures as listed in RG 1.143 are:~~ • ~~earthquake~~ • ~~wind~~ • ~~tornado~~ • ~~tornado missile~~ • ~~flood~~ • ~~precipitation (rain, snow)~~ • ~~accidental explosion (fixed facility)~~ • ~~accidental explosion (transportation vehicle)~~ • ~~malevolent vehicle assault~~ • ~~small aircraft crash~~ A~~n ITAAC inspection and~~ reconciliation analysis of the as-built RW-IIa RWB is performed ~~of the as-built RW-IIa RWB~~ to ensure that deviations between the drawings used for construction and the as-built RW-IIa RWB are reconciled and the ~~as-built~~ RW-IIa RWB maintains its structural integrity under the design basis loads in accordance with the approved design under the actual design basis loads, and the in-structure responses for the RWB are enveloped by those in the approved design.~~The design summary report provides criteria for the reconciliation between design and as-built conditions, as described in Section 3.8.4.5.1.~~	X		X		

RAI 14.03-3S1

Table 14.3-3h: Module Specific Mechanical and Electrical/I&C Equipment

Equipment Identifier	Description	Location	EQ Environment	Qualification Program	Seismic Category I	Class 1E	EQ Category[(1)]
Containment System							
CNV-8	CNTS I&C Division I Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNV-9	CNTS I&C Division II Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNV-15	CNTS PZR Heater Power #1 Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNV-16	CNTS PZR Heater Power #2 Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNV-17	CNTS I&C Channel A Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	Yes	A
CNV-18	CNTS I&C Channel B Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	Yes	A
CNV-19	CNTS I&C Channel C Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	Yes	A
CNV-20	CNTS I&C Channel D Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	Yes	A
CNV-37	CNTS CRD Power Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNV-38	CNTS RPI Group #1 Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
CNV-39	CNTS RPI Group #2 Electrical Penetration Assembly (EPA)	RXB - Top of Module RXB - Inside Containment	Harsh	Electrical Mechanical	Yes	No	A
MS-HOV-0101	MS #1 CIV (MSIV #1)	RXB - Top of Module	Harsh	Electrical Mechanical	Yes	Yes	A B
MS-HOV-0201	MS #2 CIV (MSIV #2)	RXB - Top of Module	Harsh	Electrical Mechanical	Yes	Yes	A B
MS-HOV-0103	MS line #1 Bypass Valve (MSIV Bypass #1)	RXB - Top of Module	Harsh	Electrical Mechanical	Yes	Yes	A B
MS-HOV-0203	MS line #2 Bypass Valve (MSIV Bypass #2)	RXB - Top of Module	Harsh	Electrical Mechanical	Yes	Yes	A B
FW-HOV-0137	FW #1 CIV (FWIV #1)	RXB - Top of Module	Harsh	Electrical Mechanical	Yes	Yes	A B

Table 14.3-3h: Module Specific Mechanical and Electrical/I&C Equipment (Continued)

Equipment Identifier	Description	Location	EQ Environment	Qualification Program	Seismic Category I	Class 1E	EQ Category[(1)]
RPV7 RPV8 RPV9 RPV10	Steam Plenums (4 Total)	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
RPV3 RPV4 RPV5 RPV6	Feedwater Plenums (4 Total)	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
None	Flow Restrictors	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
SG-PSV-1002 SG-PSV-2002	Thermal Relief Valves (2 Total)	RXB - Inside Containment	Harsh	Mechanical	Yes	N/A	B
Control Rod Drive System							
CRDS-ZS-0001A to 0016A CRDS-ZS-0001B to 0016B	Rod Position Indication (RPI) Coils (324 Total)	RXB - Inside Containment	Harsh	Electrical	Yes	No	B
None	Control Rod Drive Shafts	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
None	Control Rod Drive Latch Mechanism	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
None	CRDM Pressure Boundary (Latch Housing, Rod Travel Housing, Rod Travel Housing Plug)	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Control Rod Assembly							
None	All components	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Neutron Source Assembly							
None	Primary and secondary neutron source rodlets	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
None	Spider body, hub or coupling housing	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A
Reactor Coolant System							
None	Reactor Vessel Internals	RXB - Inside Containment	N/A	N/A	Yes	N/A	N/A