UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 11, 2019

MEMORANDUM TO: Samuel S. Lee, Chief
Licensing Branch 1
Division of Licensing, Siting,
and Environmental Assessment
Office of New Reactors

FROM: Marieliz Vera, Project Manager ***/RA/***
Licensing Branch 1
Division of Licensing, Siting,
and Environmental Assessment
Office of New Reactors

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION STAFF'S REPORT OF REGULATORY AUDIT FOR NUSCALE POWER, LLC; FOLLOW-UP AUDIT OF COMPONENT DESIGN SPECIFICATIONS

On January 6, 2017, NuScale Power, LLC (NuScale) submitted a design certification (DC) application, for a Small Modular Reactor, to the U.S. Nuclear Regulatory Commission (NRC) (Agencywide Documents Access and Management System (ADAMS) Accession Number ML17013A229). The NRC staff started its detailed technical review of NuScale's DC application on March 15, 2017.

The NRC staff conducted an audit of component design specifications associated with the NuScale DC application, Final Safety Analysis Report (FSAR), Sections 3.2, 3.8.2, 3.9.5, 3.9.6, 3.10, and 3.11. The audit was initiated on May 14, 2018, and ran through October 8, 2018, in accordance with the audit plan in ADAMS (ML18114A055).

The purpose of the audit was to: (1) gain a better understanding of the NuScale design; (2) verify information; (3) identify information that may require docketing to support the basis of the licensing or regulatory decision; and (4) review related documentation and non-docketed information to evaluate conformance with regulatory guidance and compliance with NRC regulations.

The audit was performed to gain a better understanding of the component design, qualification and classification in support of the NuScale Standard Plant DC application are being performed in accordance with the methodology and criteria described in the NuScale FSAR.

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The NRC staff conducted the audit via access to NuScale's electronic reading room. The audit was conducted in accordance with the NRC Office of New Reactors (NRO) Office Instruction NRO-REG-108, "Regulatory Audits."

The publicly available version of the audit report is provided as Enclosure 1. The List of Attendees is provided as Enclosure 2 and a List of RAI Questions for the audit is attached.

Docket No. 52-048

Enclosures:
As stated

cc: NuScale DC ListServ

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION STAFF REPORT OF REGULATORY AUDIT FOR NUSCALE POWER, LLC; FOLLOW-UP AUDIT OF COMPONENT DESIGN SPECIFICATIONS
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U.S. NUCLEAR REGULATORY COMMISSION STAFF REPORT OF REGULATORY AUDIT FOR NUSCALE POWER, LLC; FOLLOW-UP AUDIT OF COMPONENT DESIGN SPECIFICATIONS

May 14, 2018 – October 8, 2018

NRC Audit Team:

- Tuan Le, NRO Mechanical Engineer (U.S. Nuclear Regulatory Commission (NRC), Audit Lead
- Cheng-Ih (John) Wu, Mechanical Engineer (NRC)
- Thomas G. Scarbrough, Senior Mechanical Engineer (NRC)
- James Strnisha, Mechanical Engineer (NRC)
- Jason Huang, Mechanical Engineer (NRC)
- Yiu Law, Mechanical Engineer (NRC)
- Michael Breach, Mechanical Engineer (NRC)
- Marieliz Vera Amadiz, Project Manager (NRC)

1.0 BACKGROUND

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, Section 47, "Contents of applications; technical information," states that:

> *The application must contain a level of design information sufficient to enable the Commission to judge the applicant's proposed means of assuring that construction conforms to the design and to reach a final conclusion on all safety questions associated with the design before the certification is granted. The information submitted for a design certification must include performance requirements and design information sufficiently detailed to permit the preparation of acceptance and inspection requirements by the [U. S. Nuclear Regulatory Commission] NRC, and procurement specifications and construction and installation specifications by an applicant. The Commission will require, before design certification, that information normally contained in certain procurement specifications and construction and installation specifications be completed and available for audit if the information is necessary for the Commission to make its safety determination.*

In conducting the review of the NuScale Power, LLC (NuScale) design certification (DC) application, the NRC staff requested that the applicant make available the design specifications, as well as design documentation for equipment seismic qualification, environment qualification and component quality group classification (e.g., piping and instrumentation and equipment classification documents) for the NRC staff to confirm the implementation of the provisions in the NuScale Final Safety Analysis Report (FSAR) for the design and qualification of these components.

This information supported the NRC staff's review of the following Standard Review Plan (SRP) sections:

- Section 3.2.1, "Seismic Classification, Section 3.2.2, "System Quality Group Classification,"

- Section 3.8.2, “Steel Containment,”
- Section 3.9.5, “Reactor Pressure Vessel Internals,”
- Section 3.9.6, “Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints,”
- Section 3.10, “Seismic and Dynamic Qualification of Mechanical and Electrical Equipment,” and
- Section 3.11, “Environmental Qualification of Mechanical and Electrical Equipment.”

At the NRC office in Rockville, Maryland, from June 1, 2017, through August 29, 2017, staff members from the Mechanical Engineering Branch (MEB) of the Division of Engineering and Infrastructure in the Office of New Reactors (NRO) conducted an initial regulatory audit (Phase 1) of the NuScale design documentation in the NuScale electronic reading room (eRR) for American Society of Mechanical Engineers (ASME) *Boiler & Pressure Vessel Code* (BPV Code) components, including valves, component supports, equipment seismic qualifications, and component classifications. On January 25, 2018, the NRC staff issued a report describing its audit of the NuScale design specifications including audit observations and findings as listed in Table 1 of that audit report. See Agencywide Documents Access and Management System (ADAMS) Accession Number ML18018A234.

On April 24, 2018, the NRC staff provided NuScale with a plan to facilitate the Phase 2 follow-up audit of the design specifications to resolve the initial audit findings (ML18114A055). The staff performed the follow-up audit from May 14, 2018, through October 11, 2018, at the NRC office in Rockville, Maryland, by the review of NuScale design documentation available in the eRR. The staff followed the NRO Office Instruction, NRO-REG-108 (Revision 0), “Regulatory Audits,” in performing the follow-up audit of the NuScale design specifications.

2.0 AUDIT RESULTS

During the Phase 1 initial audit, the NRC staff reviewed the design specifications for several types of components to be used in the NuScale nuclear power plant. The staff reviewed the design specifications to determine whether they incorporated the provisions specified in the NuScale FSAR. Table 1 of the initial audit report specified the NRC staff’s findings on the NuScale design specifications.

During this Phase 2 follow-up audit, the NRC staff reviewed the design specifications for the components to be used in the NuScale nuclear power plant to confirm that the findings from the initial audit had been addressed. Based on its review of the updated design specifications, the staff found that most of the findings from the initial audit have been resolved. A total of 112 audit observation items were reviewed in this Phase 2 of the audit, 3 remain open, 30 are confirmatory, and the remainder are closed, as summarized in Table 1 of this report. RAI 9619 Question 03.02.02-7, was generated to address the class break information (Table 1 audit items1, 109 and 110). The staff closed numerous audit items based on: (1) acceptable responses by NuScale that resolved the issue, (2) NuScale having provided an ancillary RAI response that addressed the issue raised in Phase 1 of the audit, (3) the issue was reviewed in another audit, or (4) the NRC staff generated an RAI to formally track the resolution of the item. For the items identified as confirmatory, NuScale will implement changes to design

specifications or FSAR. After these changes are completed, the staff will confirm, as appropriate, that the issue has been properly addressed. The staff also identified certain items that will remain open for a future audit, because the technical information and analyses were not available for review during this audit. The Table 1 audit items 4B, 103 and 104 are open since the stress and fatigue evaluations were not available for review and will need to be reviewed in a future audit. Table 1 (Attachment) indicates the resolution of the audit findings and those items that remain open or confirmatory.

NuScale is to complete the planned changes to the applicable documents for the confirmatory items prior to completion of the NRC staff's review of the NuScale design certification application. The NRC staff will review the revised documents to confirm that the issue has been appropriately addressed once NuScale notifies the NRC, by letter, that the changes to the applicable documents have been implemented. For other documents, NuScale may incorporate appropriate changes in response to this audit in accordance with its Quality Assurance (QA) program. The NRC staff accepted the NuScale QA program by a letter dated September 22, 2016 (ML16196A391).

The NRC staff will arrange a future audit to address the technical information and analyses that were not available for review during this audit.

3.0 DOCUMENTS REVIEWED

1. NuScale Design Specification, EQ-A010-2224, "ASME Design Specification for Secondary Side Containment Isolation Valves," Revision 1, dated December 20, 2017.

2. NuScale Design Specification, EQ-A010-2235, "ASME Design Specification for Primary Systems Containment Isolation Valves," Revision 2, dated December 19, 2017.

3. NuScale Design Specification, EQ-A011-2179, "ASME Design Specification for Reactor Safety Valves," Revision 0, dated May 24, 2016.

4. NuScale Design Specification, EQ-A014-4255, "ASME Design Specification for Thermal Relief Valves," Revision 0, dated August 18, 2016.

5. NuScale Design Specification, EQ-B010-3227, "ASME Design Specification for CVCS Class 3 Valves," Revision 0, dated June 1, 2017.

6. NuScale Design Specification, EQ-B020-2140, "ASME Design Specification for Emergency Core Cooling System Valves," Revision 3, dated February 14, 2018.

7. NuScale Design Specification, EQ-B030-2258, "ASME Design Specification for Decay Heat Removal System Actuation Valves," Revision 1, dated January 29, 2018.

ATTACHMENT

Table 1: NuScale Design Specification Audit Question Status

Item #	Design Spec/Dwg	NRC Reviewer	Summary	NuScale Response	Status Open or Closed	NRC Response
1	Various	Le	Piping and Instrument Drawings (P&IDs) did not have class break information. The U.S. Nuclear Regulatory Commission (NRC) staff (hereafter referred to as the staff), requests the applicant to identify the class breaks in the following P&IDs and provide the staff' with the updated P&IDs for review:	NuScale P&IDs do not specifically identify class breaks in design drawings; however, ASME Class is identified in pipe classification. In each P&ID.	Closed	The staff requests to have uploaded P&IDs that have class break information. The staff finds that the applicant provided the information of class breaks in ER-A013-4785 Rev. 0 – Figure 7.1, and is acceptable. RAI 9619 addresses this item. This item is closed.
1a	Dwg. NP12-01-A013-M-PD-3450, CNT Rev.0.	Le	P&IDs no class break info.	See answer above	Closed	The staff requests to have uploaded P&IDs with class break information. The information of class breaks in ER-A013-4785 Rev. 0 – Figure 7.1, is acceptable. RAI 9619 addresses this item. This item is closed.

1b	Dwg. NP12-01-A014-M-PD-3451, SG Rev.0.	Le	P&IDs no class break info.	See answer above	Closed	The staff requests to have uploaded P&IDs with class break information. The information of class breaks in ER-A013-4785 Rev. 0 – Figure 7.1, is acceptable. RAI 9619 addresses this item. This item is closed.
1c	Dwg. NP12-01-A030-M-PD-1504, RCS Rev.0	Le	P&IDs no class break info.	See answer above	Closed	The staff requests to have uploaded P&IDs with class break information. The information of class breaks in ER-A013-4785 Rev. 0 – Figure 7.1, is acceptable. RAI 9619 addresses this item. This item is closed.
1d	Dwg. NP12-01-B010-M-PD-1021 R0 V7 FINAL	Le	P&IDs no class break info.	See answer above	Closed	The staff requests to have uploaded P&IDs with class break information. The information of class breaks in ER-A013-4785 Rev. 0 – Figure 7.1, is acceptable. RAI 9619 addresses this item. This item is closed.
1e	Dwg. NP12-01-B020-M-PD-1027-S01-Rev2 Signed	Le	P&IDs no class break info.	See answer above	Closed	The staff requests to have uploaded P&IDs with class break information. The

						information of class breaks in ER-A013-4785 Rev. 0 – Figure 7.1, is acceptable. RAI 9619 addresses this item. This item is closed.
1f	Dwg. NP12-01-B030-M-PD-1028-S01	Le	P&IDs no class break info.	See answer above	Closed	The staff requests to have uploaded P&IDs with class break information. The information of class breaks in ER-A013-4785 Rev. 0 – Figure 7.1, is acceptable. RAI 9619 addresses this item. This item is closed.
1g	Dwg. NP12-6A-B200-M-PD-1685-Rev 2	Le	P&IDs no class break info.	See answer above	Closed	The staff requests to have uploaded P&IDs with class break information. The information of class breaks in ER-A013-4785 Rev. 0 – Figure 7.1, is acceptable. RAI 9619 addresses this item. This item is closed.
2	Various	Le	The staff requests the applicant to confirm that RG 1.26, RG 1.29, and Standard ANSI/ANS-58.14 are used in the classification process, if that is the case, reference RG 1.26, RG 1.29, and standard ANSI/ANS-58.14 into P&IDs.	Yes. RG 1.26, RG 1.29 used. Procedure 0303-2109.	Closed	The response is acceptable.

3	ER-A014-4036 SSC Classification Report for SG	Le	Doc. ER-A014-4036, "SSC Classification Report for the Steam Generator," Revision 2, Table 3-2, lists SG tube supports and flow restrictions to be "N/A" quality group. The staff requests that the applicant provide a clarification of why the SG tube supports and flow restrictions are classified with "N/A" quality group.	The classifications of SG supports and flow restrictors are to be addressed by RAI 8901, Question 3.9.5-2, and to be included in the DCA Part 2 Tier 2, Table 3.2-1.	Closed	RAI 8901 Question 3.9.5.-2 is issued to address the classification of SG tube supports and flow restrictors.
4	EQ-A013-1826 Containment Vessel	Huang	DCD Section 3.8.2.4.1, "Containment Vessel Stress Analysis," states: "evaluation of the stress levels and fatigue usage for the CNV pressure boundary is calculated for the specified loading conditions discussed in Section 3.8.2.3 and demonstrates that the values are less than the allowable limits." In searching the ASME Design Specification for Containment Vessel, EQ-A013-1826, the staff was not able to locate any demonstration that the stress levels and fatigue usage are less than the allowable limits. Is the document demonstrating this available?	Design specs provide loading conditions and analysis requirements, but do not provide analysis results. Results for stress analysis of CNV (not including fatigue), performed in accordance with design spec are provided in Primary Stress CNV doc. Additional stress analysis for CNV support skirt and bolting in separate docs.	Closed	Response acceptable
4a	EC-A013-3377 CNV Primary Stress Analysis	Huang	In 6.0 of EC-A013-3377, CNV Primary Stress analysis, controlling stresses are discussed and ratios in excess of 0.95 were specifically mentioned, (Z31,	NuScale response – ASME Code is primarily concerned with ratios in excess of allowable 1.0 limit and chose not to include path 72, but there	Closed	Response acceptable.

			X32, X10, X12 and Path 34 and 36. However, according to the Appendix F table, 6-38 Membrane Stress results for cylinder model, Path 72 has a stress ratio of 0.95 and is not mentioned in Section 6.0. Is there a reason for excluding Path 72?	was no specific reason for this.		
4b	EC-A013-3377 CNV Primary Stress Analysis	Huang	In Section 1.1, "Purpose of EC-A013-3377, CNV Primary Stress analysis," it states that fatigue was evaluated in a separate calculation. Please make that calculation document available. Notify the NRC when the fatigue analyses is completed for the design of the reactor vessel and the containment.	NuScale response – The subject separate calculation for fatigue evaluation of the CNV is 'preliminary' at this time. NuScale recognizes that certified design reports will be required for all of the Seismic Category I components. However, as discussed with the staff, stress analysis (including fatigue) is completed using a graded approach. For the DCA, NuScale has performed selected stress analysis (including fatigue) for the most critical components. But all of the analysis of even the most critical components (RPV and CNV) has not been finalized at this time.	Open	DSRS 3.8.2 I.3.H requires a fatigue evaluation of the CNV under ASME BPV Code Section III, NB fatigue evaluation rules. The fatigue evaluation was not available for review and will need to be reviewed in a future audit.
5	EQ-B020-2140 ECCS Valves	Scarbrough	Is Design Specification EQ-B020-2140 intended to establish the specific requirements for the ECCS valves that must be satisfied by the valve supplier?	Yes, intended to specify design requirements	Closed	Response acceptable.
6	EQ-B020-2140 ECCS Valves	Scarbrough	Is the ECCS Functional Specification referenced FS-B020-517 in Section 1.4.2.14	ECCS Functional Specification in eRR	Closed	ECCS functional information acceptable for this audit. Therefore,

			of Design Specification EQ-B020-2140 available for review?			Item 6 is closed for this audit.
7	EQ-B020-2140 ECCS Valves	Scarbrough	What is the status of the Open Items for mechanical loads and containment vessel transients indicated in Section 1.5 of Design Specification EQ-B020-2140?	ODI-16-0221on Reactor Vessel Nozzle Loading remains open	Closed	Will address issue in ECCS Valve Follow-up Audit, including design specification confirmation.
8	EQ-B020-2140 ECCS Valves	Scarbrough	What is the status of Design Specification EQ-B020-2140 that has not been certified by a Professional Engineer in Section 1.6?	Certification will occur when COL applicant is determined	Closed	Response acceptable.
9	EQ-B020-2140 ECCS Valves	Scarbrough	What is the basis for re-categorizing the ECCS valves which are actuated by solenoid components to a self-actuated (Category C) valve with inconsequential leakage limitations (Category B)? Also, is the ASME Operations and Maintenance Code Assessment Report ECN-B020-5225 that is referenced in ECN-B020-5225 available for review?	ECCS valves have no specific leakage criteria	Closed	Review OM Code Assessment during ECCS Valve Follow-up Audit.
10	EQ-B020-2140 ECCS Valves	Scarbrough	Section 3.4.3 of Design Specification EQ-B020-2140 states that the supplier shall evaluate the potential for and effects of water hammer. What are the requirements for the supplier if water hammer will be evaluated through testing?	Screening or analysis will evaluate for water hammer	Closed	Response acceptable.
11	EQ-B020-2140 ECCS Valves	Scarbrough	Table 3-3 in Design Specification EQ-B020-2140 specifies that leak-before-break (LBB) considerations	FSAR Section 3.6.3 referenced.	Closed	NRO Materials and Chemical Branch (MCB) is evaluating LBB

			are allowed for a potential main steam pipe break (MSPB) and feedwater pipe break (FWPB). What is the justification for leak-before-break considerations for MSPB and FWPB?			proposal. Therefore, closed for this audit.
12	EQ-B020-2140 ECCS Valves	Scarbrough	Section 3.6 of Design Specification EQ-B020-2140 specifies that the RRVs must be qualified for radiation effects while the RVVs are sufficiently remote to not require radiation qualification. What are the requirements for the qualification of the RRVs for radiation effects? What is the justification for not requiring radiation qualification for the RVVs?	Section 3.6.3 of Design Specification addresses radiation effects	Closed	Item 92 in the list below addresses EQ issues. Therefore, this item is closed.
13	EQ-B020-2140 ECCS Valves	Scarbrough	Section 3.6 of Design Specification EQ-B020-2140 specifies that nonmetallic components be evaluated for radiation effects. Does Design Specification EQ-B020-2140 require application of Appendix QR-B in ASME QME-1-2007 for environmental qualification of nonmetallics in the ECCS valves and their subcomponents for radiation and other environmental effects? Table 3-4 (RRV) and Table 3-5 (RVV) in Design Specification EQ-B020-2140 allow a range for the C_v flow coefficient, valve seat area, and pressure drop ratio factor	Design Specification references QME-1	Closed	Item 92 in the list below addresses EQ issues. Therefore, this item is closed.

			X_T, as applicable. What is the basis for allowing a range for these valve parameters in the design specification?			
14	EQ-B020-2140 ECCS Valves	Scarbrough	Table 3-4 (RRV) and Table 3-5 (RVV) in Design Specification EQ-B020-2140 allow a range for the C_v flow coefficient, valve seat area, and pressure drop ratio factor X_T, as applicable. What is the basis for allowing a range for these valve parameters in the design specification?	Range of permissible parameters specified in Design Specification	Closed	Response acceptable.
15	EQ-B020-2140 ECCS Valves	Scarbrough	Section 3.11.4 of Design Specification EQ-B020-2140 states that the RRV will be oriented vertically with the discharge port opening downward. Section 3.11.5 specifies that the RVV will be oriented horizontally with the port pointed radially outward. What design features and qualification requirements are necessary to account for this difference in valve orientation?	Equipment Qualification Specification will address.	Closed	Response acceptable.
16	EQ-B020-2140 ECCS Valves	Scarbrough	Section 3.12.2 of Design Specification EQ-B020-2140 states that the ECCS valves and their actuators shall be designed such that leakage does not result in boric acid buildup or transport that impacts the ability of the valves to perform their safety function. What design features and qualification requirements are required to	Equipment Qualification Specification will address.	Closed	Response acceptable.

			satisfy this provision in the design specification?			
17	EQ-B020-2140 ECCS Valves	Scarbrough	Section 6.2 of Design Specification EQ-B020-2140 specifies the QA requirements for the ECCS valves. Does Design Specification EQ-B020-2140 require the application of Appendix B to 10 CFR Part 50 for the QA requirements for the ECCS valves?	Revision 3 to Design Specification requires Appendix B.	Closed	Response acceptable.
18	EQ-B020-2140 ECCS Valves	Scarbrough	Section 8.0 of Design Specification EQ-B020-2140 states that the ECCS valves and their actuators shall be qualified in accordance with ASME QME-1-2007 as accepted in RG 1.100 (Revision 3). How do the tests and their sequence listed in Section 8.0 satisfy the provisions of ASME QME-1-2007 for qualification of the valve assembly design (including the four ECCS subcomponents), extrapolation of the design following adjustments during the qualification process, demonstration of the capability of production valves consistent with the qualified valve design, and demonstration of the capability of the as-installed valves?	Revision 3 to Design Specification requires QME-1 without individual tests.	Closed	Response acceptable.
19	EQ-B020-2140 ECCS Valves	Scarbrough	Table 8-2 in Design Specification EQ-B020-2140 states that the inservice	Revision 3 of Design Specification classifies	Closed	Review during ECCS Valve Follow-up Audit.

			leakage limits are reserved. When will the leakage limits be available for review? Section 8.0 of Design Specification EQ-B020-2140 states that the ECCS valves and their actuators shall be qualified in accordance with ASME QME-1-2007 as accepted in RG 1.100 (Revision 3). How do the tests and their sequence listed in Section 8.0 satisfy the provisions of ASME QME-1-2007 for qualification of the valve assembly design (including the four ECCS subcomponents), extrapolation of the design following adjustments during the qualification process, demonstration of the capability of production valves consistent with the qualified valve design, and demonstration of the capability of the as-installed valves?	ECCS valves as OM Category B/C.		Therefore, closed for this audit.
20	EQ-B020-2140 ECCS Valves	Scarbrough	Where are the following aspects of the design and qualification requirements for the ECCS valves and their subcomponents addressed in Design Specification EQ-B020-2140?			
20a	EQ-B020-2140 ECCS Valves	Scarbrough	Specific first-of-a-kind (FOAK) valve attributes, such as valve internal and disc design.	Design Specification includes critical parameters.	Closed	Response acceptable.
20b	EQ-B020-2140 ECCS Valves	Scarbrough	Preparation of a failure modes and effects analysis (FMEA).	FMEA addresses separately.	Closed	Response acceptable.

20c	EQ-B020-2140 ECCS Valves	Scarbrough	Performance of a weak link analysis.	NuScale will update design specification to require analysis of the valve internals for the opening and closing forces applied during operation.	Confirmatory	
20d	EQ-B020-2140 ECCS Valves	Scarbrough	Seismic qualification testing with static side load testing along the least rigid axis.	Design Specification references QME-1 for static side load testing.	Closed	Response acceptable.
20e	EQ-B020-2140 ECCS Valves	Scarbrough	Thermal stress analysis in accordance with the ASME BPV Code.	Stand-alone calculation or ASME Design Report will address.	Closed	Response acceptable.
20f	EQ-B020-2140 ECCS Valves	Scarbrough	Capacity certification for the ECCS valves over their full range of fluid flow and applicable conditions.	ECCS valves will not be capacity certified, but flow tested during qualification.	Closed	Response acceptable.
20g	EQ-B020-2140 ECCS Valves	Scarbrough	Evaluation of potential flow-induced vibration and its effects.	Vibration will be addressed during qualification.	Closed	Response acceptable.
20h	EQ-B020-2140 ECCS Valves	Scarbrough	Evaluation of potential pressure locking and thermal binding.	Revision 3 to Design Specification indicates design will avoid pressure locking and thermal binding.	Closed	Response acceptable.
20i	EQ-B020-2140 ECCS Valves	Scarbrough	Sizing and setting of the individual springs in each of the four ECCS valve subcomponents, including pressure and flow load, seating and unseating load, uncertainties, and margin requirements.	Differential pressure requirement used to specify spring size with combined license (COL) holder responsible for evaluating.	Closed	Response acceptable.
20j	EQ-B020-2140 ECCS Valves	Scarbrough	Preparation of an operating experience report related to the specific valve design to be provided by the supplier.	No design requirement for suppliers to address operating experience. NuScale will rely on Part 21 requirements.	Closed	Response acceptable.

20k	EQ-B020-2140 ECCS Valves	Scarbrough	Documentation in accordance with ASME QME-1-2007.	Design Specification requires QME-1 including documentation.	Closed	Response acceptable.
20 Additional	EQ-B020-2140 Revision 3	Scarbrough	Specific comments on Revision 3 provided during ECCS valve audit		Closed	Review during ECCS Valve Follow-up Audit.
21	EQ-A010-2235 PSCIVs		Section 1.1 of Design Specification EQ-A010-2235 states that the purpose of the document is to provide the ASME design specification for the primary systems containment isolation valves (PSCIVs), such as used for the reactor coolant system (RCS) injection and discharge lines, pressurizer spray supply line, and reactor pressure vessel degasification line. Design Specification EQ-A010-2235 is also said to apply to isolation valves in other lines. Is Design Specification EQ-A010-2235 intended to establish the specific requirements for the PSCIVs that must be satisfied by the valve supplier, such as the types and sizes of the tandem PSCIVs for their various applications?	Design Specification does not address size or type.	Closed	Review during CIV Audit. Therefore, closed for this audit.
22	EQ-A010-2235 PSCIVs	Scarbrough	Is the Containment System Functional Specification FS-A013-509 referenced in Section 1.5.1.1 of Design Specification EQ-A010-2235 available for review?	Containment System Functional Specification in eRR.	Closed	Containment information acceptable for this audit. Therefore, Item 22 closed for this audit.
23	EQ-A010-2235 PSCIVs	Scarbrough	What is the status of the Open Items for high energy line break conditions, lowest	ODI 16-0221 remains open.	Closed	Review during CIV Audit. Therefore, closed for this audit.

			service temperature, mechanical design loads, and containment vessel combustible gas control indicated in Section 1.6 of Design Specification EQ-A010-2235?			
24	EQ-A010-2235 PSCIVs	Scarbrough	What is the status of Design Specification EQ-A010-2235 that has not been certified by a Professional Engineer in Section 1.7?	See Item 8	Closed	Response acceptable.
25	EQ-A010-2235 PSCIVs	Scarbrough	Note (3) in Table 3-2 in ECN-A010-4613 for Design Specification EQ-A010-2235 states that leak-before-break (LBB) considerations are allowed for a potential main steam pipe break (MSPB) and feedwater pipe break (FWPB). What is the justification for leak-before-break considerations for an MSPB and FWPB?	LBB used.	Closed	MCB reviewing LBB. Therefore, closed for this audit.
26	EQ-A010-2235 PSCIVs	Scarbrough	Table 3-1 and Section 3.6.2 of Design Specification EQ-A010-2235 discuss the radiation conditions for the PSCIVs, including a zero 1-hour accident dose. What is the justification for the radiation qualification requirements for the PSCIVs?	Revision 2 to Design Specification includes radiation requirements.	Closed	Item 92 in the list below addresses EQ issues. Therefore, this item is closed.
27	EQ-A010-2235 PSCIVs	Scarbrough	Does Design Specification EQ-A010-2235 require application of Appendix QR-B in ASME QME-1-2007 for environmental qualification of nonmetallics in the PSCIVs	Design Specification requires QME-1 and QR-B may be used.	Closed	Item 92 in the list below addresses EQ issues. Therefore, this item is closed.

			for radiation and other environmental effects?			
28	EQ-A010-2235 PSCIVs	Scarbrough	Section 3.11 of Design Specification EQ-A010-2235 states that the PSCIVs will be oriented with the flow axis vertical. What design features and qualification requirements are necessary to account for this valve orientation?	Equipment Qualification Specification will address orientation.	Closed	Response acceptable.
29	EQ-A010-2235 PSCIVs	Scarbrough	Section 8.0 of Design Specification EQ-A010-2235 states that the PSCIVs shall be qualified in accordance with ASME QME-1-2007. How do the tests and their sequence listed in Section 8.0 satisfy the provisions of ASME QME-1-2007 for qualification of the valve assembly design, extrapolation of the valve assembly qualification, demonstration of the capability of production valves consistent with the qualified valve design, and demonstration of the capability of the as-installed valves?	Revision 2 to Design Specification removes conflicting requirements and requires QME-1.	Closed	Response acceptable.
30	EQ-A010-2235 PSCIVs	Scarbrough	Section 11.2 of Design Specification EQ-A010-2235 specifies the QA requirements for the PSCIVs. Does Design Specification EQ-A010-2235 require the application of Appendix B of 10 CFR Part 50 for the QA requirements for the PSCIVs?	NuScale to revised Design Specification to require Appendix B.	Confirmatory	

31	EQ-A010-2235 PSCIVs	Scarbrough	Where are the following aspects of the design and qualification requirements for the PSCIVs addressed in Design Specification EQ-A010-2235?			
31a	EQ-A010-2235 PSCIVs	Scarbrough	Specific first-of-a-kind (FOAK) valve attributes, such as valve internal and disc design.	See Item 20.a	Closed	Response acceptable.
31b	EQ-A010-2235 PSCIVs	Scarbrough	Preparation of a failure modes and effects analysis (FMEA).	See Item 20.b	Closed	Response acceptable.
31c	EQ-A010-2235 PSCIVs	Scarbrough	Performance of a weak link analysis.	NuScale will update design specification to require weak link analysis by supplier.	Confirmatory	
31d	EQ-A010-2235 PSCIVs	Scarbrough	Seismic qualification testing with static side load testing along the least rigid axis.	See Item 20.d	Closed	Response acceptable.
31e	EQ-A010-2235 PSCIVs	Scarbrough	Thermal stress analysis in accordance with the ASME BPV Code.	See Item 20.e	Closed	Response acceptable.
31f	EQ-A010-2235 PSCIVs	Scarbrough	Evaluation of potential flow-induced vibration and its effects.	See Item 20.g	Closed	Response acceptable.
31g	EQ-A010-2235 PSCIVs	Scarbrough	Evaluation of potential pressure locking and thermal binding.	TBD	Closed	Review during CIV Audit. Therefore, closed for this audit.
31h	EQ-A010-2235 PSCIVs	Scarbrough	Sizing and setting of the hydraulic actuators for the PSCIVs, including pressure and flow load (including friction coefficient assumptions), seating and unseating load, packing load, actuator output assumptions, uncertainties, and margin requirements.	Sizing not included in Design Specification.	Closed	Review during CIV Audit. Therefore, closed for this audit.
31i	EQ-A010-2235 PSCIVs	Scarbrough	Preparation of an operating experience report related to	See Item 20.j	Closed	Response acceptable.

			the specific valve design to be provided by the supplier.			
31j	EQ-A010-2235 PSCIVs	Scarbrough	Documentation in accordance with ASME QME-1-2007.	See Item 20.k	Closed	Response acceptable.
32	EQ-A010-2224 SSCIVs	Scarbrough	Section 1.1 of Design Specification EQ-A010-2224 states that the purpose of the document is to provide the ASME design specification for the secondary side containment isolation valves (SSCIVs). Is Design Specification EQ-A010-2224 intended to establish the specific requirements for the SSCIVs that must be satisfied by the valve supplier, such as the types and sizes of the main steam isolation valves (MSIVs) with their bypass valves, and the feedwater isolation valves (FWIVs) with their combined nozzle check valve?	See Item 21	Closed	Review during CIV Audit. Therefore, closed for this audit.
33	EQ-A010-2224 SSCIVs	Scarbrough	Is the Containment System Functional Specification FS-A013-509 referenced in Section 1.5.1.1 of Design Specification EQ-A010-2224 available for review?	See Item 22	Closed	Containment information acceptable for this audit. Therefore, Item 33 closed for this audit.
34	EQ-A010-2224 SSCIVs	Scarbrough	What is the status of the Open Items for normal operating conditions, lowest service temperature, mechanical loads, and containment piping connections to the MSIVs and FWIVs indicated in Section 1.6 of Design Specification EQ-A010-2224?	ODI-16-0221 remains open.	Closed	Review during CIV Audit. Therefore, closed for this audit.

35	EQ-A010-2224 SSCIVs	Scarbrough	What is the status of Design Specification EQ-A010-2224 that has not been certified by a Professional Engineer in Section 1.7?	See Item 8	Closed	Response acceptable.
36	EQ-A010-2224 SSCIVs	Scarbrough	Note (3) in Table 3-A in ECN-A010-4614 for Design Specification EQ-A010-2224 states that leak-before-break (LBB) considerations are allowed for a potential main steam pipe break (MSPB) and feedwater pipe break (FWPB). What is the justification for leak-before-break considerations for an MSPB and FWPB?	LBB used.	Closed	MCB reviewing LBB. Therefore, closed for this audit.
37	EQ-A010-2224 SSCIVs	Scarbrough	Section 2.1 of Design Specification EQ-A010-2224 states that the MSIV will be oriented for vertical flow upward through the valve, and that the FWIV will be oriented for vertical flow downward through the valve. What design features and qualification requirements are necessary to account for this difference in valve orientation?	Orientation addressed in qualification.	Closed	Response acceptable.
38	EQ-A010-2224 SSCIVs	Scarbrough	Table 3-1 of Design Specification EQ-A010-2224 indicates that the external design pressures for the MSIV and FWIV are reserved. When will the external design pressures for these valves be available for review?	Revision 1 to Design Specification revised Table 3-1	Closed	Response acceptable.
39	EQ-A010-2224 SSCIVs	Scarbrough	Section 3.8 of Design Specification EQ-A010-2224	Radiation effects addressed in Section 3.8	Closed	Item 92 in the list below addresses EQ issues.

			states that the SSCIVs are sufficiently remote to not require qualification for radiation effects. What is the justification for not requiring radiation qualification of the SSCIVs?			Therefore, this item is closed.
40	EQ-A010-2224 SSCIVs	Scarbrough	Section 3.8 of Design Specification EQ-A010-2224 states that nonmetallic components will be evaluated for radiation effects. Does Design Specification EQ-A010-2224 require application of Appendix QR-B in ASME QME-1-2007 for environmental qualification of nonmetallics in the SSCIVs for radiation and other environmental effects?	Design Specification requires QME-1 and QR-B may be used.	Closed	Item 92 in the list below addresses EQ issues. Therefore, this item is closed.
41	EQ-A010-2224 SSCIVs	Scarbrough	Section 8.0 of Design Specification EQ-A010-2224 states that the SSCIVs shall be qualified in accordance with ASME QME-1-2007 as accepted in RG 1.100 (Revision 3). How do the tests and their sequence listed in Section 8.0 satisfy the provisions of ASME QME-1-2007 for qualification of the valve assembly design, extrapolation of the valve assembly qualification, demonstration of the capability of production valves consistent with the qualified valve design, and demonstration of the	Revision 1 to Design Spec clarifies QME-1 requirement.	Closed	Response acceptable.

			capability of the as-installed valves?			
42	EQ-A010-2224 SSCIVs	Scarbrough	Section 11.2 of Design Specification EQ-A010-2224 specifies the QA requirements for the SSCIVs. Does Design Specification EQ-A010-2224 require the application of Appendix B of 10 CFR Part 50 for the QA requirements for the SSCIVs?	NuScale to include Appendix B requirement.	Confirmatory	
43	EQ-A010-2224 SSCIVs	Scarbrough	Where are the following aspects of the design and qualification requirements for the SSCIVs addressed in Design Specification EQ-A010-2224?			
43a	EQ-A010-2224 SSCIVs	Scarbrough	Specific first-of-a-kind (FOAK) valve attributes, such as valve internal and disc design.	See Item 20.a	Closed	Response acceptable.
43b	EQ-A010-2224 SSCIVs	Scarbrough	Preparation of a failure modes and effects analysis (FMEA).	See Item 20.b	Closed	Response acceptable.
43c	EQ-A010-2224 SSCIVs	Scarbrough	Performance of a weak link analysis.	NuScale will update design specification to require weak link analysis by supplier.	Confirmatory	
43d	EQ-A010-2224 SSCIVs	Scarbrough	Seismic qualification testing with static side load testing along the least rigid axis.	See Item 20.d	Closed	Response acceptable.
43e	EQ-A010-2224 SSCIVs	Scarbrough	Thermal stress analysis in accordance with the ASME BPV Code.	See Item 20.e	Closed	Response acceptable.
43f	EQ-A010-2224 SSCIVs	Scarbrough	Evaluation of potential flow-induced vibration and its effects.	See Item 20.g	Closed	Response acceptable.
43g	EQ-A010-2224 SSCIVs	Scarbrough	Evaluation of potential pressure locking and thermal binding.	Design to allow actuator to open.	Closed	Review during CIV Audit. Therefore, closed for this audit.

43h	EQ-A010-2224 SSCIVs	Scarbrough	Sizing and setting of the hydraulic actuators for the PSCIVs, including pressure and flow load (including friction coefficient assumptions), seating and unseating load, packing load, actuator output assumptions, uncertainties, and margin requirements.	Vendor documents will size actuators.	Closed	Review during CIV Audit. Therefore, closed for this audit.
43i	EQ-A010-2224 SSCIVs	Scarbrough	Preparation of an operating experience report related to the specific valve design to be provided by the supplier.	See Item 20.j	Closed	Response acceptable.
43j	EQ-A010-2224 SSCIVs	Scarbrough	Documentation in accordance with ASME QME-1-2007.	See Item 20.k	Closed	Response acceptable.
44	EQ-A011-2179 RSVs	Scarbrough	Section 1.1 of Design Specification EQ-A011-2179 states that the purpose of the document is to provide the ASME Design Specification for the reactor coolant system (RCS) reactor safety valves (RSVs). Is Design Specification EQ-A011-2179 intended to establish the specific requirements for the RSVs that must be satisfied by the valve supplier, such as their specific design?	Design Specification does not include size or type.	Closed	Review during RSV Audit. Therefore, closed for this audit.
45	EQ-A011-2179 RSVs	Scarbrough	Is the RCS Functional Specification referenced in Section 1.5.1.1 of Design Specification EQ-A011-2179 available for review?	RCS Functional Specification in eRR	Closed	Response acceptable.
46	EQ-A011-2179 RSVs	Scarbrough	What is the status of the Open Items for inservice examination requirements, service temperature, mechanical design loads,	Several ODIs remain open	Closed	ODIs will be evaluated as part of RSV audit. See CIV-RSV Audit Plan Accession No. ML18229A114.

			containment vessel pneumatic and hydraulic testing, and containment transients for prototype testing indicated in Section 1.6 of Design Specification EQ-A011-2179?			Therefore, Item 46 closed for this audit.
47	EQ-A011-2179 RSVs	Scarbrough	What is the status of Design Specification EQ-A011-2179 that has not been certified by a Professional Engineer in Section 1.7?	See Item 8	Closed	Response acceptable.
48	EQ-A011-2179 RSVs	Scarbrough	Section 2.3 of Design Specification EQ-A011-2179 provides the ASME BPV Code classification of the RSVs. What is the ASME OM Code category for the RSVs?	RSVs are OM Category B/C because no specific leakage criteria.	Closed	Response acceptable.
49	EQ-A011-2179 RSVs	Scarbrough	Table 3-2 in Design Specification EQ-A011-2179 was modified in ECN-A011-4845 to specify that leak-before-break (LBB) considerations are allowed for a potential main steam pipe break (MSPB) and feedwater pipe break (FWPB). What is the justification for leak-before-break considerations for an MSPB and FWPB?	LBB used.	Closed	MCB reviewing LBB. Therefore, closed for this audit.
50	EQ-A011-2179 RSVs	Scarbrough	Section 3.5 of Design Specification EQ-A011-2179 states that the RSVs are sufficiently remote to not require radiation qualification. What is the justification for not requiring radiation qualification for the RSVs?	Radiation requirements in Design Specification.	Closed	Item 92 in the list below addresses EQ issues. Therefore, this item is closed.

51	EQ-A011-2179 RSVs	Scarbrough	Section 3.5 of Design Specification EQ-A011-2179 states that nonmetallic components will be evaluated for radiation effects. Does Design Specification EQ-A011-2179 require application of Appendix QR-B in ASME QME-1-2007 for environmental qualification of nonmetallics in the RSVs for radiation and other environmental effects?	Design Specification requires QME-1 and QR-B may be used.	Closed	Item 92 in the list below addresses EQ issues. Therefore, this item is closed.
52	EQ-A011-2179 RSVs	Scarbrough	Section 3.6 of Design Specification EQ-A011-2179 states that only the reactor pressure vessel (RPV) connection of the RSV needs to be evaluated for thermal effects. What is the justification for this assumption over the full range of safety functions for the RSVs?	NuScale will include thermal binding precluded by design.	Confirmatory	
53	EQ-A011-2179 RSVs	Scarbrough	Section 3.7 of Design Specification EQ-A011-2179 specifies the flow capacity requirement for the RSVs for saturated steam. What are the flow requirements with respect to the full range of steam, steam/water mixture, and liquid conditions for the RSV safety functions?	RSVs must not be damaged by water. NuScale indicated that RSV might need to accommodate water flow for some ATWS transients. Section 3.8 in the design specification requires that RSV not be damaged under normal, accident, shutdown, and maintenance conditions.	Closed	Response acceptable.
54	EQ-A011-2179 RSVs	Scarbrough	Section 3.9 of Design Specification EQ-A011-2179 specifies the valve settings for the RSVs. Are the planned	Settings consistent with NB-7311(b)	Closed	Response acceptable.

			settings consistent with the ASME BPV Code requirements as incorporated by reference in 10 CFR 50.55a? If not, what is the plan to obtain NRC acceptance of the differences from the Code requirements?			
55	EQ-A011-2179 RSVs	Scarbrough	Section 6.2 of Design Specification EQ-A011-2179 specifies the QA requirements for the RSVs. Does Design Specification EQ-A011-2179 require the application of Appendix B to 10 CFR Part 50 for the QA requirements for the RSVs?	NuScale to require 10 CFR Part 50, Appendix B in Design Specification	Confirmatory	
56	EQ-A011-2179 RSVs	Scarbrough	Section 8.0 of Design Specification EQ-A011-2179 states that the RSVs shall be functionally qualified in accordance with ASME QME-1. How do the tests and their sequence listed in Section 8.0 satisfy the provisions of ASME QME-1-2007 for qualification of the valve assembly design, extrapolation of the valve assembly qualification following design adjustments during the qualification process, demonstration of the capability of production valves consistent with the qualified valve design, and demonstration of the capability of the as-installed valves for the RSVs?	Section 8.0 references QME-1	Closed	Review during RSV Audit. See CIV-RSV Audit Plan Accession Number ML18229A114. Therefore, closed for this audit.

57	EQ-A011-2179 RSVs	Scarbrough	Where are the following aspects of the design and qualification requirements for the RSVs addressed in Design Specification EQ-A011-2179?			
57a	EQ-A011-2179 RSVs	Scarbrough	Specific first-of-a-kind (FOAK) valve attributes for the RSVs.	See Item 20.a	Closed	Response acceptable.
57b	EQ-A011-2179 RSVs	Scarbrough	Preparation of a failure modes and effects analysis (FMEA).	See Item 20.b	Closed	Response acceptable.
57c	EQ-A011-2179 RSVs	Scarbrough	Performance of a weak link analysis.	NuScale will update design specification to require analysis of the valve internals for the opening and closing forces applied during operation.	Confirmatory	
57d	EQ-A011-2179 RSVs	Scarbrough	Seismic qualification testing with static side load testing along the least rigid axis.	See Item 20.d	Closed	Response acceptable.
57e	EQ-A011-2179 RSVs	Scarbrough	Thermal stress analysis in accordance with the ASME BPV Code. Capacity certification for the RSVs over their full range of fluid flow and applicable conditions.	See Item 20.e	Closed	Response acceptable.
57ee	EQ-A011-2179 RSVs	Scarbrough	Capacity certification for the RSVs over their full range of fluid flow and applicable conditions.	Design Specification provides capacity requirements. Sections 6.8.3 and 8.8 of the design specification includes capacity certification requirements for the RSVs per ASME BPV Code.	Closed	Response acceptable.
57f	EQ-A011-2179 RSVs	Scarbrough	Evaluation of potential flow-induced vibration and its effects.	See Item 20.g	Closed	Response acceptable.
57g	EQ-A011-2179 RSVs	Scarbrough	Evaluation of potential pressure locking and thermal binding.	Spring to be capable of opening.	Closed	Review during RSV Audit. See CIV-RSV Audit Plan Accession

						Number ML18229A114. Therefore, closed for this audit.
57h	EQ-A011-2179 RSVs	Scarbrough	Sizing and setting of the RSVs.	Design Specification provides setpoint and capacity requirements.	Closed	Review during RSV Audit. See CIV-RSV Audit Plan Accession Number ML18229A114. Therefore, closed for this audit.
57i	EQ-A011-2179 RSVs	Scarbrough	Preparation of an operating experience report related to the specific valve design to be provided by the supplier.	See Item 20.j	Closed	Response acceptable.
57j	EQ-A011-2179 RSVs	Scarbrough	Documentation in accordance with ASME QME-1-2007.	See Item 20.k	Closed	Response acceptable.
58	EQ-B030-2258 DHR Valves	Scarbrough	Section 1.1 of Design Specification EQ-B030-2258 states that the purpose of the document is to provide the ASME design specification for the decay heat removal system (DHRS) actuation valves. Is Design Specification EQ-B030-2258 intended to establish the specific requirements for the DHRS actuation valves that must be satisfied by the valve supplier, such as the actuator types of hydraulic or pneumatic for the DHRS actuation valves?	Section 13.0, Valve Data Sheet, in the design specification includes the valve type (wedge-ball) and size (6 inch) and actuator type (gas-hydraulic).	Closed	Response acceptable.
59	EQ-B030-2258 DHR Valves	Scarbrough	Is the Decay Heat Removal Functional Specification FS-B030-508 referenced in Section 1.5.1.1 of Design Specification EQ-B030-2258 available for review?	DHR Functional Specification in eRR.	Closed	Response acceptable.
60	EQ-B030-2258 DHR Valves	Scarbrough	What is the status of the Open Items for DHRS flow	Several ODIs remain open.	Confirmatory	

			rate during transients, and valve loads and piping specific acceleration values indicated in Section 1.6 of Design Specification EQ-B030-2258?			
61	EQ-B030-2258 DHR Valves	Scarbrough	What is the status of Design Specification EQ-B030-2258 that has not been certified by a Professional Engineer in Section 1.7?	See Item 8	Closed	Response acceptable.
62	EQ-B030-2258 DHR Valves	Scarbrough	Section 3.2 of Design Specification EQ-B030-2258 states that the supplier will provide the means to address leakage. Is Design Specification EQ-B030-2258 intended to specify the specific design features and qualification requirements for the DHRS actuation valves?	Revision 1 to Design Specification includes design pressure requirement.	Closed	Response acceptable.
63	EQ-B030-2258 DHR Valves	Scarbrough	Table 3-1 of Design Specification EQ-B030-2258 states that the external design pressure for the DHRS actuation valves is reserved. When will the external design pressure for these valves be available for review?	Revision 1 to Design Specification includes external design pressure references.	Closed	Response acceptable.
64	EQ-B030-2258 DHR Valves	Scarbrough	Section 3.7.2 of Design Specification EQ-B030-2258 states that the DHRS actuation valves are sufficiently remote to not require qualification for radiation effects. What is the justification for not requiring radiation qualification of these valves?	Design Specification includes radiation requirements.	Closed	Item 92 in the list below addresses EQ issues. Therefore, this item is closed.

65	EQ-B030-2258 DHR Valves	Scarbrough	Does Design Specification require application of Appendix QR-B in ASME QME-1-2007 for environmental qualification of nonmetallics in the DHRS actuation valves for radiation and other environmental effects?	Design Specification requires QME-1 and QR-B may be used.	Closed	Item 92 in the list below addresses EQ issues. Therefore, this item is closed.
66	EQ-B030-2258 DHR Valves	Scarbrough	Section 8.0 of Design Specification EQ-B030-2258 states that the DHRS actuation valves shall be qualified in accordance with ASME QME-1-2007. How do the tests and their sequence listed in Section 8.0 satisfy the provisions of ASME QME-1-2007 for qualification of the valve assembly design, extrapolation of the valve assembly qualification to account for design adjustments, demonstration of the capability of production valves consistent with the qualified valve design, and demonstration of the capability of the as-installed valves?	Section 8.0 revised to clarify QME-1 requirement.	Confirmatory	Section 8.1.1 needs to be corrected to include “analysis, testing, or combination” language.
67	EQ-B030-2258 DHR Valves	Scarbrough	Does Design Specification EQ-B030-2258 require the application of Appendix B of 10 CFR Part 50 for the QA requirements for the DHRS actuation valves?	NuScale to include Appendix B requirement. (Question 17, 30, 42, 55, 67, 77, 88)	Confirmatory	
68	EQ-B030-2258 DHR Valves	Scarbrough	Where are the following aspects of the design and qualification requirements for the DHRS actuation valves	(Question 20, 31, 43, 57, 68, 78, 90) See below		

			addressed in Design Specification EQ-B030-2258?			
68a	EQ-B030-2258 DHR Valves	Scarbrough	Specific first-of-a-kind (FOAK) valve attributes.	See Item 20.a	Closed	Response acceptable.
68b	EQ-B030-2258 DHR Valves	Scarbrough	Preparation of a failure modes and effects analysis (FMEA).	See Item 20.b	Closed	Response acceptable.
68c	EQ-B030-2258 DHR Valves	Scarbrough	Performance of a weak link analysis.	NuScale will update design specification to require weak link analysis by supplier.	Confirmatory	
68d	EQ-B030-2258 DHR Valves	Scarbrough	Seismic qualification testing with static side load testing along the least rigid axis.	See Item 20.d	Closed	Response acceptable.
68e	EQ-B030-2258 DHR Valves	Scarbrough	Thermal stress analysis in accordance with the ASME BPV Code.	See Item 20.e	Closed	Response acceptable.
68f	EQ-B030-2258 DHR Valves	Scarbrough	Evaluation of potential flow-induced vibration and its effects.	See Item 20.g	Closed	Response acceptable.
68g	EQ-B030-2258 DHR Valves	Scarbrough	Evaluation of potential thermal binding.	Qualification to address.	Closed	Response acceptable.
68h	EQ-B030-2258 DHR Valves	Scarbrough	Sizing and setting of the DHRS actuation valves, including pressure and flow load (including friction coefficient assumptions), seating and unseating load, packing load, actuator output assumptions, uncertainties, and margin requirements.	Vendor documentation will include design details.	Closed	Response acceptable.
68i	EQ-B030-2258 DHR Valves	Scarbrough	Preparation of an operating experience report related to the specific valve design to be provided by the supplier.	See Item 20.j	Closed	Response acceptable.
68j	EQ-B030-2258 DHR Valves	Scarbrough	Documentation in accordance with ASME QME-1-2007.	See Item 20.k	Closed	Response acceptable.
69	EQ-B010-3227 CVCS Class 3	Scarbrough	Section 1.1 of Design Specification EQ-B010-3227 states that the purpose of the document is to provide the	Appendix A, Valve Data Sheets, in the design specification includes the specific valve and actuator	Closed	Response acceptable.

			ASME design specification for the ASME BPV Code Class 3 valves in the chemical and volume control system (CVCS). Is Design Specification EQ-B010-3227 intended to establish the specific requirements for the CVCS Class 3 valves that include multiple valve types, such as air-operated isolation valves, check valves, manual drain valves, and solenoid valves?	information for the various CVCS valves.		
70	EQ-B010-3227 CVCS Class 3	Scarbrough	What is the status of the Open Items for the valve locations in the reactor building indicated in Section 1.6 of Design Specification EQ-B010-3227?	ODI remains open.	Confirmatory	
71	EQ-B010-3227 CVCS Class 3	Scarbrough	What is the status of Design Specification EQ-B010-3227 that has not been certified by a Professional Engineer in Section 1.7?	See Item 8	Closed	Response acceptable.
72	EQ-B010-3227 CVCS Class 3	Scarbrough	Sections 2.3.2 and 2.3.3.1 of Design Specification EQ-B010-3227 specifies that Quality Group C and ASME BPV Code Class 3 applies to specific CVCS Class 3 valves. Is this applicable to all CVCS Class 3 valves within the scope of this design specification?	Components specified in Scope section.	Closed	Response acceptable.
73	EQ-B010-3227 CVCS Class 3	Scarbrough	Section 3.6.2.2 of Design Specification EQ-B010-3227 states that the CVCS demineralized water isolation valves are sufficiently remote	NuScale will revise Design Specification to require FSAR Section 3.11 process.	Confirmatory	

			to not require qualification for radiation effects. What is the justification for not requiring radiation qualification of these valves?			
74	EQ-B010-3227 CVCS Class 3	Scarbrough	Does Design Specification EQ-B010-3227 require application of Appendix QR-B in ASME QME-1-2007 for environmental qualification of nonmetallics in the CVCS Class 3 valves for radiation and other environmental effects?	Design Spec requires QME-1 and QR-B may be used.	Closed	Item 92 in the list below addresses EQ issues. Therefore, this item is closed.
75	EQ-B010-3227 CVCS Class 3	Scarbrough	Table 3-2 of Design Specification EQ-B010-3227 specifies the flow characteristics of various CVCS Class 3 valves. What is the basis for the greater-than values for C_v flow coefficients for various valves? What is the intent for the table not specifying the flow coefficient for the degasification line isolation valve?	Greater than Cv intended to indicate minimum Cv.	Closed	Response acceptable.
76	EQ-B010-3227 CVCS Class 3	Scarbrough	Section 7.0 of Design Specification EQ-B010-3227 addresses the testing and qualification requirements for the CVCS Class 3 valves. Does Design Specification EQ-B010-3227 require that the CVCS Class 3 valves be qualified in accordance with ASME QME-1-2007 as accepted in RG 1.100 (Revision 3)? If so, how do the tests and their sequence	Section 8.0 requires QME-1.	Closed	Response acceptable.

			listed in Section 7.0 satisfy the provisions of ASME QME-1-2007 for qualification of the valve assembly design, extrapolation of the valve assembly qualification, demonstration of the capability of production valves consistent with the qualified valve design, and demonstration of the capability of the as-installed valves?			
77	EQ-B010-3227 CVCS Class 3	Scarbrough	Section 10.2 of Design Specification EQ-B010-3227 specifies the QA requirements for the CVCS Class 3 valves. Does Design Specification EQ-B010-3227 require the application of Appendix B of 10 CFR Part 50 for the QA requirements for these valves?	NuScale will revise Design Specification to require Appendix B.	Confirmatory	
78	EQ-B010-3227 CVCS Class 3	Scarbrough	Where are the following aspects of the design and qualification requirements for the CVCS Class 3 valves addressed in Design Specification EQ-B010-3227?	(Question 20, 31, 43, 57, 68, 78, 90) See below		
78a	EQ-B010-3227 CVCS Class 3	Scarbrough	Specific first-of-a-kind (FOAK) valve attributes.	See Item 20.a	Closed	Response acceptable.
78b	EQ-B010-3227 CVCS Class 3	Scarbrough	Preparation of a failure modes and effects analysis (FMEA).	See Item 20.b	Closed	Response acceptable.
78c	EQ-B010-3227 CVCS Class 3	Scarbrough	Performance of a weak link analysis.	NuScale will update design specification to require weak link analysis by supplier.	Confirmatory	
78d	EQ-B010-3227 CVCS Class 3	Scarbrough	Seismic qualification testing with static side load testing along the least rigid axis.	See Item 20.d	Closed	Response acceptable.

78e	EQ-B010-3227 CVCS Class 3	Scarbrough	Thermal stress analysis in accordance with the ASME BPV Code.	See Item 20.e	Closed	Response acceptable.
78f	EQ-B010-3227 CVCS Class 3	Scarbrough	Evaluation of potential flow-induced vibration and its effects.	See Item 20.g	Closed	Response acceptable.
78g	EQ-B010-3227 CVCS Class 3	Scarbrough	Evaluation of potential pressure locking (PL) and thermal binding (TB).	Design will avoid PL/TB.	Closed	Response acceptable.
78h	EQ-B010-3227 CVCS Class 3	Scarbrough	Sizing and setting of the actuators for the CVCS Class 3 valves, including pressure and flow load (including friction coefficient assumptions), seating and unseating load, packing load, actuator output assumptions, uncertainties, and margin requirements.	Supplier responsible for sizing and setting of actuators.	Closed	Response acceptable.
78i	EQ-B010-3227 CVCS Class 3	Scarbrough	Preparation of an operating experience report related to the specific valve design to be provided by the supplier.	See Item 20.j	Closed	Response acceptable.
78j	EQ-B010-3227 CVCS Class 3	Scarbrough	Documentation in accordance with ASME QME-1-2007.	See Item 20.k	Closed	Response acceptable.
79	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Section 1.1 of Design Specification EQ-A014-4255 states that the purpose of the document is to provide the ASME Design Specification of the thermal relief valves (TRVs), including two TRVs in the feedwater piping in the steam generator system (SGS) and one TRV in the control rod drive system (CRDS) cooling piping. Is Design Specification EQ-A014-4255 intended to establish the specific	See Item 21	Confirmatory	NuScale will add valve data sheet.

			requirements for the TRVs that must be satisfied by the valve supplier?			
80	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Is the NuScale Reactor Module (RXM) Thermal Transient Load Definition Specification ER-A010-2529 referenced in Section 1.5.1.1 of Design Specification EQ-A014-4255 available for review?	RXM Thermal Transient Load Definition in eRR.	Closed	RXM information acceptable for this audit. Therefore, Item 80 closed for this audit.
81	EQ-A014-4255 Thermal Relief Valves	Scarbrough	What is the status of Design Specification EQ-A014-4255 that has not been certified by a Professional Engineer in Section 1.6?	See Item 8	Closed	Response acceptable.
82	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Section 2.3 of Design Specification EQ-A014-4255 provides the ASME BPV Code classification of the TRVs. What is the ASME OM Code category for the TRVs?	NuScale will revise Design Specification to require Category AC for SGS Thermal Reliefs.	Confirmatory	
83	EQ-A014-4255 Thermal Relief Valves (TRVs)	Scarbrough	Table 3-1 of Design Specification EQ-A014-4255 states that the relieving capacities of the SGS and CRDS TRVs are reserved. When will the relieving capacities for the full range of steam, steam/water mixture, and liquid conditions for the safety functions of these valves be available for review?	NuScale will verify values based on ODI 17-18.	Confirmatory	
84	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Table 3-3 in Design Specification EQ-A014-4255 was modified in ECN-A014-4850 to specify that leak-before-break (LBB) considerations are allowed for	LBB supported by calculations.	Closed	MCB reviewing LBB. Therefore, closed for this audit.

			a potential main steam pipe break (MSPB) and feedwater pipe break (FWPB). What is the justification for leak-before-break considerations for an MSPB and FWPB?			
85	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Section 4.5 of Design Specification EQ-A014-4255 states that the TRVs are sufficiently remote to not require radiation qualification. What is the justification for not requiring radiation qualification for the TRVs?	NuScale will revise Design Specification to require radiation requirements in accordance with process in FSAR Section 3.11.	Confirmatory	
86	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Does Design Specification EQ-A014-4255 require application of Appendix QR-B in ASME QME-1-2007 for environmental qualification of nonmetallics in the TRVs for radiation and other environmental effects?	Design Specification requires QME-1 and QR-B may be used.	Closed	Item 92 in the list below addresses EQ issues. Therefore, this item is closed.
87	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Section 3.9 of Design Specification EQ-A014-4255 states that the valve settings for the TRVs are provided in Table 3-1 of the specification. Are the planned settings consistent with the ASME BPV Code requirements as incorporated by reference in 10 CFR 50.55a? If not, what is the plan to obtain NRC acceptance of the differences from the Code requirements?	NuScale will update design specification to require ASME BPV Code.	Confirmatory	
88	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Section 6.2 of Design Specification EQ-A014-4255 specifies the QA requirements for the TRVs. Does Design Specification EQ-A014-4255	NuScale will revise Design Specification to include Appendix B requirement.	Confirmatory	

			require the application of Appendix B to 10 CFR Part 50 for the QA requirements for the TRVs?			
89	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Section 8.0 of Design Specification EQ-A014-4255 states that the TRVs shall be functionally qualified in accordance with ASME QME-1. How do the tests and their sequence listed in Section 8.0 satisfy the provisions of ASME QME-1-2007 for qualification of the valve assembly design, extrapolation of the valve assembly qualification, demonstration of the capability of production valves consistent with the qualified valve design, and demonstration of the capability of the as-installed valves?	Section 8.0 requires QME-1	Closed	Response acceptable.
90	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Where are the following aspects of the design and qualification requirements for the TRVs addressed in Design Specification EQ-A014-4255?			
90a	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Any first-of-a-kind (FOAK) valve attributes for the TRVs.	See Item 20.a	Closed	Response acceptable.
90b	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Preparation of a failure modes and effects analysis (FMEA).	See Item 20.b	Closed	Response acceptable.
90c	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Performance of a weak link analysis.	NuScale will update design specification to require weak link analysis by supplier.	Confirmatory	

90d	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Seismic qualification testing with static side load testing along the least rigid axis.	See Item 20.d	Closed	Response acceptable.
90e	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Thermal stress analysis in accordance with the ASME BPV Code.	See Item 20.e	Closed	Response acceptable.
90f	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Capacity certification for the TRVs over their full range of fluid flow and applicable conditions	Design Specification provides capacity requirement.	Closed	Response acceptable.
90g	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Evaluation of potential flow-induced vibration and its effects.	See Item 20.g	Closed	Response acceptable.
90h	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Evaluation of potential pressure locking and thermal binding.	Spring capable of opening with qualification requirements.	Closed	Response acceptable.
90i	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Sizing and setting of the TRVs.	NuScale will revise design specification.	Confirmatory	NuScale will add Valve Data Sheet as acceptable response.
90j	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Preparation of an operating experience report related to the specific valve design to be provided by the supplier.	See Item 20.j	Closed	Response acceptable.
90k	EQ-A014-4255 Thermal Relief Valves	Scarbrough	Documentation in accordance with ASME QME-1-2007.	See Item 20.k	Closed	Response acceptable.
91	EQ-B020-2140 ECCS Valves	Strnisha	Does the design specification identify LOCA-generated debris, latent debris, and chemical products	During Telecom on June, 20, 2018, NuScale stated that LOCA-generated debris, latent debris, and chemical products are identified in NuScale Document ER-B020-4364 revision 0, “GSI-191, Assessment of Debris Accumulation on Pressurized Water Reactor [PWR] Sump Performance – Evaluation of Ex-Vessel and In-Vessel Effects.”	Closed	The staff verified that NuScale Document ER-B020-4364 identifies the LOCA-generated debris, latent debris, and chemical products and that NuScale Design Specification EQ-B020-2140, “ASME Design Specification for Emergency Core Cooling System Valves,” Revision 3, references NuScale Document ER-

						B020-4364. This item is closed.
92	EQ-B020-2140 ECCS Valves	Strnisha	Does the design specification require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times	NuScale proposed to revise FSAR Revision 3 to incorporate ASME QME-1-2007, Appendix QR-B with exceptions as stated in NuScale Letter dated October 17, 2018 (ML18290A557) and to revise the applicable specifications.	Confirmatory	Acceptable
93	EQ-A010-2235 PSCIVs	Strnisha	Does the design specification require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times	Same as item 92	Confirmatory	Same as item 92
94	EQ-A010-2224 SSCIVs	Strnisha	Does the design specification require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times	Same as item 92	Confirmatory	Acceptable
95	EQ-B030-2258 RMX Check Valves	Strnisha	Does the design specification require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times	Same as item 92	Confirmatory	Acceptable
96	EQ-B010-3227 CVCS Class 3 Valves	Strnisha	Does the design specification require the application of Appendix QR-B in ASME QME-1-2007 and are the	Same as item 92	Confirmatory	Acceptable

			qualification environments and post-accident operating times			
97	EQ-B030-2258 DHR Actuation Valves	Strnisha	Does the design specification require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times	Same as item 92	Confirma tory	Acceptable
98	EQ-A014-4255 Thermal Relief Valves	Strnisha	Does the design specification require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times	Same as item 92	Confirma tory	Acceptable
99	EQ-A011-2179 RSVs	Strnisha	Does the design specification require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times	Same as item 92	Confirma tory	Acceptable
100	EQ-A023-1943 Reactor Internals	Law	In Table 3-1, where is the maximum design pressure difference of 10 psid from?	10 psid is a convenient and bounding value established for design conditions. (EC-A010-3204, Revision 1). Pressure differentials as a result of thermal transients, including blowdown conditions are provided in respective loading specification that apply to various service level (A, B, C, D) conditions.	Closed	Response acceptable.
101	EQ-A023-1943 Reactor Internals	Law	When will deflection limit in Table 3-3 be available?	Deflection limits in Table 3-3 are dependent on several factors. Deflection limits for the upper riser section and	Closed	This issue was assessed and closed via the control rod drive system

				control rod drive shaft supports are dependent on the results of control rod drop alignment testing (testing is currently in progress). Final determination of all deflection limits depend both on established manufacturing tolerances as well as critical review of component functions, both of which are being performed as part of design for lifecycle (DFL) efforts which are currently in progress.		audit in September 2018 (ML18235A509).
102	EQ-A023-1943 Reactor Internals	Law	Explain the use of OBE loads in Table 4-1. Is OBE load included in Level A, B and C analyses?	An OBE event is established as 1/3 of SSE. OBE is only included in fatigue analysis conducted to satisfy service level B loading conditions and is not considered as part of satisfying service level A or C loading conditions. This approach is consistent with guidance in Appendix S of 10 CFR Part 50, as well as NUREG-0800, Section 3.7.3	Closed	Response acceptable.
103	EQ-A023-1943 Reactor Internals	Law	When will mechanical loads in Appendix A be available? What about other loads such as thermal and seismic?	This question applies to EQ-A023-1943, Revision 1 (ASME Design Specification for Reactor Vessel Internals). The scope of Appendix A includes mechanical loads due to support/restraint of the RVI within the reactor	Open	The staff considers the mechanical loads for RVI, which is information required to have a completed design specification, to be necessary information for a safety finding, and should not be addressed

				pressure vessel (RPV). The necessary analysis required to develop these loads has not yet been performed, but will be required to be completed to develop a certified ASME design report for the RVI. See ITAAC Items 02.01.01 and 02.01.03 for inspection commitments which provided verification that certified design reports (inclusive of all ASME code analysis) are provided. Thermal (transient) loads are available in ER-A010-2529, Revision 0 (RXM Thermal Transient Load Definition Specification). Seismic loads are available in EC-A010-3559, Revision 4 (Reactor Module Seismic Calculation).		solely using ITAAC. This issue remains open and will need to be reviewed in a future audit
104	EQ-A023-1943 Reactor Internals	Wu	In ASME Design Specifications: EQ-A010-2235, for Primary System CIV (PSCIV), EQ-A023-1775 for Reactor Pressure Vessel, EQ-A023-1943 for Reactor Vessel Internals, it is not clear as to how the stress analyses were performed for loads to be considered for the design in compliance with service Level A, B, C and D limits. Please list and upload the stress analysis reports for staff review for thermal and mechanical transients related	Stress analysis result for the RPV (conducted in accordance with analysis requirements of EQ-A011-1775) are provided in EC-A011-2278, Revision 0. EC-A011-2278 presents the stress analysis for applicable Service level A, B, C and D conditions, including evaluation of thermal and mechanical transient events. Generically, “thermal and mechanical transients” are covered under Service level	Open	The staff requested NuScale to provide preliminary stress analysis for RVI and PSCIVs. No CUF and Fen were calculated for reactor vessel as required by the design specification EQ-A011-1775. No stress and fatigue analysis for RVIs and PSCIV was available for review and will need to

			to DBPB (CVCS injection and discharging line breaks, MSPB and FWPB), and actuations of RVVs, RSVs, RRVs and inadvertent MSIV closure, if they become available.	A and B conditions. Inadvertent main steam isolation valve closure is a Service level B event as defined in FSAR Section 3.9 and Table 3.9-1. Opening of the ECCS RRV and RVV and RSVs are defined as Service Level C events and DBPB are defined as Service level D (Section 3.9 of the FSAR and Table 3.9-1). All of the indicated transient events are addressed in the analysis documented in EC-A011-2278. There are no other stress calculations applicable to the RPV. Final stress analysis results from the RVI and PSCIVs conducted in accordance with EQ-A010-2235, EQ-A023-1943 are not currently available. NuScale does not consider these analyses to be part of the DCA review. Design analysis required for these components has been defined within the applicable ASME design specifications (provided for review) and will be completed in support of providing certified design reports for these ASME components. See ITAAC items 02.01.01 and		be reviewed in a future audit

				02.01.03 for inspection commitments which provide verification that certified design reports (inclusive of all ASME code analysis) are provided.		
105	EQ-A023-1943 Reactor Internals	Wu	Open items are listed in Section 1.6 of EQ-A023-1775. It appears that RXM Nozzle loads are either preliminary or not available. The staff asked NuScale when these open Items will be closed. Section 4.4.1 of ASME Design Specification, EQ-A023-1775 for Reactor Pressure Vessel, states that Dynamic load factors of 15 percent (1.15 times the expected DW load) shall be applied at all lifting and transportation support points. The staff requests the basis for using a 1.15 factor in lieu of 2.0 standard dynamic load factor.	A factor of 2.0 is not a "standard" dynamic loading factor, it is a theoretical maximum value. There are no specific regulatory or industry standards or requirements which require use of a factor of 2.0. A factor of 2.0 represents a "worst case scenario" and may be unnecessarily limiting to apply to all design situations. The factor of 1.15 selected by NuScale applies to controlled lifts. This factor is selected consistent with guidance provided in NUREG-0612. NUREG-0612, Section 1.2 defines a handling system as "All load bearing components used to lift the load, including the crane or hoist, the lifting device, and interfacing load lift points." Based on this definition, the interfacing load points are part of the components (e.g., CNV, RPV, RXM, etc.) and guidance for the handling system applies to	Closed	Response acceptable.

				interfacing points on the component being lifted. NUREG-0612 (paragraph 5.1.1(7)) indicates the crane should be design to meet applicable requirements of criteria… or CMAA-70. CMAA-70 (Section 3.3.2.1.1.4.2) indicates a minimum “hoist load factor” (i.e. dynamic loading factor) of 15 percent. The NuScale requirement of a factor of 1.15 is consistent with CMAA-70. As discussed in DCA Tier 2, Section 9.1.5.1, the NuScale reactor building crane is designed in accordance with NOG-1 and therefore no safety related SSCs (e.g. the RXM) are affected by load drops. In lieu of application of the guidance in NUREG-0612, as supplemented by NOG-1, there does not appear to be any other regulatory guidance related to the selection of dynamic load factors for lifting and handling of safety related SSCs. The full, practical implementation of the factor of 1.15 is not necessarily fully defined by a design specification. In order to		

				verify/enforce this design dynamic loading factor, measures such as accelerometers may be employed during shipping and/or other controls may be applied during controlled lifts. These additional measures and controls for shipping and conduct of controlled lifts have not been developed at this time and may or may not be implemented through the ASME design specification.		
106	EQ-A023-1943 Reactor Internals	Wu	Section 2.2 of EC-A011-3428 and EC-A013-3036-01, stated that the maximum allowable gap between flanges at the center of the outer o-ring is assumed to be 0.03 inches. Therefore, the pressure capacity is determined when the flange gap of 0.03" begins to form. It appears that the opening of the flange joint is a result of deformation from the opening in the shell deforming resulting from the vessel shell expansion. The opening will allow mass to escape from RPV to CNV and from CNV to the surrounding pool water. The applicant stated that since actual seal/o-ring specifications are not available, the severity of the failure is uncertain. Was a thermal hydraulic analysis performed for the blowdown	The evaluations performed in EC-A011-3428 and EC-A013-3036 are very conservative analyses to provide a bounding (lowest possible) maximum ultimate pressure at which the vessel is considered to fail. Failure criteria established that no leakage would occur with a 0.03 inch gap or less at the o-ring. It is not until the gap exceeds a 0.03 inch gap that leakage would be expected to occur. The gap at the reported pressure is just prior to the seal being lost and therefore there is no leakage to calculate. Neither the RPV nor CNV vessels are expected to reach accident conditions at these higher pressures.	Closed	NuScale's response is acceptable as the case was for the loading beyond the design condition.

			to the CNV during the RPV depressurization?			
106a	EQ-A023-1943 Reactor Internals	Wu	Also, what are the consequences of 1240 psi steam escaping from the CNV to the pool water? It might cause a RXB vibration similar to the suppression pool loading in the BWR plants.	The evaluation performed in EC-A013-3036 is a very conservative analysis to provide a bounding (lowest possible) maximum ultimate pressure at which containment is considered to fail. Failure criteria was established that no leakage would occur at a 0.03 inch gap or less at the o-ring. It is not until the gap exceeds 0.03 inch that leakage would be expected to occur. The containment is not expected to reach any accident conditions at this pressure or higher. The 1240 psi pressure is a bounding condition when containment has been considered to fail so no leakage is calculated. It is expected that a more realistic ultimate pressure will be at a significantly higher pressure.	Closed	The response is acceptable for the reason as stated in Question 106.
107	EQ-A023-1943 Reactor Internals	Wu	In Section Lifting, handling, and transportation loads are not required to meet ASME stress limits specified in Section 4.1. However, the ASME Service Level B primary limits shall be used as the allowable limits for the lifting, handling and transportation loads. The lifting points shall be analyzed	All handling loads are covered by requirement 4.4.3. In a future revision we may choose to clarify this and explicitly break out maintenance loads as a separate requirement but the current requirement is intended to cover all handling loads.	Closed	Response acceptable.

			to ensure minimum safety factors of five, (5) for material ultimate strength and three (3) for material yield strength are maintained for all lifting and handling conditions including consideration of the dynamic load factor, specified in Section 4.4.1. Are the lifting, handling and transportation loads shall be considered during the refueling operation for the plant life of 60 years.			
108	EP-0303-21019 Classification of SSCs	Le	In the "Procedure" section (page 13 of 35), the applicant states "NuAQ = NuScale augmented quality. This sub-classification includes the functions that are identified by NuScale that require augmented requirements. These B1 and B2 function, due to their importance to safety, would not be treated as commercial grade and require augmentation". The staff finds this procedure is not clear. If B1 and B2 function are not be treated as commercial grade and require augmentation, will, DCD Tier 2, Table 3.2-1, reflect that these B1 and B2 components require NuScale augmented quality?	Revision 6 of EP-0303-2109 removed to NuAQ as it is no longer applicable. All B1 and B2 items that require augmented quality requirements are reflected in DCD Tier 2, Table 3.2-1. See Note 2 and Note 3 of Table 3.2-1.	Closed	Response acceptable.
109	Dwg. NP12-01-B010-M-PD-1021-S02	Le	On Sheet 2 of 3, class break of SRW and CVC indicates that the break occurs on the pipe line. Provide the	NuScale design basis does not use class break in design drawings. ASME Class is identified in piping classification in each P&ID.	Closed	The staff requests that the applicant provide the class break information in this drawing. The information of class

			clarification of this class break location.			breaks in ER-A013-4785 Rev. 0 – Figure 7.1, is acceptable. RAI 9619 addresses this item. This item is closed.
110	Dwg. NP12-01-B010-M-PD-1021-S02	Le	On Sheet 3 of 3, CNT line to CVC line indicates there is a class break at the isolation valve. However, the isolation valve location is not clearly defined. Provide the clarification that the class break location is on the second isolation valve.	NuScale design basis does not use class break in design drawings. ASME Class is identified in piping classification in each P&ID.	Closed	The staff requests the applicant provides the class break information in this drawing. The information of class breaks in ER-A013-4785 Rev. 0 – Figure 7.1, is acceptable. RAI 9619 addresses this item. This item is closed.
111	COL Item 3.10-2		COL Item 3.10-2 states, A COL applicant that references the NuScale Power Plant design certification will develop the equipment qualification database and ensure equipment qualification record files are created for the structures, systems, and components that require seismic qualification. However, the following requirement stated in the SRP is omitted: Identification of all design (functional) specifications and qualification reports and their locations. Functional specifications for active valve assemblies should conform to RG 1.148, “Functional	Regulatory Guide 1.148 has been withdrawn as documented in ML13066A552. As stated in RG 1.100, Revision 3, “The NRC is revising this RG (i.e., Revision 3 of RG 1.100) to endorse with exceptions and clarifications, IEEE Std. 344-2004 and ASME QME-1-2007. (This is the first time the NRC has endorsed ASME QME-1). This revision of the RG will also subsume RG 1.148. Specifically, Sections B.1 and C1 of this RG endorse, with exceptions and clarifications, the entire IEEE Std. 344-2004 and	Closed	

			Specification for Active Valve Assemblies in Systems Important to Safety in Nuclear Power Plants." Please explain how the design functional specifications and qualification reports and valve locations are specified in the design document.	Section QR "General Requirements" and Non-mandatory Appendix QR-A "Seismic Qualification of Active Mechanical Equipment," to ASME QME-1 2007 for the seismic qualification of electrical and active mechanical equipment" Note: NUREG 0800, Revision 4, still references RG 1.148 even though it has been withdrawn. Recommend withdrawal of this question as it does not apply.		
112	EC-A013-3377	Huang	Document EC-A013-3377 on page 64 of 128 states, "Due to poor quality mesh on the CNV26 cover, results from CNV27 and CNV30 are considered instead. This is acceptable due to similar geometry under similar loading." Explain the reason for the poor quality mesh on CNV26. Will it be rerun at a later time with a better quality mesh? Was it due to a software issue, or is it due to assumptions made in the analysis?	NuScale's response stated that "poor quality" is not factual and needs to be updated (document not currently in eRR to verify). State that this model is similar to CNV27 and CNV30 and per result tables of Appendix F results are inline.	Closed	Closed to NuScale corrective action program, tracking number CR-0918-61768.

U.S. NUCLEAR REGULATORY COMMISSION STAFF REPORT OF REGULATORY AUDIT FOR NUSCALE POWER, LLC; FOLLOW-UP AUDIT OF COMPONENT DESIGN SPECIFICATIONS

May 14, 2018 – October 8, 2018

List of Attendees

Name	Organization
Marieliz Vera Amadiz	NRC
Michael Breach	NRC
Jason Huang	NRC
Yiu Law	NRC
Tuan Le	NRC
Shanlai Lu	NRC
Thomas G. Scarbrough	NRC
James Strnisha	NRC
Cheng-Ih (John) Wu	NRC
JJ Arthur	NuScale
Marty Bryan	NuScale
Patrick Conley	NuScale
Scott Harris	NuScale
Dan Lassiter	NuScale
Wayne Massie	NuScale
Gary McGee	NuScale