U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Presentation to the Advisory Committee on Reactor Safeguards Subcommittee Staff Review of NuScale's US460 Standard Design Approval Application Final Safety Analysis Report, Revision 1

Chapters 3 (Except Sections 3.7, 3.8, 3.9.2), 8, and 14

November 5, 2024
(Open Session)

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

Contributors

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NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

Overview

- NuScale submitted Chapter 3, “Design of Structures, Systems, Components and Equipment,” Revision 1, of the NuScale SDAA FSAR on October 31, 2023.
- NRC performed a regulatory audit as part of its review of Chapter 3, from March 2023 to December 2023.
- Questions raised during the audit were resolved within the audit. Seven RAIs were issued.
- The staff completed the review of Chapter 3 (Except for Sections 3.7, 3.8, 3.9.2) and issued an advanced safety evaluation to support the ACRS Subcommittee meeting.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

Sections Evaluated

- Section 3.1 – Conformance with the U.S. Nuclear Regulatory Commission General Design Criteria
- Section 3.2 – Classification of Structures, Systems, and Components
- Section 3.3 – Wind and Tornado Loading
- Section 3.4 – Water Level (Flood) Design
- Section 3.5 – Missile Protection
- Section 3.6 - Protection against Dynamic Effects Associated with the Postulated Rupture of Piping
- Section 3.9 (except 3.9.2) - Mechanical Systems and Components
- Section 3.10 - Seismic and Dynamic Qualification of Mechanical and Electrical Equipment
- Section 3.11 - Environmental Qualification of Mechanical and Electrical Equipment –
- Section 3.12 - ASME BPV Code Class 1, 2, and 3 Piping Systems and Associated Support Design
- Section 3.13 - Threaded Fasteners—ASME BPV Code Class 1, 2, and 3

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):

- Sections 3.1 Conformance with the U.S. Nuclear Regulatory Commission General Design Criteria
  - Discussed in applicable sections of the SE.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):

- Sections 3.2 Classification of Structures, Systems, and Components
  - There are no significant differences between NuScale DCA FSAR and SDAA FSAR.
  - NuScale provided SSC seismic classification of Category I, II and III in FSAR Tables 3.2-1 and 3.2-2, consistent with regulations and guidance.
  - SDAA SE conclusion is the same as DCA SE conclusion.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.3 Wind and Tornado Loading
  - Significant differences between NuScale DCA FSAR and SDAA FSAR include:
    - High wind speed 190 mph and maximum tornado wind speed 270 mph.
    - Using ASCE/SEI 7-16 to establish the wind load pressure for RW-IIa structures.
  - NuScale provided adequate justification for applying the wind load pressure on the RW-IIa structures by using ASCE/SEI 7-16.
  - SDAA SE conclusion is the same as DCA SE conclusion.
- 7 Audit Questions
  - All were resolved during the audit.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Sections 3.4.1 Internal Flood Protection for Onsite Equipment Failure
  - Significant differences between NuScale DCA FSAR and SDAA FSAR.
    - Flood analysis methodology defined bounding flood levels for building zones (individual rooms not discussed, such as battery rooms or instrument rooms).
    - Maximum SDAA flood heights are significantly greater than DCA.
    - Location of SSC subject to flood protection not identified.
  - NuScale provided
    - Flood analysis results table of zone, limiting flood source, and max flood height
    - COL Items 3.5-1, 3.5-2 and 3.5-3 confirm the final location and mitigation of SSC subject to flood
  - SDAA SE conclusion is the same as DCA SE conclusion, with addition of COL applicant to further evaluate SSC protection from flood levels.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.4.2 Flood Protection from External Sources
  - There are no significant differences between NuScale DCA FSAR and SDAA FSAR.
  - NuScale provided:
    - The analysis procedures to transform the static and dynamic effects of the highest flood and groundwater levels into effective loads.
    - COL Items 3.4-4 and 3.4-5.
  - SDAA SE conclusion is the same as DCA SE conclusion.
- 11 Audit Questions
  - All were resolved during the audit.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.5.1.1 Internally-Generated Missiles (Outside Containment)
  - There are no significant differences between NuScale DCA FSAR and SDAA FSAR.
  - NuScale provided:
    - The evaluation of internally-generated missile from plant equipment and credibility of missiles.
  - SDAA SE conclusion is the same as DCA SE conclusion.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.5.1.2 Internally-Generated Missiles (Inside Containment)
  - There are no significant differences between NuScale DCA FSAR and SDAA FSAR.
  - NuScale described:
    - no credibility of missiles inside containment based on plant design.
  - SDAA SE conclusion is the same as DCA SE conclusion.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.5.1.3 Turbine Missile
  - Significant differences between NuScale DCA FSAR and SDAA FSAR include:
    - Increased bounding turbine missile parameters - mass and velocity (77MWe vs 50 MWe turbine)
    - Orientation of Control Building (CRB) is more favorable with regard to turbine missile trajectory; however, the CRB is not considered essential to be protected from turbine missiles (high trajectory)
  - NuScale provided:
    - Bounding missile parameters and barriers analysis of Reactor Building (discussed in Section 3.5.3 of the SER)
    - SCC required to be protected
    - COL Items 3.5-1 and 3.5-3- demonstrate site specific turbine missile parameters are bounded by analysis, and evaluate other nearby facilities turbine parameters
  - SDAA SE conclusion is the same as DCA SE conclusion that essential SSCs are protected from turbine missiles using barriers.
- 2 Audit Questions
  - All were resolved in audit

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.5.1.4 Missiles Generated by Tornadoes and Extreme Winds
  - There are no significant differences between NuScale DCA FSAR and SDAA FSAR.
  - NuScale described:
    - Defined missile types and parameters from extreme wind missiles evaluated in design.
    - COL 3.5-2 to confirm automobile missile velocity and altitude of impact parameters will bound extreme wind conditions at site
  - SDAA SE conclusion is the same as DCA SE conclusion.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.5.1.5 Site Proximity Missiles (Except Aircraft)
  - There are no significant differences between NuScale DCA FSAR and SDAA FSAR.
  - NuScale provided:
    - COL Item 3.5-3 to evaluate site-specific hazards from nearby or co-located facilities for more energetic missiles than defined in SDAA
  - SDAA SE conclusion is the same as DCA SE conclusion.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.5.2 Structures, Systems, and Components to be Protected from External Missiles
  - There are no significant differences between NuScale DCA FSAR and SDAA FSAR.
  - NuScale provided:
    - Safety-related and risk significant SSC that must be protected are from external missiles are located inside Seismic Category I RXB and Seismic Category I portions of CRB.
    - CRB is not considered essential to be protected from turbine missiles (see slide for Section 3.5.1.3)
  - SDAA SE conclusion is the same as DCA SE conclusion.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.5.3 Barrier Design Procedures
  - Significant differences between NuScale DCA FSAR and SDAA FSAR include:
    - Steel-Plate Composite Walls (not available for DCA)
    - Steel Barriers (not available for DCA)
  - NuScale provided:
    - Three-step design approach based on Bruhl Equations to prevent perforation of SC walls from missile impacts.
    - Ballistic Research Laboratory (BRL) Formula to determine the minimum steel missile barriers with 25% thickness increase.
  - SDAA SE conclusion is the same as DCA SE conclusion except for Steel-Plate Composite Walls and Steel Barriers.
- 8 Audit Questions
  - All were resolved during the audit.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Sections 3.6 "Protection against Dynamic Effects Associated with the Postulated Rupture of Piping"
  - Significant differences between NuScale DCA FSAR and SDAA FSAR include:
    - LBB methodology no longer used for MSS and FWS inside CNV – BEZ to use BTP 3-4
    - Leak Detection sensitivity changed from 0.005 gpm to 0.01 gpm - no LBB
    - Added CITF between CNV Nozzle safe end and CIV for lines outside CNV in the BEZ under Bioshield
  - NuScale provided:
    - Preliminary analysis results for MSS & FWS show acceptability for change to BTP 3-4
    - Leakage detection sensitivity change, stated above, meets RG 1.45 limit of 0.5 gpm
    - Preliminary analysis results for welds in BEZ outside CNV under bioshield justifies break exclusion (with CITF)
    - Preliminary stress analysis for ECCS RRV/RVV bolted connections with threaded inserts (unchanged from DCA) is representative for other bolted connections with threaded inserts
  - 5 Audit Questions and 3 RAIs - resolved
  - SDAA SE conclusion is the same as DCA SE conclusion

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Sections 3.9.1 "Special Topics for Mechanical Components"
  - Significant differences between NuScale DCA FSAR and SDAA FSAR include:
    - Heatup rate for Reactor Heatup to Hot Shutdown transient changed
  - NuScale provided:
    - The final component stress analysis will use the latest transients' input for ITAAC.
  - SDAA SE conclusion is the same as DCA SE conclusion
  - This does not include evaluation of DWO

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Sections 3.9.3 "ASME Code Class 1, 2, and 3 Components, Component Supports, and Core Support Structures"
  - Significant differences between NuScale DCA FSAR and SDAA FSAR include:
    - Upper and lower sections of the Reactor Vessel are constructed from different materials that have different coefficients of thermal expansion, which is considered in the stress qualification of the closure bolts and flanges.
  - NuScale provided:
    - Discussion of bolted connection and its design
    - Preliminary FEA results
  - SDAA SE conclusion is the same as DCA SE conclusion

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Sections 3.9.4 "Control Rod Drive Systems"
  - Significant differences between NuScale DCA FSAR and SDAA FSAR include:
    - Use of DCA drop and shaft alignment testing for SDAA design
    - Use of threaded connections instead of welded connections between CRDM and RPV (further discussed in Section 3.13)
    - Rod holdout mechanism feature
    - Steam generator tube support assembly (consider impact to CRDS)
  - NuScale provided:
    - Adequate justification to apply DCA testing to SDAA design, reconciling differences.
    - Analysis of threaded connections (discussed in Section 3.13)
    - Justification that rod holdout mechanism feature would not adversely impact safety function of inserting rods
    - Details of assemblies, proposed inspections to monitor for degradation
  - SDAA SE conclusion is the same as DCA SE conclusion.
  - Audit Questions and RAIs:
    - 7 Audit Questions were resolved in audit
    - 2 RAIs resolved

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.9.5 "Reactor Pressure Vessel Internals"
  - There are no significant differences between NuScale DCA FSAR and SDAA FSAR
  - SDAA SE conclusion is the same as DCA SE conclusion.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.9.6, "Functional Design, Qualification, and Inservice Testing [IST] Programs for Pumps, Valves, and Dynamic Restraints"
  - Significant differences between NuScale DCA FSAR and SDAA FSAR include:
    - Redesign of ECCS Valve System requiring 10 CFR 50.43(e) testing and lessons learned to plan for ASME QME-1 qualification testing
    - Need to address 2017 Edition of ASME OM Code with motor-operated valve and air-operated valve diagnostic testing requirements beyond 2012 Edition in DCA
  - NuScale provided:
    - Audit access to ECCS valve system proof-of-concept test specification and reports to support compliance with 10 CFR 50.43(e).
    - Updated relief and alternative requests to reflect 2017 Edition of ASME OM Code
    - Draft revision to FSAR and ECCS test description in response to NRC review and audit findings.
  - SDAA SE conclusion is the same as DCA SE conclusion.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Sections 3.10 Seismic and Dynamic Qualification of Mechanical and Electrical Equipment
  - There are no significant differences between NuScale DCA FSAR and SDAA FSAR
  - SDAA SE conclusion is the same as DCA SE conclusion.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Section 3.11, "Environmental Qualification of Mechanical and Electrical Equipment"
  - Significant differences between NuScale DCA FSAR and SDAA FSAR include:
    - Changes to FSAR Table 3.11-1 for equipment and qualification
    - Potential use of IEEE standards not endorsed by NRC regulatory guides
    - Chapter 15 accident scenarios with lower coolant levels for longer duration than DCA
  - NuScale provided:
    - Adequate justification for NRC staff to rely on past experience from DCA review to inform SDAA review.
    - Proposed FSAR revisions to support NRC safety findings.
  - Conclusion:
    - The staff found that all applicable regulatory requirements were adequately addressed.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Sections 3.12 ASME BPV Code Class 1, 2, and 3 Piping Systems and Associated Support Design
  - There are no significant differences between NuScale DCA FSAR and SDAA FSAR.
  - SDAA SE conclusion is the same as DCA SE conclusion.

NuScale SDAA FSAR Chapter 3 Review

(Except for Sections 3.7, 3.8, 3.9.2)

- **NuScale DCA FSAR Chapter 3 (Rev. 5) vs SDAA FSAR Chapter 3 (Rev. 1):**
- Sections 3.13 Threaded Fasteners—ASME BPV Code Class 1, 2, and 3
  - Significant differences between NuScale DCA FSAR and SDAA FSAR:
    - The RVVs and RRVs were changed to be bolted directly to the reactor vessel nozzle
      - These four bolted flange connections were classified as break exclusion areas
    - Added augmented examination requirements for ASME Class 1 threaded inserts and seal welds
  - NuScale provided:
    - Engineering study of stresses of the bolted flange connections that adequately show that the probability of gross rupture of the ECCS valves bolted connections is extremely low
  - SDAA SE conclusion is the same as DCA SE conclusion.
    - Sampling plan and expansion criteria for the steam and feedwater plenum that can be credited for RVV and RRV break exclusion locations.

NuScale SDAA FSAR Chapter 3 Review
(Except for Sections 3.7, 3.8, 3.9.2)

Conclusion

- While there are some differences between the DCA and the SDAA, the staff found that the applicant provided sufficient information to support the staff's safety finding.
- The staff found that all applicable regulatory requirements were adequately addressed.

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Presentation to the ACRS Subcommittee
Staff Review of NuScale SDAA FSAR, Revision 1

Chapter 8 “Electric Power"

November 5, 2024

(Open Session)

NuScale SDAA FSAR Chapter 8 Review

Overview

- NuScale submitted Chapter 8, Auxiliary Systems, Revision 0 of the NuScale SDAA FSAR on December 31, 2022, and Revision 1 on October 31, 2023
- NRC regulatory audit of Chapter 8 was performed from March 2023 to August 2023, generating 24 audit issues
- 14 audit issues were resolved in the audit
- 14 audit issues resulted in NuScale submitting supplemental information to address questions raised during the audit. 10 issues were retracted as a result of information presented.
- No RAIs were issued
- Staff completed Chapter 8 review and issued an advanced safety evaluation to support today's ACRS Subcommittee meeting

NuScale SDAA FSAR Chapter 8 Review

Contributors

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NuScale SDAA FSAR Chapter 8 Review

Sections

- 8.1 – Electric Power - Introduction
- 8.2 – Offsite Power System
- 8.3 – Onsite Power System
- 8.4 – Station Blackout

NuScale SDAA FSAR Chapter 8 Review

Augmented DC Power System (EDAS)

- EDAS is the Augmented DC power system of the NuScale US 460 design
- Consistent with the SRM-SECY-19-0036, a risk-informed, graded approach commensurate with the design type and features that acknowledges the mitigative measures available to ensure reasonable confidence of public health and safety is acceptable.
- This holistic approach considers realistic conditions, plant behaviors, and operator responses in conjunction with the agency's deterministic assumptions and analyses to provide context and perspective to making risk-informed decisions.
- The staff used a risk-informed, graded approach to evaluate the augmented quality aspects in FSAR Table 8.3-3 of the EDAS as supported by SRM-SECY-19-0036.
- The staff considers that the description for the augmented design, qualification, and quality assurance provisions in FSAR Table 8.3-3 is adequate.

NuScale SDAA FSAR Chapter 8 Review

Conclusion

- While there are some differences between the DCA and the SDAA, the staff found that the applicant provided sufficient information to support the staff's safety finding.

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Presentation to the ACRS Subcommittee
Staff Review of NuScale SDAA FSAR, Revision 1

Chapter 14, “Initial Test Program and Inspections, Tests, Analyses and Acceptance Criteria"

November 5, 2024

(Open Session)

NuScale SDAA FSAR Chapter 14 Review

Overview

- NuScale submitted Chapter 14, “Initial Test Program and Inspections, Tests, Analysis, and Acceptance Criteria,” Revision 0 of the SDAA FSAR on December 31, 2022, and Revision 1 on October 31, 2023
- NRC regulatory audit of Chapter 14 performed March 2023 to December 2023, generating 22 audit issues
- 22 audit issues were resolved in the audit
- 4 audit issues resulted in NuScale submitting supplemental information to address questions raised during the audit
- 0 RAIs were issued
- Staff completed Chapter 14 review and issued an advanced safety evaluation to support today's ACRS Subcommittee meeting

NuScale SDAA FSAR Chapter 14 Review

Contributors

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NuScale SDAA FSAR Chapter 14 Review

Sections Evaluated

- Section 14.2 – Initial Test Program
- Section 14.3 (SDAA Part 8) – Inspections, Tests, Analyses, and Acceptance Criteria
- The ITP and ITAAC may change to address information needed to make a safety finding in high effort chapters, as needed. The changes will be discussed as part of the high effort chapters presentation.

NuScale SDAA Ch. 14.2 Initial Test Program

Significant Changes from DCA to SDAA

- A comprehensive review of the Initial Test Program (ITP) procedures was performed and compared to the DCA ITP.
  - Reviewers found that design changes between the DCA and the SDAA were appropriately captured in the applicants test program submittal and revisions.
- No significant programmatic changes to the Initial Test Program itself were noted by the staff.
- The staff concluded that the SDAA ITP submittal as revised conforms to the NUREG-0800 Standard Review Plan for Initial Test Programs.

NuScale SDAA FSAR Ch. 14.3 ITAAC Review

NO Significant Changes from DCA to SDA

- A comprehensive review of the ITAAC requirements for the following SER Sections were performed and compared to the corresponding DCA system ITAAC Requirements and no significant changes to the ITAAC program itself were noted by the staff.
  - Section 14.3.2, "Structural and Systems Engineering“
  - Section 14.3.4, "Reactor Systems"
  - Section 14.3.5, "Instrument and Controls Systems"
  - Section 14.3.6, "Electrical Systems"
  - Section 14.3.8, "Radiation Protection"
  - Section 14.3.10, "Emergency Planning"
  - Section 14.3.13, "External Flooding Protection"
- The staff concluded that the SDAA ITAAC submittal for these Sections as revised conforms to the NUREG-0800 Standard Review Plan for Initial Test Programs and ITAAC.

NuScale SDAA FSAR Ch. 14.3 ITAAC Review

Significant Changes from DCA to SDAA
SER Section 14.3.3 Piping Systems and Components ITAAC

- A comprehensive review of the SDAA proposed Piping Systems and Components ITAAC was performed and compared to the corresponding DCA Piping Systems and Components ITAAC.
  - Reviewers found that design changes between the DCA and the SDAA were appropriately captured in the applicant's proposed ITAAC, such as the addition of the ECCS supplemental boron dissolvers and CNV lower mixing tubes.
- The staff concluded that the SDAA proposed Piping Systems and Components ITAAC as revised meets the regulatory requirements for ITAAC, as described in the SER.

NuScale SDAA FSAR Ch. 14.3 ITAAC Review

Significant Changes from DCA to SDAA
SER Section 14.3.7 Plant Systems ITAAC

- A comprehensive review of the Plant Systems ITAAC requirements were performed.
- In comparing the SDAA ITAAC with those proposed in the DCA the staff found changes/modifications were made to the ITAAC for the systems used to perform fuel handling and for systems used to conduct heavy load movements.
  - The ITAAC for the Fuel Handling equipment added ASME NUM 1 to the ITAAC acceptance criteria
  - The ITAAC for the Overhead heavy load handling system added ASME NUM-1 to the acceptance criteria for a TYPE 1A crane
- The staff finds that the SDAA Plant Systems ITAAC submittal, as revised, to be necessary and sufficient to provide reasonable assurance that the facility built has been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act as amended, and the Commission's rules and regulations.

NuScale SDAA FSAR Ch. 14.3 ITAAC Review

Significant Changes from DCA to SDAA
SER Section 14.3.9 Human Factors Engineering ITAAC

- A comprehensive review of the HFE ITAAC requirements was performed
- Some Human Factors Engineering activities for the NuScale SDAA are still ongoing
  - For the DCA, the staff reviewed results from the applicant's Integrated Systems Validation (ISV) activities before finalizing their SER
  - For the SDAA, ISV results were not available for the staff during their safety review
  - The SDAA includes an ITAAC for completion of an ISV test in accordance with the human factors verification and validation implementation plan
- The staff concluded that the SDAA HFE ITAAC submittal as revised conforms with the NUREG-0800 Standard Review Plan for HFE

NuScale SDAA FSAR Ch. 14.3 ITAAC Review

Significant Changes from DCA to SDA
SER Section 14.3.11 Containment Systems ITAAC

- The staff reviewed the containment systems ITAAC requirements.
- Significant changes resulted from staff concerns raised during the review of Ch 6:
  - Section 6.2.1.1, NuScale proposed a one-time ITAAC for the first module built to verify the as-built CNV free volume bounds the minimum value used in the containment design-basis analyses.
  - Section 6.2.5, NuScale is proposing three ITAAC In response to staff RAIs for the passive autocatalytic recombiner (PAR):
    - An inspection to confirm the PAR is installed in accordance with the associated installation specification
    - A report to confirm the PAR has sufficient capacity for required oxygen recombination to maintain the CNV atmosphere inert during DBEs
    - Environmental qualification of PAR
- The staff finds that the SDAA Containment Systems ITAAC submittal as revised conforms with the NUREG-0800 Standard Review Plan for Initial Test Programs.

NuScale SDAA FSAR Chapter 14 Review

Conclusion

- While there are some differences between the DCA and SDAA, the staff found that the applicant provided sufficient information to support the staff's safety findings.
- The staff found that all applicable regulatory requirements were adequately addressed for the design.
- COL items are provided for programs and site-specific aspects, similar to the DC application.