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

January 25, 2018

MEMORANDUM TO: Samuel S. Lee, Chief
Licensing Branch 1
Division of New Reactor Licensing
Office of New Reactors

FROM: Marieliz Vera Amadiz, Project Manager ***/RA/***
Licensing Branch 1
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION STAFF REPORT OF REGULATORY AUDIT FOR NUSCALE POWER, LLC; 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 No. 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 June 1, 2017, and ran through August 29, 2017, in accordance with the audit plan in ADAMS Accession No. ML17158B428.

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 and the audit attendee list are enclosed with this memorandum.

Docket No. 52-048

Enclosures:
1. Audit Report
2. Attendee List
3. List of questions for the Designs Specifications audit

cc: NuScale DC ListServ

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION STAFF REPORT OF REGULATORY AUDIT FOR NUSCALE POWER, LLC; COMPONENT DESIGN SPECIFICATIONS
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ADAMS Accession No.: ML18018A234 *via email NRO-002

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U.S. NUCLEAR REGULATORY COMMISSION

NUSCALE POWER, LLC

SUMMARY AUDIT REPORT OF DESIGN SPECIFICATIONS

NRC Audit Team:

Tuan Le, NRO Mechanical Engineer (U.S. Nuclear Regulatory Commission (NRC), Audit Lead
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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 of equipment seismic qualification, environment qualifications 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 design control document (DCD) for the design and qualification of these components.

In addition, the NRC staff audited the design, equipment qualification, and specifications for selected components in support of its reviews of the following 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."

The NRC staff provided NuScale with the audit plan to facilitate the audit, as documented in the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML17150A457. The NRC staff followed the NRO Office Instruction, NRO-REG-108 (Revision 0), "Regulatory Audits," in performing the audit of the NuScale design specifications.

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 a regulatory audit of NuScale design for American Society of Mechanical Engineers (ASME) Code components, including valves, pumps, component supports, dynamic restraints, equipment seismic qualifications, and component classifications. The NRC staff reviewed the NuScale design documents and individual design specifications for ASME Code components, including valves, pumps, component supports, dynamic restraints, equipment seismic qualifications and component classifications. During the audit, the NRC staff had audit observations and findings as listed in Table 1 of this audit report.

2.0 AUDIT RESULTS

During this Phase 1 audit, the NRC staff reviewed the design specifications for several types of components to be used in the NuScale nuclear power plant. The NRC staff reviewed the design specifications to determine whether they incorporated the provisions specified in the NuScale Final Safety Analysis Report (FSAR). The NRC staff also evaluated whether the design specifications addressed valve operating experience as well as first-of-a-kind (FOAK) attributes for the design and qualification provisions of specific NuScale components.

The staff prepared questions on each of the design specifications for NuScale valves reviewed during this Phase 1 audit, and provided those questions to NuScale. In general, the staff found that various aspects of the design specifications for the NuScale valves are not completed. For example, most of the valve design specifications include open items that remain to be resolved. In addition, the design specifications for the NuScale valves do not

include specific design and qualification requirements typically found in design specifications for valves to be used in nuclear power plants. The staff questions prepared as part of this audit on the design specifications for the NuScale valves are contained in Table 1 of this audit report.

The NRC staff found that the component classification incorporated the provisions specified in the NuScale DCD. However, several design specifications have not been completed with the design information, such as the class break information that would need to be included in the P&IDs and design classification documents. The design specifications (or information typically included in specifications) have not been specified, such as the quality group for flow restrictions, (see question number 3 of Table 1). The additional design information would need to be included in the design documents and made available for a Phase 2 audit, such that the staff can reach a conclusion regarding the specification-related provision in 10 CFR 52.47.

The NRC staff reviewed several mechanical equipment design specifications to determine whether they incorporated environmental qualification provisions specified in the NuScale FSAR. Based on this review, the staff prepared questions in Table 1 of this audit report regarding the incorporation of qualification environments, post-accident operating times, and loss-of-coolant (LOCA)-generated debris into the design specifications.

The NRC reviewed the design specifications for the containment vessel (CNV) including the containment vessel assembly specification, CNV top head specification, CNV upper section specification, CNV lower section specification, and the CNV-RPV closure bolts specification. During the review of the CNV stress analysis report, the staff found that the fatigue evaluation of the CNV was not available during the audit, nor was a timetable available for completion. This information will need to be made available to the staff before the follow-up audit in Phase 2.

The staff will perform a follow-up audit to review the design specifications for the components to be used in the NuScale nuclear power plant when notified that the questions identified in Table 1 of this report have been addressed. In addition to the specific valve design specifications reviewed during this Phase 1 audit, NuScale should also update any design specifications not reviewed during the Phase 1 audit to address the staff questions as applicable. The staff will conduct the follow-up audit during Phase 2 of its review of the NuScale design certification application (DCA). The staff will maintain an Open Item in the NRC SER regarding the NuScale DCA until the staff questions are resolved during the follow-up audit.

DOCUMENTS REVIEWED

1. EP-0303-2109 “Classification of Structures, Systems, and Components,” Revision 5, dated November 17, 2016.

2. ER-A014-4036, “SSC Classification Report for the Stream Generator” Revision 2.

3. ER-A014-4036, “SSC Classification Report for the Steam Generator” Revision 2.

4. NuScale Design Specification, EQ-A0101-2252, “ASME Design Specification for RXM Check Valves” Revision0, dated January 2014.

5. NuScale Design Specification, EQ-A010-3642, “ASME Design Specification for RXM Class 1, 2, & 3 Piping,” Revision 0.

6. NuScale Design Specification, EQ-A010-2224, “ASME Design Specification for Secondary Side Containment Isolation Valves,” Revision 0, dated May 18, 2016.

7. NuScale Design Specification, EQ-A010-2235, “ASME Design Specification for Primary Systems Containment Isolation Valves,” Revision 0, dated May 27, 2016.

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

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

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

11. NuScale Design Specification, EQ-B020-2140, “ASME Design Specification for Emergency Core Cooling System Valves,” Revision 2, dated December 1, 2016.

12. NuScale Design Specification, EQ-B030-2258, “ASME Design Specification for Decay Heat Removal System Actuation Valves,” Revision 0, dated May 12, 2016.

13. NuScale Design Specification, NP12-01-A013-M-GA-1933, “Containment Vessel Assembly,” Revision 3.

14. NuScale Design Specification, NP12-01-A013-M-GA-2603, “CNV Top Head Assembly,” Revision 1.

15. NuScale Design Specification, NP12-01-A013-M-GA-2602, “CNV Upper Section,” Revision 2.

16. NuScale Design Specification, NP12-01-A013-M-GA-2601, “Lower CNV Section,” Revision 1.

17. NuScale Design Specification, NP12-01-A0101-M-GA-2604, “CNV-RPV Closure bolts,” Revision 0.

18. NuScale Design Specification, EQ-A013-1826, “ASME Design Specification for Containment Vessel,” Revision 1, dated November 18, 2016.

19. EC-A013-3036, “CNV Ultimate Pressure Integrity Analysis” Revision 1, dated December 28, 2016.

20. ES-0303-3685, “Seismic Design Criteria” Revision 1.

21. EC-A013-3377, “Primary Stress Analysis of the Containment Vessel,” Revision 0, dated December 22, 2016.

22. EC-A011-3428, “RPV Ultimate Pressure Capacity Analysis,” Rev 1.

23. EQ-A012-2041, “PRZ Heater ASME Load Combination,” Rev 0.

24. NuScale Design Specification EQ-A023-1775, “ASME Design Specification for Reactor Pressure Vessel,” Rev 1.

25. NuScale Design Specification EQ-A023-1943, “ASME Design Specification for Reactor Vessel Internals.”

26. EP-0303-2122, “DRAP Implementing Procedure,” Rev 3.

27. EQ-A013-2267, “ASME Design Spec for RXM Top Support Structure,” Rev 0.

28. EQ-A022-2283, “ASME Design Spec for CRDM (Control Rod Drive Mechanisms)” Rev 0.

29. EQ-B030-3055, “ASME Design Spec for DHRS condenser,” Rev 0.

30. EQ-A010-3643, “ASME Design Spec for RXM Class 1, 2, & 3 Piping Supports,” Rev 0.

31. ER-B020-4090, “SSC Classification Report for the CVCS System (B020),” Rev 1.

32. ER-B030-4201, “SSC Classification Report for the DHR System (B030),” Rev 1.

33. ER-B10-4230, “SSC Classification Report for the CVCS System B010),” Rev 1.

34. EQ-B200-4307, “SSC Classification Report for the RCCW Systems (B200),” Rev 3.

35. PG-0302-9541, Revision 2, dated November 23, 2016.

36. NP12-01-A013-M-PD-3450, CNT Revision 0.

37. NP12-01-A014-M-PD-3451, SG Revision 0.

38. NP12-01-A030-M-PD-1504, RCS Revision 0.

39. NP12-01-B010-M-PD-1021, Revision 0, Version 7 FINAL.

40. NP12-01-B020-M-PD-1027-S01, Revision 2, Signed.

41. NP12-01-B030-M-PD-1028-S01.

42. NP12-6A-B200-M-PD-1685, Revision 2.

U. S. NUCLEAR REGULATORY COMMISSION

STAFF REPORT OF REGULATORY AUDIT FOR

NUSCALE POWER, LLC; COMPONENT DESIGN SPECIFICATIONS

LIST OF ATTENDEES

June 1, 2017 - August 29, 2017

NRC Staff Participants:

Tuan Le, NRO
Cheng-Ih (John) Wu
Thomas G. Scarbrough)
James Strnisha
Jason Huang
Yuken Wong
Yiu Law
Michael Breach
Marieliz Vera Amadiz

NuScale (and other support organization) Participants:

Zack Houghton
Matt Mallet
Vern Pence
Wayne Massie
Marty Bryan

U. S. NUCLEAR REGULATORY COMMISSION

STAFF REPORT OF REGULATORY AUDIT FOR

NUSCALE POWER, LLC; COMPONENT DESIGN SPECIFICATIONS

List of Questions for the Designs Specifications Audit

1. 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 identify the class breaks in the following P&IDs and provide the staff' with the updated P&IDs for review:

   a. Dwg. NP12-01-A013-M-PD-3450, CNT Revision0.

   b. Dwg. NP12-01-A014-M-PD-3451, SG Revision0.

   c. Dwg. NP12-01-A030-M-PD-1504, RCS Revision0

   d. Dwg. NP12-01-B010-M-PD-1021 R0 V7 FINAL.

   e. Dwg. NP12-01-B020-M-PD-1027-S01-Rev2 Signed.

   f. Dwg. NP12-01-B030-M-PD-1028-S01.

   g. Dwg. NP12-6A-B200-M-PD-1685-Rev 2.

2. 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.

NuScale response: Yes, RG 1.26 and 1.29 are used. Procedure 0303-2109.

3. In 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 the applicant provides a clarification of why the SG tube supports and flow restrictions are classified with "N/A" quality group.

4. DCD Section 3.8.2.4.1, Containment Vessel Stress Analysis, it 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?

   a. 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, 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?

NuScale response – The ASME Code is concerned about ratios in excess of the allowable (1.0). There is not a requirement to do any special reporting or provide discussion of values approaching this allowable. Nevertheless, NuScale chose to provide some discussion of the controlling stresses and ratios in excess of 0.95 in Section 6.0 of EC-A013-3377. Beside this > .95 cutoff, there was no specific reason for excluding Section 6.0 discussion of Path 72.

b. 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.

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. Hence the current 'preliminary' calculation status. In general, NuScale does not release or post "preliminary" to the eRR.

Notify the NRC when the fatigue analyses is completed for the design of the reactor vessel and the containment.

Audit Questions on ECCS Valves and CIVs

NuScale Design Specification EQ-B020-2140, "ASME Design Specification for Emergency Core Cooling System Valves," Revision 2, dated December 1, 2016.

5. Section 1.1 of Design Specification EQ-B020-2140 states that the purpose of the document is to define the design requirements for the ECCS valves which include the reactor vent valves (RVVs) and reactor recirculation valves (RVVs) and their individual subcomponent valves. Is Design Specification EQ-B020-2140 intended to establish the specific requirements for the ECCS valves that must be satisfied by the valve supplier, such as the types and sizes of the four ECCS valve subcomponents?

6. Is the ECCS Functional Specification referenced in Section 1.4.2.14 of Design Specification EQ-B020-2140 available for review?

7. 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?

8. What is the status of Design Specification EQ-B020-2140 that has not been certified by a Professional Engineer in Section 1.6?

9. Section 2.4.3.3 of Design Specification EQ-B020-2140 states that the ECCS valves are ASME OM Code Category A. However, Engineering Change Notice ECN-B020-5225 proposes to modify the ASME OM Code categorization of the ECCS valves from

Category A to Category B/C. 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?

10. 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?

11. Table 3-3 in Design Specification EQ-B020-2140 specifies that leak-before-break 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 MSPB and FWPB?

12. 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?

13. 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?

14. 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?

15. 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?

16. 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 satisfy this provision in the design specification?

17. 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?

18. 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?

19. Table 8-2 in Design Specification EQ-B020-2140 states that the inservice leakage limits are reserved. When will the leakage limits be available for review?

20. 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?

    a. Specific first-of-a-kind (FOAK) valve attributes, such as valve internal and disc design.

    b. Preparation of a failure modes and effects analysis (FMEA).

    c. Performance of a weak link analysis.

    d. Seismic qualification testing with static side load testing along the least rigid axis.

    e. Thermal stress analysis in accordance with the ASME BPV Code.

    f. Capacity certification for the ECCS valves over their full range of fluid flow and applicable conditions.

    g. Evaluation of potential flow-induced vibration and its effects.

    h. Evaluation of potential pressure locking and thermal binding.

    i. 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.

    j. Preparation of an operating experience report related to the specific valve design to be provided by the supplier.

    k. Documentation in accordance with ASME QME-1-2007.

NuScale Design Specification EQ-A010-2235, “ASME Design Specification for Primary Systems Containment Isolation Valves,” Revision 0, dated May 27, 2016.

21. 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?

22. Is the Containment System Functional Specification referenced in Section 1.5.1.1 of Design Specification EQ-A010-2235 available for review?

23. What is the status of the Open Items for high energy line break conditions, lowest service temperature, mechanical design loads, and containment vessel combustible gas control indicated in Section 1.6 of Design Specification EQ-A010-2235?

24. What is the status of Design Specification EQ-A010-2235 that has not been certified by a Professional Engineer in Section 1.7?

25. Note (3) in Table 3-2 in ECN-A010-4613 for Design Specification EQ-A010-2235 states that leak-before-break 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?

26. 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?

27. 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 for radiation and other environmental effects?

28. 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?

29. 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?

30. 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?

31. Where are the following aspects of the design and qualification requirements for the PSCIVs addressed in Design Specification EQ-A010-2235?

    a. Specific first-of-a-kind (FOAK) valve attributes, such as valve internal and disc design.

    b. Preparation of a failure modes and effects analysis (FMEA).

    c. Performance of a weak link analysis.

    d. Seismic qualification testing with static side load testing along the least rigid axis.

    e. Thermal stress analysis in accordance with the ASME BPV Code.

f. Evaluation of potential flow-induced vibration and its effects.

g. Evaluation of potential pressure locking and thermal binding.

h. 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.

i. Preparation of an operating experience report related to the specific valve design to be provided by the supplier.

j. Documentation in accordance with ASME QME-1-2007.

NuScale Design Specification EQ-A010-2224, "ASME Design Specification for Secondary Side Containment Isolation Valves," Revision 0, dated May 18, 2016.

32. 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?

33. Is the Containment System Functional Specification referenced in Section 1.5.1.1 of Design Specification EQ-A010-2224 available for review?

34. 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?

35. What is the status of Design Specification EQ-A010-2224 that has not been certified by a Professional Engineer in Section 1.7?

36. Note (3) in Table 3-A in ECN-A010-4614 for Design Specification EQ-A010-2224 states that leak-before-break 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?

37. 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?

38. 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?

39. Section 3.8 of Design Specification EQ-A010-2224 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?

40. 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?

41. 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 capability of the as-installed valves?

42. 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?

43. Where are the following aspects of the design and qualification requirements for the SSCIVs addressed in Design Specification EQ-A010-2224?

    a. Specific first-of-a-kind (FOAK) valve attributes, such as valve internal and disc design.

    b. Preparation of a failure modes and effects analysis (FMEA).

    c. Performance of a weak link analysis.

    d. Seismic qualification testing with static side load testing along the least rigid axis.

    e. Thermal stress analysis in accordance with the ASME BPV Code.

    f. Evaluation of potential flow-induced vibration and its effects.

    g. Evaluation of potential pressure locking and thermal binding.

    h. Sizing and setting of the hydraulic actuators for the SSCIVs, including pressure and flow load (including friction coefficient assumptions), seating and unseating load, packing load, actuator output assumptions, uncertainties, and margin requirements.

    i. Preparation of an operating experience report related to the specific valve design to be provided by the supplier.

    j. Documentation in accordance with ASME QME-1-2007.

Audit Questions on RSV-DHR-CVCS-TRVs

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

44. 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?

45. Is the RCS Functional Specification referenced in Section 1.5.1.1 of Design Specification EQ-A011-2179 available for review?

46. What is the status of the Open Items for inservice examination requirements, service temperature, mechanical design loads, containment vessel pneumatic and hydraulic testing, and containment transients for prototype testing indicated in Section 1.6 of Design Specification EQ-A011-2179?

47. What is the status of Design Specification EQ-A011-2179 that has not been certified by a Professional Engineer in Section 1.7?

48. 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?

49. Table 3-2 in Design Specification EQ-A011-2179 was modified in ECN-A011-4845 to specify that leak-before-break 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?

50. 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?

51. 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?

52. 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?

53. 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?

54. Section 3.9 of Design Specification EQ-A011-2179 specifies the valve settings for the RSVs. 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?

55. 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?

56. 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?

57. Where are the following aspects of the design and qualification requirements for the RSVs addressed in Design Specification EQ-A011-2179?

    a. Any first-of-a-kind (FOAK) valve attributes for the RSVs.

    b. Preparation of a failure modes and effects analysis (FMEA).

    c. Performance of a weak link analysis.

    d. Seismic qualification testing with static side load testing along the least rigid axis.

    e. 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.

    f. Evaluation of potential flow-induced vibration and its effects.

    g. Evaluation of potential pressure locking and thermal binding.

    h. Sizing and setting of the RSVs.

    i. Preparation of an operating experience report related to the specific valve design to be provided by the supplier.

    j. Documentation in accordance with ASME QME-1-2007.

NuScale Design Specification EQ-B030-2258, “ASME Design Specification for Decay Heat Removal System Actuation Valves,” Revision 0, dated May 12, 2016.

58. 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?

59. 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?

60. What is the status of the Open Items for DHRS flow rate during transients, and valve loads and piping specific acceleration values indicated in Section 1.6 of Design Specification EQ-B030-2258?

61. What is the status of Design Specification EQ-B030-2258 that has not been certified by a Professional Engineer in Section 1.7?

62. 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?

63. 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?

64. 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?

65. 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?

66. 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?

67. 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?

68. Where are the following aspects of the design and qualification requirements for the DHRS actuation valves addressed in Design Specification EQ-B030-2258?

    a. Any first-of-a-kind (FOAK) valve attributes.

    b. Preparation of a failure modes and effects analysis (FMEA).

    c. Performance of a weak link analysis.

    d. Seismic qualification testing with static side load testing along the least rigid axis.

    e. Thermal stress analysis in accordance with the ASME BPV Code.

    f. Evaluation of potential flow-induced vibration and its effects.

    g. Evaluation of potential thermal binding.

    h. 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.

    i. Preparation of an operating experience report related to the specific valve design to be provided by the supplier.

j. Documentation in accordance with ASME QME-1-2007.

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

69. Section 1.1 of Design Specification EQ-B010-3227 states that the purpose of the document is to provide the 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?

70. 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?

71. What is the status of Design Specification EQ-B010-3227 that has not been certified by a Professional Engineer in Section 1.7?

72. 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?

73. Section 3.6.2.2 of Design Specification EQ-B010-3227 states that the CVCS demineralized water isolation valves are sufficiently remote to not require qualification for radiation effects. What is the justification for not requiring radiation qualification of these valves?

74. 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?

75. 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?

76. 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 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. 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?

78. Where are the following aspects of the design and qualification requirements for the CVCS Class 3 valves addressed in Design Specification EQ-B010-3227?

a. Any first-of-a-kind (FOAK) valve attributes.

b. Preparation of a failure modes and effects analysis (FMEA).

c. Performance of a weak link analysis.

d. Seismic qualification testing with static side load testing along the least rigid axis.

e. Thermal stress analysis in accordance with the ASME BPV Code.

f. Evaluation of potential flow-induced vibration and its effects.

g. Evaluation of potential pressure locking and thermal binding.

h. 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.

i. Preparation of an operating experience report related to the specific valve design to be provided by the supplier.

j. Documentation in accordance with ASME QME-1-2007.

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

79. 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 requirements for the TRVs that must be satisfied by the valve supplier?

80. 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?

81. What is the status of Design Specification EQ-A014-4255 that has not been certified by a Professional Engineer in Section 1.6?

82. 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?

83. Table 3-1 of Design Specification EQ-A014-4255 states that the relieving capacities of the SGS and CRDS TFVs 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?

84. Table 3-3 in Design Specification EQ-A014-4255 was modified in ECN-A014-4850 to specify that leak-before-break 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?

85. 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?

86. 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?

87. 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?

88. Section 6.2 of Design Specification EQ-A014-4255 specifies the QA requirements for the TRVs. Does Design Specification EQ-A014-4255 require the application of Appendix B to 10 CFR Part 50 for the QA requirements for the TRVs?

89. 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?

90. Where are the following aspects of the design and qualification requirements for the TRVs addressed in Design Specification EQ-A014-4255?

    a. Any first-of-a-kind (FOAK) valve attributes for the TRVs.

    b. Preparation of a failure modes and effects analysis (FMEA).

    c. Performance of a weak link analysis.

    d. Seismic qualification testing with static side load testing along the least rigid axis.

    e. Thermal stress analysis in accordance with the ASME BPV Code.

    f. Capacity certification for the TRVs over their full range of fluid flow and applicable conditions.

    g. Evaluation of potential flow-induced vibration and its effects.

    h. Evaluation of potential pressure locking and thermal binding.

    i. Sizing and setting of the TRVs.

    j. Preparation of an operating experience report related to the specific valve design to be provided by the supplier.

    k. Documentation in accordance with ASME QME-1-2007.

Audit Questions for Environmental Qualification

NuScale Design Specification EQ-B020-2140, “ASME Design Specification for Emergency Core Cooling System Valves,” Revision 2, dated December 1, 2016.

91. Does the design specification identify LOCA-generated debris, latent debris, and chemical products in the service fluid during post-LOCA operation as a design parameter for the ECCS valves and subcomponents?

92. NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C describe the NuScale approach for the environmental qualification of nonmetallic parts of active mechanical equipment. Do the design specifications require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times as identified in NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C specified for the environmental qualification of nonmetallic parts of active mechanical valves?

NuScale Design Specification EQ-A010-2235, “ASME Design Specification for Primary Systems Containment Isolation Valves,” Revision 0, dated May 27, 2016.

93. NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C describe the NuScale approach for the environmental qualification of nonmetallic parts of active mechanical equipment. Do the design specifications require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times as identified in NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C specified for the environmental qualification of nonmetallic parts of active mechanical valves?

NuScale Design Specification EQ-A010-2224, “ASME Design Specification for Secondary Side Containment Isolation Valves,” Revision 0, dated May 18, 2016.

94. NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C describe the NuScale approach for the environmental qualification of nonmetallic parts of active mechanical equipment. Do the design specifications require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times as identified in NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C specified for the environmental qualification of nonmetallic parts of active mechanical valves?

NuScale Design Specification EQ-B030-2258, “ASME Design Specification for Reactor Module (RMX) Check Valves,” Revision 0, dated October 24, 2016.

95. NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C describe the NuScale approach for the environmental qualification of nonmetallic parts of active mechanical equipment. Do the design specifications require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times as identified in NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C specified for the environmental qualification of nonmetallic parts of active mechanical valves?

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

96. NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C describe the NuScale approach for the environmental qualification of nonmetallic parts of active mechanical equipment.

Do the design specifications require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times as identified in NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C specified for the environmental qualification of nonmetallic parts of active mechanical valves?

NuScale Design Specification EQ-B030-2258, "ASME Design Specification for Decay Heat Removal System Actuation Valves," Revision 0, dated May 12, 2016

97. NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C describe the NuScale approach for the environmental qualification of nonmetallic parts of active mechanical equipment. Do the design specifications require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times as identified in NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C specified for the environmental qualification of nonmetallic parts of active mechanical valves?

NuScale Design Specification EQ-A014-4255, "Thermal Relief Valves Design Specification Terminology and Load Combination Changes" Revision 0, dated August 18, 2016.

98. NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C describe the NuScale approach for the environmental qualification of nonmetallic parts of active mechanical equipment. Do the design specifications require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times as identified in NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C specified for the environmental qualification of nonmetallic parts of active mechanical valves?

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

99. NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C describe the NuScale approach for the environmental qualification of nonmetallic parts of active mechanical equipment. Do the design specifications require the application of Appendix QR-B in ASME QME-1-2007 and are the qualification environments and post-accident operating times as identified in NuScale FSAR, Tier 2, Section 3.11 and Appendix 3C specified for the environmental qualification of nonmetallic parts of active mechanical valves?

EQ-A023-1943, Revision 1 "ASME Design Specification for Reactor Vessel Internals"

100. In Table 3-1, where is the maximum design pressure difference of 10 psid from?

101. When will deflection limit in Table 3-3 be available?

102. Explain the use of OBE loads in Table 4-1. Is OBE load included in Level A, B and C analyses?

103. When will mechanical loads in Appendix A be available? What about other loads such as thermal and seismic?

104. 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 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.

105. 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 asks 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% (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.

106. In Section 2.2 of EC-A011-3428 and EC-A013-3036-01, it 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 to the CNV during the RPV depressurization. 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.

107. 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 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.

Doc. EP-0303-21019 "Classification of Structures, Systems, and Components" Revision 5

108. 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?

Dwg. NP12-01-B010-M-PD-1021-S02, Revision 0

109. On Sheet 2 of 3, class break of SRW and CVC indicates that the break occurs on the pipe line. Provide the clarification of this class break location.

110. 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.

111. 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 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.

112. 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?