NuScale Power

RAIO-1117-56899

November 02, 2017

Docket No. 52-048

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 148 (eRAI No. 8954) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 148 (eRAI No. 8954)," dated August 05, 2017

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

The Enclosure to this letter contains NuScale's response to the following RAI Question from NRC eRAI No. 8954:

- 03.09.03-12

This letter and the enclosed response make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Marty Bryan at 541-452-7172 or at mbryan@nuscalepower.com.

Sincerely,

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

Distribution: Gregory Cranston, NRC, OWFN-8G9A
Samuel Lee, NRC, OWFN-8G9A
Marieliz Vera, NRC, OWFN-8G9A

Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 8954

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 8954

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

eRAI No.: 8954
Date of RAI Issue: 08/05/2017

NRC Question No.: 03.09.03-12

NRC Commission Paper SECY-95-132, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems (RTNSS) in Passive Plant Designs (SECY-94-084)," includes several provisions to be applied to new reactors with passive emergency cooling systems to provide assurance of proper component performance. For example, these designs should incorporate provisions to test safety-related power-operated valves (POVs) under design-basis differential pressure and flow. In its SRM dated June 28, 1995, the Commission approved those provisions and directed the staff clarify the IST recommendations to demonstrate design capability of safety-related POVs prior to installation, to verify valve capability during a preoperational test, and to periodically verify valve capability during the operational phase. In a public memorandum dated July 24, 1995, the NRC staff provided a consolidated list of the approved policy and technical positions for passive plant designs discussed in applicable Commission papers and their associated SRMs. The NRC issued Regulatory Issue Summary (RIS) 2000-03, "Resolution of Generic Issue 158: Performance of Safety-Related Power-Operated Valves Under Design Basis Conditions," to discuss the application of lessons learned from valve operating experience and research programs to POVs.

NuScale FSAR Tier 2, Section 3.9.6.3.2, "Inservice Testing Program for Power-Operated Valves Other Than MOVs," states that POVs in the IST program and their testing provisions are summarized in tables attached to NuScale FSAR Tier 2, Section 3.9.6. NuScale Tier 2, Section 3.9.6.3.2 and the referenced tables do not provide a full description of the IST program for POVs in the NuScale Power Plant. For example, the NuScale FSAR Tier 2 does not address the lessons learned from operating experience at nuclear power plants for the POV testing program.

Discuss the plans to provide a full description of the IST program for POVs for a NuScale Power Plant, or to specify a COL action item regarding POV testing.

NuScale Response:

NuScale has revised Tier 2, FSAR Section 3.9.6 to fully describe the IST program for Power-Operated Valves (POVs). Two additional COL items were added;

COL Item 3.9-8: A COL applicant that references the NuScale Power Plant design certification will develop specific test procedures to allow detection and monitoring of HOV assembly performance sufficient to satisfy periodic verification design basis capability requirements.

COL Item 3.9-9: A COL applicant that references the NuScale Power Plant design certification will develop specific test procedures to allow detection and monitoring of ECCS valve assembly performance sufficient to satisfy periodic verification design basis capability requirements.

Impact on DCA:

Tier 2, FSAR Section 3.9.6 and Table 1.8-2 have been revised as described in the response above and as shown in the markup provided in this response.

RAI 02.04.13-1, RAI 03.04.02-1, RAI 03.04.02-2, RAI 03.04.02-3, RAI 03.05.01.04-1, RAI 03.05.02-2, RAI-03.06.02-15, RAI 03.07.01-2, RAI 03.07.01-3, RAI 03.07.02-8, RAI 03.07.02-12, RAI 03.09.02-15, RAI 03.09.02-48, RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-6, RAI 03.09.06-16, RAI 03.09.06-27, RAI 03.11-8, RAI 03.11-14, RAI 06.04-1, RAI 09.01.02-4, RAI 09.01.05-3, RAI 09.01.05-6, RAI 09.03.02-3, RAI 09.03.02-4, RAI 09.03.02-5, RAI 09.03.02-6, RAI 09.03.02-8, RAI 10.02-1, RAI 10.02-2, RAI 10.04.10-2, RAI 13.01.01-1, RAI 13.01.01-1S1, RAI 13.02.02-1, RAI 13.03-4, RAI 13.05.02.01-2, RAI 13.05.02.01-2S1, RAI 13.05.02.01-3, RAI 13.05.02.01-3S1, RAI 13.05.02.01-4, RAI 13.05.02.01-4S1

Table 1.8-2: Combined License Information Items

Item No.	Description of COL Information Item	Section
COL Item 1.1-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will identify the site-specific plant location.	1.1
COL Item 1.1-2:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will provide the schedules for completion of construction and commercial operation of each power module.	1.1
COL Item 1.4-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will identify the prime agents or contractors for the construction and operation of the nuclear power plant.	1.4
COL Item 1.7-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will provide site-specific diagrams and legends, as applicable.	1.7
COL Item 1.7-2:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will list additional site-specific P&IDs and legends as applicable.	1.7
COL Item 1.8-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will provide a list of departures from the certified design.	1.8
COL Item 1.9-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will review and address the conformance with regulatory criteria in effect six months before the docket date of the COL application for the site-specific portions and operational aspects of the facility design.	1.9
COL Item 1.10-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will evaluate the potential hazards resulting from construction activities of the new NuScale facility to the safety-related and risk significant structures, systems, and components of existing operating unit(s) and newly constructed operating unit(s) at the co-located site per 10 CFR 52.79(a)(31). The evaluation will include identification of any management and administrative controls necessary to eliminate or mitigate the consequences of potential hazards and demonstration that the limiting conditions for operation of an operating unit would not be exceeded. This COL item is not applicable for construction activities (build-out of the facility) at an individual NuScale Power Plant with operating NuScale Power Modules.	1.10
COL Item 2.0-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will demonstrate that site-specific characteristics are bounded by the design parameters specified in Table 2.0-1. If site-specific values are not bounded by the values in Table 2.0-1, the COL applicant will demonstrate the acceptability of the site-specific values in the appropriate sections of its combined license application.	2.0
COL Item 2.1-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will describe the site geographic and demographic characteristics.	2.1
COL Item 2.2-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will describe nearby industrial, transportation, and military facilities. The COL applicant will demonstrate that the design is acceptable for each potential accident, or provide site-specific design alternatives.	2.2
COL Item 2.3-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will describe the site-specific meteorological characteristics for Section 2.3.1 through Section 2.3.5, as applicable.	2.3
COL Item 2.4-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will investigate and describe the site-specific hydrologic characteristics for Section 2.4.1 through Section 2.4.14, as applicable.	2.4

Table 1.8-2: Combined License Information Items (Continued)

Item No.	Description of COL Information Item	Section
COL Item 3.9-2:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will develop design specifications and design reports in accordance with the requirements outlined under American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section III (Reference 3.9-1). A COL applicant will address any known issues through the reactor vessel internals reliability programs (i.e. Comprehensive Vibration Assessment Program, steam generator programs, etc.) in regards to known aging degradation mechanisms such as those addressed in Section 4.5.2.1.	3.9
COL Item 3.9-3:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will provide a summary of reactor core support structure ~~maximum total stress,~~ASME Service Level Stresses, deformation, and cumulative usage factor values for each component and each operating condition in conformance with ASME Boiler and Pressure Vessel Code Section III Subsection NG.	3.9
COL Item 3.9-4:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will submit a Preservice Testing program for valves as required by 10 CFR 50.55a.	3.9
COL Item 3.9-5:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will establish an Inservice Testing program in accordance with ASME OM Code and 10 CFR 50.55a.	3.9
COL Item 3.9-6:	~~A COL Applicant that references the NuScale Power Plant design certification will identify any site-specific valves and provide inservice testing in accordance with the latest endorsed ASME Code with addenda of the ASME OM Code incorporated by reference by 10 CFR 50.55a 18 months prior to the date for initial fuel load.~~A COL applicant that references the NuScale Power Plant design certification will identify any site-specific valves, implementation milestones, and the applicable ASME OM Code (and ASME OM Code Cases) for the preservice and inservice testing programs. These programs are to be consistent with the requirements in the latest edition and addenda of the OM Code incorporated by reference in 10 CFR 50.55a in accordance with the time period specified in 10 CFR 50.55a before the scheduled initial fuel load (or the optional ASME Code Cases listed in RG 1.192 incorporated by reference in 10 CFR 50.55a).	3.9
COL Item 3.9-7:	~~Where the NuScale definition of Modes of Operation differ from those defined in the ASME OM Code, an Alternative may be provided to reconcile the terminology. A COL Applicant that reference the NuScale Power Plant design certification will generate any relief request(s) needed as part of the Inservice Testing Program Document.~~A COL applicant that references the NuScale Power Plant design certification will generate any relief request(s) needed as part of the Inservice Testing Program Document. Where the NuScale Power Plant design certification definition of modes of operation differs from those defined in the ASME OM Code, an Alternative may be provided to reconcile the terminology.	3.9
COL Item 3.9-8:	A COL applicant that references the NuScale Power Plant design certification will develop specific test procedures to allow detection and monitoring of HOV assembly performance sufficient to satisfy periodic verification design basis capability requirements.	3.9
COL Item 3.9-9:	A COL applicant that references the NuScale Power Plant design certification will develop specific test procedures to allow detection and monitoring of ECCS valve assembly performance sufficient to satisfy periodic verification design basis capability requirements.	3.9
COL Item 3.9-10:	A COL applicant that references the NuScale Power Plant design certification will verify that evaluations are performed during the detailed design of the MS lines utilizing acoustic resonance screening criteria and additional calculations as necessary (e.g., Strouhal number) to determine if there is a concern. The methodology contained in "NuScale Comprehensive Vibration Assessment Program Technical Report," TR-0716-50439 is acceptable for this purpose. The COL applicant will update Section 3.9.2.1.1.3 to describe the results of this evaluation.	3.9
COL Item 3.10-1:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will develop and maintain a site-specific seismic and dynamic qualification program.	3.10
COL Item 3.10-2:	A COL ~~Applicant~~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.	3.10
COL Item 3.10-3:	A COL ~~Applicant~~applicant that references the NuScale Power Plant design certification will submit an implementation program for Nuclear Regulatory Commission approval prior to the installation of the equipment that requires seismic qualification.	3.10

3.9.5.2 Loading Conditions

Design, construction, and testing of the RVI core support structures and internal structures are in accordance with ASME BPVC Section III, Division 1, Subsection NG.

Section 3.6.2 provides determination and evaluation of pipe rupture locations and loads, and includes dynamic effects of postulated rupture of piping. Section 3.9.1 provides acceptable analytical methods for Seismic Category I components and supports designated ASME BPVC, Section III, Division 1, Class CS, which include RVI. The plant and system operating transient conditions including postulated seismic events and DBE that provide the basis for the design of the RVI are provided in Section 3.9.3. Section 3.9.2 addresses the results of the comprehensive vibration assessment program including the preoperational vibration test program plan for the RVI that is consistent with the guidelines of RG 1.20.

RAI 03.09.06-27

COL Item 3.9-3: A COL applicant that references the NuScale Power Plant design certification will provide a summary of reactor core support structure ASME Service Level Stresses, deformation, and cumulative usage factor values for each component and each operating condition in conformance with ASME Boiler and Pressure Vessel Code Section III Subsection NG.

3.9.5.3 Design Bases

Pursuant to GDC 10, the RVI are designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences.

The RVI core support structures and internal structures are designed for the service loadings and load combinations shown in Table 3.9-5. The method of combining loads for ASME service level A, B, C, D, and test conditions is addressed in Section 3.9.3.

Section 3.9.3.1 describes allowable design or service loads to be applied to the RVI and the effects of service environments, deflection, cycling, and fatigue limits.

Section 3.9.2 provides the dynamic analyses of the RVI design under steady-state and operational transient conditions, and the proposed program for pre-operational and startup testing of flow-induced vibration and acoustic resonance.

Structural integrity evaluation for the structural design adequacy and ability, with no loss of safety function, of the reactor vessel internals (RVI) to withstand the loads from breaches in high energy pressure boundaries in combination with the safe shutdown earthquake is provided in Section 3.9.3.

3.9.6 Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

This section describes the functional design, and qualification provisions for preservice (PST) and inservice testing (IST) program for ASME BPVC Code, Section III Class 1, Class 2, Class 3, and non-safety-related and non-ASME valves that have been added to the IST program as having an important function and augmented quality requirements. The NuScale Power Plant standard design does not have any pumps or dynamic restraints which perform a specific function identified in the ASME OM Code (OM-2012) Subsection ISTA-1100 (Reference 3.9-3).of safety-related valves that are designated as Class 1, 2, or 3 under Section III of the ASME BPV Code and meet the requirements of the OM Code, Subsection ISTA-1100. This also includes valves not categorized as ASME BPV Code Class 1, 2, or 3 that have a safety-related function. Inservice testing of ASME Code Class 1, 2, and 3 valves is performed in accordance with the ASME Operation and Maintenance (OM) Code and applicable addenda, as endorsed by 10 CFR 50.55a(f), or where relief has been granted by the NRC in accordance with 10 CFR 50.55a(f).

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The provisions and programs described here verify that components in the IST program are in a state of operational readiness to perform their intended functions throughout the life of the plant.Testing requirements for pumps, valves, and dynamic restraints are specified in the ASME OM Code (Reference 3.9-3). The ASME OM-2012 and 2017 Code Editions were used to develop the inservice testing plan for the NuScale Power Plant design certification. The NuScale inservice testing plan includes a limited number of valves not constructed to the ASME Code. These valves are relied on in some safety analyses. The plan also considers the guidance provided in NUREG-1482 Revision 2.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The IST of valves is performed in accordance with the ASME OM Code, as required by 10 CFR 50.55a(f). In addition, the program also considers the guidance provided in RG 1.192 and NUREG-1482 ASME OM Code, Subsection ISTC defines the functional testing requirements for valves.ASME OM Code, Subsection ISTC specifies requirements for functional testing of valves. The functional tests are required for valves that have an active safety-related function.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

In addition to the valves that meet the criteria of ISTA-1100, valves identified by the Design Reliability Assurance Program (DRAP) as augmented quality are included in an augmented IST program, also described in this section.The NuScale inservice test plan includes testing of valves in nonsafety-related systems that perform safety-related functions, such as decay heat removal boundary, main steam isolation, or feedwater isolation.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The NuScale Power Plant does not have any pumps or dynamic restraints which perform a specific function identified in the ASME OM Code Subsection ISTA-1100 (Reference 3.9-3).

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The following GDC apply to this section

- GDC 1 requires, in part, that structures, systems, and components (SSC), which include pumps, valves, and dynamic restraints be designed, fabricated, erected, constructed,

~~and inspected to quality standards commensurate with the importance of the safety functions they perform.~~

- ~~GDC 2 requires, in part, that components be designed to withstand the effects of severe natural phenomena, combined with appropriate effects of normal and accident conditions, without a loss of capability to perform their safety functions~~
- ~~GDC 4 requires, in part, that components be designed to accommodate the effects of, and be compatible with, the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents as described in Section 3.11. In addition, the NuScale Power Plant design applies the leak-before-break methodology to eliminate the dynamic effects of pipe rupture, as described in Section 3.6.3.~~
- ~~GDC 14 requires that the reactor coolant pressure boundary (RCPB) be designed with an extremely low probability of abnormal leakage, rapidly propagating failure, and gross rupture.~~
- ~~GDC 15 requires that the reactor coolant system (RCS) be designed with sufficient margin of safety so that the design conditions of the RCPB are not exceeded during conditions of normal operation, including AOOs.~~
- ~~GDC 37 requires that the emergency core cooling system be designed to permit periodic functional testing to ensure leak-tight integrity and performance of the active components. The tests verify the operability and performance of the active components in accordance with the ASME OM Code.~~
- ~~GDC 43 requires the containment atmospheric cleanup system to have functional testing to verify leak tightness. The NuScale Power Plant design does not have a containment atmospheric cleanup system.~~
- ~~GDC 46 requires that the cooling water system be designed to permit periodic functional testing to ensure leak tight integrity and performance of the active components. The tests verify the operability and performance of the active components in accordance with the ASME OM Code.~~
- ~~GDC 54 requires that piping systems penetrating the primary reactor containment be provided with the capability to periodically test the operability of the isolation valves and determine valve leakage acceptability. The IST program ensures the active components operability and performance are in accordance with the ASME OM Code.~~

RAI 03.09.06-27

COL Item 3.9-4: A COL applicant that references the NuScale Power Plant design certification will submit a Preservice Testing program for valves as required by 10 CFR 50.55a.

RAI 03.09.06-27

COL Item 3.9-5: A COL applicant that references the NuScale Power Plant design certification will establish an Inservice Testing program in accordance with ASME OM Code and 10 CFR 50.55a.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Components subject to the preservice and the inservice testing plan are identified in Table 3.9-16. The method and frequency of preservice and inservice testing are also identified.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

NuScale Mode 3 safe shutdown with all reactor coolant temperatures < 200 °F is considered to be the equivalent of cold shutdown outage as defined in the OM Code ISTA-2000. The term cold shutdown is used in this subsection for clarity with OM Code requirements. NuScale Power Plant modes of operation differ from other pressurized water reactor standard technical specifications. Mode 3 safe shutdown reactivity condition is k_{eff} < 0.99 and all reactor coolant temperatures < 420 °F. Containment and containment isolation operability is required at temperatures ≥ 200 °F. To meet the intent of the ASME OM Code for cold shutdown, safe shutdown with reactor coolant temperatures < 200 °F is an equivalent condition where the NPM is stable, important safety systems are not required, and cold shutdown testing can commence per OM Code requirements.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Refueling outage as defined in OM Code ISTA-2000 is Mode 5, Refueling in the NuScale Technical Specifications. The term “refueling” is used in this section.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

COL Item 3.9-7: Where the NuScale definition of modes of operation differ from those defined in the ASME OM Code, an alternative may be provided to reconcile the terminology. A COL applicant that references the NuScale Power Plant design certification will generate any request(s) for alternatives needed as part of the Inservice Testing Program Document.

3.9.6.1 Functional Design and Qualification of Pumps, Valves, and Dynamic Restraints

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~The NuScale Power Plant standard design does not have any safety-related pumps, dynamic restraints, or motor operated valves.~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The functional design and qualification of safety-related valves is performed in accordance with ASME QME-1 ~~(QME-1-2007),~~ as endorsed in RG 1.100, ~~Revision 3 with clarifications~~ as described in Section 3.10.2. Qualification for the electrical components of valves is described in ~~FSAR Section~~Chapter 3.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

In accordance with 10 CFR 50.55a(f)(3), Class 1, 2 and 3 valves are designed and provided with access to enable the performance of inservice testing to assess operational readiness in accord with the ASME OM Code and as defined in the inservice testing ~~program~~plan (Section 3.9.6.3.4). ~~Working platforms are provided in areas requiring inspection and servicing of valves.~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~A COL applicant that references the NuScale Power Plant design certification will incorporate all IST access requirements into the design and construction, as specified by 10 CFR 50.55a(f)(3). The quality assurance requirements for the design, fabrication, construction, and testing safety-related pumps, valves, and dynamic restraints~~Access requirements have been incorporated into the engineering design and construction documents, as specified by 10 CFR 50.55a(f)(3). The quality assurance requirements for the design, fabrication, construction, and testing of safety-related valves is controlled by the plant Quality Assurance program as described in Chapter 17. These requirements are in accordance with 10 CFR 50 Appendix B.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.2 Inservice Testing ~~Program for~~ of Pumps

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~The NuScale Power Plant design does not have any pumps which perform a specific function identified in ASME OM Code Subsection ISTA-1100.~~Pumps that meet the criteria of ISTA-1100 are subject to the inservice testing requirements of ISTB. The NuScale Power Plant design contains no safety-related pumps and no nonsafety-related pumps that meet the criteria of ISTA-1100. Therefore, the NuScale inservice test plan does not include any pumps.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.3 Inservice Testing ~~Program for~~of Valves

Valves that meet the criteria of ISTA-1100 are subject to the inservice testing requirements of ISTC. The valves that are subject to inservice testing include those valves that perform a specific function in shutting down the reactor to a safe shutdown condition, in maintaining a safe shutdown condition, or in mitigating the consequences of an accident. Inservice testing of valves verifies the operational readiness including actuating, leakage, and position verification. Pressure relief devices subject to inservice testing are those used for protecting systems or portions of systems that perform a function in shutting down the reactor to a safe shutdown condition, in maintaining a safe shutdown condition, or in mitigating the consequences of an accident.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The NuScale inservice test plan includes valves classified as ASME Code Class 1, Class 2, and Class 3 valves and non-ASME valves that meet the criteria of ISTA 1100. The NuScale inservice test plan also includes testing of nonsafety-related valves that perform safety-related functions. The NuScale inservice valve test plan is summarized in Table 3.9-16 and includes information regarding the scope of the valve preservice and inservice testing plan, valve functions, valve categories, and test frequencies. The NuScale inservice test plan adheres to the requirements of ASME OM, Subsection ISTC. Lessons learned from operating experience at nuclear power plants were used in the development of the inservice testing plan. NRC Generic Letters, NUREG-1482, industry, and utility guidelines were considered in developing the inservice test plan and are reflected in the requirements identified in Table 3.9-16. The testing of power-operated valves uses guidance from NRC Regulatory Issue Summary (RIS) 2000-03 and the Joint

Owners Group (JOG) on air-operated valve (AOV) testing. The lessons learned from this guidance are reflected in the inservice testing plan and valve qualification testing requirements for both AOVs and hydraulic-operated valves (HOVs).

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Inservice testing may incorporate the use of nonintrusive techniques to periodically assess performance and degradation of selected check valves. The ASME OM ISTC requires that safety-related check valves be exercise tested in both the open and closed direction, regardless of the safety function position. Safety-related power-operated valves that have an active function require an exercise test and an operability test. The operability test verifies that the valve can perform its intended safety function and can be either a dynamic test (with flow and differential pressure) or a static test. Operability testing is discussed in Section 3.9.6.3.2 (3).

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The NuScale design does not use any safety-related:

- motor operated valves,
- manual valves, or
- valves that are actuated by an energy source capable of only one operation, such as a rupture disk or explosively actuated valve.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

A valve test program will be developed and administered by the COL applicant and based on the inservice test plan outlined in this subsection.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~The NuScale Power Plant IST program applies to valves classified as ASME Code Class 1, Class 2, or Class 3 valves and non-ASME valves that meet the criteria of ISTA-1100. The IST valve program is summarized in Table 3.9-15 through Table 3.9-23. Table 3.9-15 and Table 3.9-16 include information regarding scope of the valve program, valve functions, valve categories, and test frequencies.~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~Valves are exercised at the frequency identified in Table 3.9-17 through Table 3.9-23 to affirm their continued availability for service. If a valve fails its surveillance test or exceeds degradation criteria, corrective actions are taken. Periodic Verification of power operated valves will be performed in accordance with the ASME OM Code and the requirements of 10CFR50.55a.~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~Grouping of valves for analysis or testing in accord with the ASME OM Code is done by valve type, model, and size. The population of each group is made up of valves from all installed NPM. The NuScale IST plan consists of 564 total valves (for 12 NPMs) divided into 15 valve groups. This results in 47 valves per NPM for a NuScale 12-module facility.~~

RAI 03.09.06-27

COL Item 3.9-6: ~~A COL applicant that references the NuScale Power Plant design certification will identify any site-specific valves and provide inservice testing in accordance with the latest endorsed ASME Code with addenda of the ASME OM Code incorporated by reference by 10 CFR 50.55a 18 months prior to the date for initial fuel load.~~A COL applicant that references the NuScale design certification will identify any site-specific valves, implementation milestones, and the applicable ASME OM Code (and ASME OM Code Cases) for the preservice and inservice testing programs. These programs are to be consistent with the requirements in the latest edition and addenda of the OM Code incorporated by reference in 10 CFR 50.55a in accordance with the time period specified in 10 CFR 50.55a before the scheduled initial fuel load (or the optional ASME Code Cases listed in RG 1.192 incorporated by reference in 10 CFR 50.55a).

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.3.1 ~~Inservice Testing for Motor-Operated Valves~~Valve Functions Tested

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~The NuScale Power Plant design does not have any motor-operated valves that perform a specific function identified in ASME OM code Subsection ISTA-1100.~~The NuScale inservice testing plan identifies the intended safety-related functions for valves in NuScale systems. Open (active function) and Closed (active function) safety-related functions have been identified in Table 3.9-16.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Inservice tests confirm the ability of the valve to perform the intended function(s). An active valve is defined as a valve that is required to open or close to reach its safety function position. Active valves, as defined in ASME OM ISTA, are "valves that are required to change obturator position to accomplish a specific function in shutting down a reactor to the safe shutdown condition, maintaining the safe shutdown condition, or mitigating the consequences of an accident."

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

There are no passive valves in the NuScale design that meet the requirements of ISTA-1100. Therefore, no passive valves are included in the inservice testing plan.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The NuScale design does not rely on safety-related electrical power to position valves to their safety function position. All valves classified as active in Table 3.9-16 are designed to fail to their safe position. These valves have a fail-safe test specifically identified, and this function will be tested as part of the exercise test.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Valve safety functions and actuator characteristics are used to determine the type of inservice testing required. These valve functions include:

- active movement to meet their safety-related function(s). All NuScale safety-related active valves fail to their safe position.

- reactor coolant pressure boundary isolation.
- containment isolation.
- limiting seat leakage. Seat leakage is limited to a specific maximum amount when required to meet the safety-related function.
- remote position indication.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Valve safety functions and valve characteristics were used to determine ASME inservice testing categories. The following criteria are used in assigning the ASME OM Code categories to the NuScale valves.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Category A - valves with safety-related seat leakage requirements (valves for which seat leakage is limited to a specific maximum amount in the closed position for fulfillment of their required function)

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Category B - valves requiring inservice testing, but without safety-related seat leakage requirements (valves for which seat leakage in the closed position is inconsequential for fulfillment of the required function)

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Category C - safety-related, self-actuated valves, such as check valves and pressure relief devices, and valves that are self-actuating in response to some system characteristic, such as pressure (relief valves) or flow direction (check valves) for fulfillment of the required function

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The NuScale design does not utilize any Category D valves.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.3.2 ~~Inservice Testing Program for Power-Operated Valves Other Than MOVs~~Valve Testing

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Valve testing is specified in ASME OM ISTC, Mandatory Appendices I, II and IV. Five types of inservice tests have been identified for the NuScale Power Plant.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

(1) Valve Position Verification Tests

Valves that are included in the inservice testing plan that have position indication will be observed locally or by a change in system parameter (flow, pressure, etc.) during valve exercising to verify proper operation of the position indication. The frequency for this position indication test is once every two years, unless otherwise justified.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

(2) Valve Leakage Tests

Valves with safety-related seat leakage limits will be tested to verify their seat leakage. These valves include:

- Containment Isolation - valves that provide isolation for fluid penetrations into the containment and must meet the requirements of 10 CFR 50 Appendix J.
- Decay Heat Removal System Boundary - valves that close to establish the DHRS boundary so closed-loop, natural circulation heat removal can be established between the DHRS and the SGS.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Containment Isolation

Containment isolation valves (CIVs) are leak tested in accordance with 10 CFR 50, Appendix J and ISTC-3620. These valves are tested individually as a part of the Type C testing. Containment leak rate testing is discussed in Section 6.2.6 and in Technical Report TR-1116-51962, "NuScale Containment Leakage Integrity Assurance." NuScale CIVs adhere to the provisions in 10 CFR 50.55a(b)(2). CIVs referenced in the NuScale inservice test plan shall meet the corrective action requirements of the ASME OM ISTC if the CIV fails to meet its leakage criteria.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Decay Heat Removal System Boundary

Secondary system CIVs (SSCIVs) close automatically to isolate steam lines, feed lines, establish the containment boundary, and to establish the decay heat removal system (DHRS) boundary. Nonsafety-related backup SSCIVs have a safety-related function to isolate steam lines and feed lines and to establish the decay heat removal system boundary. Both the SSCIVs and backup SSCIVs have safety-related, specific leakage criteria. The leakage criteria are selected to maintain DHRS inventory within acceptable limits. SSCIVs and backup SSCIVs are leak tested in accordance with ISTC-3630.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Pressure Isolation Valves

Pressure isolation valves that provide isolation between high- and low-pressure systems are not used in the NuScale design. Instead, eight safety-related Chemical Volume and Control System (CVCS) CIVs perform the following RCS isolation functions:

- isolating RCS makeup to prevent overfilling of the pressurizer during non-LOCA transients. This function is provided by closing the CVCS makeup line and spray line isolation valves.
- isolating CVCS postulated breaks outside containment, thereby maintaining RCS inventory. This function is provided by closing the CIVs on all four CVCS lines.
- protecting against reverse RCS flow during low-power startup conditions. The protection function against RCS reverse flow is achieved by closing the CVCS makeup line CIVs.

This pressure isolation function is controlled by NuScale Technical Specification 3.4.6, Chemical Volume and Control System (CVCS) Isolation Valves. The NuScale design does not incorporate dedicated pressure isolation valves.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

(3) Power-Operated Valve Tests

Power-Operated Valve Exercise Tests - Valves identified in Table 3.9-16 as having an active safety function shall be exercised periodically in accordance with the ASME OM ISTC. Safety-related power-operated valves (POVs) in the NuScale design consist of AOVs and HOVs.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

ISTC requires that POVs be exercise tested quarterly. However, when it is not practical to exercise the valve during plant operation, a valve can be tested less frequently. If quarterly full-stroke exercise testing of a valve is not practical, then full-stroke testing is performed during cold shutdowns no more often than quarterly. If cold shutdown testing is not practical, then the full-stroke testing may be performed each refueling cycle.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The inservice testing requirement for measuring stroke time for valves in the NuScale Power Plant may be completed in conjunction with a valve exercise inservice test. The exercise test identified in Table 3.9-16 includes the stroke time test.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

All NuScale safety-related, power-operated valves fail to their safety-related function position and are subject to a valve exercise inservice test and a fail-safe test.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The valve exercise and fail-safe tests are intended to verify that the valve repositions to its safety-related position on loss of actuator power. The valve exercise test may satisfy this requirement if the exercise test removes actuator power from the valve.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The fail-safe test is identified as a separate test in Table 3.9-16 for clarity; however, the fail-safe and exercise test may be the same inservice test.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Valves that operate during normal plant operation at a frequency that satisfies the exercising requirement do not have to have an additional exercise test provided that the observations (and measurements) required of inservice testing are made and recorded at the required frequency specified by ISTC and that fail-safe requirements have been met.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Power-Operated Valve Operability Tests - Lessons learned from operating experience at nuclear power plants were used in developing the NuScale design. The results are a simplified design that relies on passive safety systems and far fewer components than in a typical inservice testing plan. The active safety functions of the high safety significant valves in the NuScale inservice test plan include containment isolation (reactor coolant pressure boundary) and emergency core cooling.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

This results in the following high-safety-significant POV groups for the NuScale Power Plant ECCS valves (PORV), which include both the reactor recirculation valves and the reactor vent valves, and small actuator HOVs that include reactor coolant pressure boundary CIVs.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Operability testing to ensure that NuScale power-operated valves perform their intended safety function(s) when called upon shall consider NRC RIS 2000-03 and OM Mandatory Appendix IV. The requirements for OM Mandatory Appendix IV are applied to both AOVs and HOVs. Lessons learned and recommendations from the AOV Joint Owners Group are considered in the development of the specific on-site operability test procedures for all NuScale POVs.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

NuScale HOV (large and small actuator) operability testing will contain the following attributes:

- verification of the integrity of the nitrogen cylinder via visual inspection
- recording of as-found and as-left nitrogen pressure and temperatures when performing stroke time measurements
- comparing of nitrogen pressure and temperature with the previous valve tests to determine cylinder leakage rate over the test period
- testing the two redundant, fail-safe hydraulic vent paths on each valve separately to ensure that each vent path is fully functional
- measuring and trending obturator torque periodically to verify and monitor valve friction degradation

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

NuScale ECCS valve operability testing contains the following attributes:

- testing or inspection to ensure Cv(min) (minimum flow capacity) is confirmed
- testing of the inadvertent block valve function
- testing of any ECCS valve not opened during exercise testing during NPM shutdown to demonstrate that the valve will open on low RCS pressure while the trip valve remains energized (closed)

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

COL Item 3.9-8: A COL applicant that references the NuScale Power Plant design certification will develop specific test procedures to allow detection and monitoring of HOV assembly performance sufficient to satisfy periodic verification design basis capability requirements.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

COL Item 3.9-9: A COL applicant that references the NuScale Power Plant design certification will develop specific test procedures to allow detection and monitoring of ECCS valve assembly performance sufficient to satisfy periodic verification design basis capability requirements.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

(4) Check Valve Tests

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Check Valve Exercise Tests - Check valves identified with specific safety-related functions to transfer closed or maintain close are periodically tested.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

There are no check valves with an open safety function in the NuScale design.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

There are four check valves per NPM in the NuScale inservice test plan. They are all normally closed, nozzle check valves in the feedwater line. Valves FW-CKV-1002/2002 are safety-related and are located outboard of the FWIVs in the same valve body. Valves FW-CKV-1007/2007 are nonsafety-related located in the feedwater header in the Reactor Building. All four valves are required to close rapidly on a feedwater line breach to preserve DHRS inventory until the FWIV and the feedwater regulating valve close.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

These valves are of the same four-inch nozzle check valve design and are grouped together when applying the criteria of ASME OM Code Mandatory Appendix II. The valves are tested during cold shutdown as detailed in Table 3.9-16.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

ISTC requires that check valves be exercised to both the open and closed positions regardless of their safety function position. The exercise test is intended to show that the check valve will open in response to flow and close when the flow is stopped. In all cases, the open exercise test is in the nonsafety function position. Sufficient flow shall be provided to demonstrate that the valve obturator fully opens. This test may be performed during normal operation in accordance with ISTC-3550, Valves in Regular Use. During the closed exercise test, valve obturator position is verified by direct measurements using nonintrusive devices or by other positive means (i.e., seat leakage or other system parameters). The acceptance criteria for assessing individual valve performance is based on full open (achieving design minimum flowrates) and valve closure verification using backflow tests. Valves that cannot be verified using a flow test may use other means to exercise the valve to the open and closed position as described in ISTC.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The NuScale check valve test frequencies are identified in Table 3.9-16. The ASME Code requires that check valves be exercise tested quarterly. However, when it is not practical to exercise the valve during plant operation, a check valve can be tested less frequently. If quarterly exercise testing of a check valve is not practical, then exercise testing is performed during cold shutdowns no more often than quarterly. If cold shutdown testing is not practical, then check valve exercise testing shall be performed each refueling cycle. Other means of exercise testing include nonintrusive diagnostic techniques or valve disassembly and inspection.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

(5) Pressure Relief Device Tests

Pressure relief devices that meet the criteria of ISTA-1100 are required to have periodic inservice testing. The inservice tests for these valves are identified in ASME OM Code Mandatory Appendix I.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Preservice and periodic inservice tests are specified in Mandatory Appendix I according to pressure relief device type and ASME Code class. The testing includes visual inspection, seat tightness determination, set pressure determination, and operational determination of balancing devices, alarms, and position indication as appropriate.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The NuScale Power Plant has two ASME Code Class 1 reactor safety valves per NPM. The frequency for inservice testing of ASME Class 1 safety valves is every five years. Twenty percent of the valves from this valve group are tested within any 24-month interval for Class 1 safety valves.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The NuScale Power Plant has two ASME Code Class 2 SGS thermal relief valves per NPM. The frequency for inservice testing of ASME Class 2 SGS thermal relief valves is every 10 years for ASME Class 2 devices. Twenty percent of the valves from this valve group are tested within any 48-month interval.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

There are no Class 3 pressure relief devices.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

There are no other safety-related pressure relief devices used in the NuScale design. The NuScale design does not contain safety-related main steam safety valves or nonreclosing pressure relief devices for overpressure protection.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~Power-operated valves (POVs) included in the IST program and their testing requirements are summarized in Table 3.9-17 through Table 3.9-22.~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~Testing and assessment of active pneumatically operated valves is in accordance with ASME OM Code (Reference 3.9-3) Subsection ISTC. There are four groups of active pneumatically operated valves as follows:~~

- ~~chemical and volume control system (CVCS) boron dilution isolation valves consisting of two valves per NPM (24 valves total)~~
- ~~FW regulating valves consisting of two valves per NPM (24 valves total)~~
- ~~backup main steam isolation valves (MSIV) consisting of two valves per NPM (24 valves total)~~
- ~~backup MS isolation bypass valves consisting of two valves per NPM (24 valves total).~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~Testing and assessment of active hydraulic-operated valves (HOVs) is in accordance with ASME OM Code (Reference 3.9-3) Subsection ISTC. There are five groups of HOVs as follows:~~

- ~~2-inch containment isolation valves consisting of 16 valves per NPM (192 valves total)~~
- ~~feedwater isolation valves, consisting of two valves per NPM (24 valves total)~~
- ~~MSIVs consisting of two valves per NPM (24 valves total)~~
- ~~MS isolation bypass valves consisting of two valves per NPM (24 valves total)~~
- ~~DHRS actuation valves consisting of four valves per NPM (48 valves total)~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.3.3 ~~Inservice Testing Program for Check Valves~~Valve Disassembly and Inspection

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

There are four check valves per NPM in the NuScale inservice testing plan. These valves are normally closed, nozzle check valves located in the feedwater system. The safety-related feedwater check valves (FW-CKV-1002/2002) are located in the FWIV body and can be leak tested to satisfy the closed exercise test. The nonsafety-related backup feedwater check valves (FW-CKV-1007/2007) are located in the RXB in the feedwater header. Valve disassembly and inspection may be required if nonintrusive techniques do not prove to be reliable. The valve group is the four nozzle check valves in each NPM (48 check valves total).

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Disassembly and inspection of other types of valves is performed based on information from qualification testing, inservice testing, or other program requirements, such as:

- NuScale PRA importance measures.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

- historical performance of power-operated valves (identify valve types which experience unacceptable degradation in service.)
- basic design of valves including the use of components subject to aging and requiring periodic replacement.
- analysis of valve test results during valve qualification tests.
- analysis of trends of valve test parameters during valve inservice tests.
- nonintrusive techniques to be applied where possible. Nonintrusive techniques are preferable to disassembly and inspection if both methods sufficiently detect valve degradation.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The program for periodic check valve disassembly and inspection includes evaluation to determine which of the valves identified in the inservice testing plan in Table 3.9-16 require disassembly and inspection and the frequency of the inspection. If the test methods in ISTC-5221(a) and ISTC-5521(b) are impractical for certain check valves, a sample disassembly examination program is used to verify valve obturator movement. The sample disassembly examination program groups check valves of similar design, application, and service condition, and requires a periodic examination of one valve from each group.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~Check valves included in the IST program and their testing requirements are summarized in Table 3.9-19. Testing and assessment of check valves is in accordance with ISTC-3522 and Check Valve Condition Monitoring (OM Mandatory Appendix II). There are two groups of check valves in the program, the feedwater (FW) isolation check valves and the FW backup isolation check valves, consisting of four valves per NPM (48 valves total).~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.3.4 ~~Pressure Isolation Valve Leak Testing~~Valve Accessibility

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

The design of the NuScale Power Plant allows for the ability to access valves for the performance of preservice and inservice testing as required by 10 CFR 50.55a and the ASME OM Code. Neither relief from Code requirements nor application of any approved ASME Code Case is expected to be implemented as part of the NuScale inservice testing plan. The valves in the inservice testing plan are located in the following areas.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Inside Containment

ECCS valves (5), RSVs (2) and SGS thermal relief valves (2) are located inside the CNV. The ECCS valves are exercised tested remotely as the NPM is being shut down for refueling (Mode 5). ECCS operability testing can be performed remotely or if the valves are removed from containment and bench tested. The RSVs and SG thermal relief valves are removed for bench testing at the test frequency specified by the OM Code Mandatory Appendix I.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Containment Vessel Head

The NuScale containment isolation design ensures sufficient valve accessibility for testing and maintenance. This is achieved by containment vessel (CNV) head penetration spacing and a compact CIV design. To meet the GDC 55, 56 and 57 criteria that "isolation valves outside containment shall be located as close to the containment as practical," all safety-related CIVs (22) are located on top of the CNV head. The DHRS actuation valves (4) and the feedwater check valves (2) (located in the FWIV body) are located on the CNV head. Figure 6.2-3b shows CNV head penetrations. These 28 valves are located on top of the CNV head and underneath the top support structure. All POVs on the CNV head are of a hydraulic-operator with nitrogen gas closure design. This actuator design is more compact than that of a hydraulic-operator with spring closure. All valve bodies, except the MSIVs, MISBVs, and DHRS actuation valves are welded directly to the CNV nozzle safe-ends. MSIVs are welded to an ASME Code Class 2, NPS 12, approximate 4-foot length main steam pipe (Table 6.2-4). The MSIBVs are integral to the MSIV body (Figure 6.2-6a). The DHRS actuation valves are located near the MSIVs, off of a branch line from the same NPS 12 main steam pipe.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Inservice tests that require local access at the CNV head are containment leak rate testing, DHRS boundary valve leak rate testing, and the feedwater check valve closed exercise test (leak test). Each valve is designed with an "in-service" and "test" insert (Figure 6.2-5, Figure 6.2-6a, and Figure 6.2-6b). This design allows for Appendix J Type C, Technical Specification surveillance for DHRS, or a check valve exercise test to be performed locally. The in-service insert is designed to allow Appendix J Type B testing following IST completion.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Operability testing will be performed remotely by temporary or permanently installed local diagnostic sensors.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Reactor Building Valves

The CVCS demineralized water supply isolation valves (2) and the backup secondary system containment isolation valves (8) are contained outside the NPM bioshield and located in the Reactor Building. These valves are accessible for testing and maintenance.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

~~The NuScale Power Plant design does not contain any pressure isolation valves which perform a specific function identified in ASME OM code Subsection ISTA-1100.~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.3.5 ~~Containment Isolation Valve Leak Testing~~

~~Containment isolation valves subject to leak testing are shown in Table 3.9-19. Testing requirements for these valves are also shown in the table. ASME Class boundaries relative to containment isolation valves are shown in Figure 3.6-1.~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.3.6 ~~Inservice Testing Program for Safety and Relief Valves~~

~~RAI 03.09.06-15~~

~~Safety and relief valves included in the IST program and their testing requirements are presented in Table 3.9-23. Pressure Relief Devices (OM Mandatory Appendix I) have four groups of valves, the reactor safety valves, the reactor vent valves (RVV), reactor recirculation valves (RRV), and steam generator system (SGS) thermal relief valves. The reactor safety valves consist of two valves per NPM (24 valves total). The RVVs are power-actuated relief valves that meet elements of Subsection ISTC of the ASME OM Code. The RVVs consist of three valves per NPM (36 valves total). These valves are tested in place each refueling outage. The RRVs meet the elements of Subsection ISTC of the ASME OM Code. The RRVs consist of two valves per NPM (24 valves total), and these valves are tested in place each refueling outage. The SGS thermal relief valves consist of two valves per NPM (24 valves total). All of these valves are grouped per NPM to meet the intent of Mandatory Appendix I. Any problems identified during testing are evaluated for generic applicability to the entire NuScale Power Plant.~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.3.7 Inservice Testing Program for Manually Operated Valves

There are no manually-operated safety-related valves in the NuScale Power Plant design which perform a specific function identified in ASME OM code Subsection ISTA-1100.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.3.8 Inservice Testing Program for Explosively Activated Valves

The NuScale Power Plant design does not utilize explosive valves.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.4 Inservice Testing Program for Dynamic Restraints

The NuScale Power Plant design does not utilize dynamic restraints.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

3.9.6.5 Relief Requests and Alternative Authorizations to the OM Code

In the event that compliance with ASME OM Code is impractical, a relief request from the code will be submitted in accordance with 10 CFR 50.55a. The relief request will identify the applicable code requirements, describe alternative testing methods and explain why compliance is impractical. The request will provide a specific schedule for implementation of the relief request and justify the request for relief from the ASME OM Code.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

In the event that any ASME OM Code Cases are implemented as part of the inservice testing plan, they shall either be previously accepted by Regulatory Guide 1.192 as incorporated by reference in 10 CFR 50.55a, or be submitted as a separate alternative authorization pursuant to 10 CFR 50.55a(z).

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

No relief requests to the ASME OM Code are anticipated for the NuScale Power Plant design. No ASME Code Cases are anticipated to be invoked for the NuScale inservice testing plan.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

For the purpose of the ISTI Program, a Plant or Unit is what is defined by a "single" license issued by the governing regulatory authority. A plant or unit may consist of multiple "reactors" as long as the reactors are defined inoperated under a single license. The NuScale Power Plant consists of up to 12 NuScale Power Modules (NPMs) licensed under a single operating License. Therefore, as consistent with the Plant operating license(s), a single IST program isplan may used andcover multiple NPMs, provided it is is adjusted as each new NPM train is constructed and exposed to nuclear heat. This approach may be submitted as an Alternative to the Code upon development of the COL applicant's IST ProgramPlan.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

COL Item 3.9-7: ~~Where the NuScale definition of Modes of Operation differ from those defined in the ASME OM Code, an Alternative may be provided to reconcile the terminology. A COL applicant that reference the NuScale Power Plant design certification will generate any relief request(s) needed as part of the Inservice Testing Program Document.~~

RAI 03.09.06-26

3.9.6.6 ~~Augmented Valve Testing Program~~

RAI 03.09.06-26

~~Components not required by ASME OM Code, Subsection ISTA-1100, but with augmented quality requirements similar to ISTA-1100 are included in an augmented inservice testing program. These components were identified by the DRAP.~~

RAI 03.09.06-26

~~The DRAP process identifies functions requiring augmented quality requirements to provide greater assurance that the supporting components will perform their intended function when called upon. The DRAP considered the GDC and other select 10 CFR 50 regulations to identify safety significant functions. The augmented quality components identified as part of the DRAP process were reviewed for inservice test applicability. Those components meeting the definition of ISTA-1100 were included in the IST program. Components not meeting ISTA-1100 but having augmented requirements for the nonsafety-related functions are included in the augmented IST program. These components will be tested to the intent of the OM Code commensurate with their augmented requirements. The augmented IST plan is presented in Table 3.9-24 through Table 3.9-26 and includes valves in the following systems:~~

RAI 03.09.06-26

- ~~chemical and volume control system~~
- ~~condensate and feedwater system~~
- ~~reactor coolant system~~

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~~Testing and assessment of valves within the augmented IST program meet the intent of Subsection ISTC. The NuScale augmented IST Plan includes 96 total valves (8 valves per NPM) divided into four valve groups as follows:~~

- ~~two CVCS Class 3 boundary active pneumatically operated valves per NPM (24 valves total)~~
- ~~two CVCS Class 3 boundary nozzle check valves per NPM (24 valves total)~~
- ~~one RCS nozzle check valve inside containment (excess flow valve installed in reverse) per NPM (12 valves total)~~
- ~~three RCS excess flow check valves inside containment per NPM (36 valves total)~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Table 3.9-15: NuScale Power Plant Inservice Testing Plan (Example Plan to be used in development of COL IST Plan)

1. General Information 1.1 Introduction Inservice testing plan, hereafter referred to as the IST plan, summarizes the test program for certain components pursuant to the requirements of the Code of Federal Regulations, 10 CFR 50.55a(f)(4). This testing plan is applicable to NuScale Power Plant Modules 1 through 12. 1.2 Code edition This example IST plan meets the requirements of the ASME OM Code 2012 as endorsed by 10 CFR 50.55a. In specifically identified instances where an alternative to the Code requirements is proposed or where it has been determined that conformance with certain Code requirements is impractical; an example request for relief from the Code requirement(s), including proposed alternatives to the requirement(s), has been prepared for future Nuclear Regulatory Commission review and approval pursuant to 10 CFR 50.55a(a)(3) or (f)(5). 1.3 Dates of test interval The preservice test and preservice test period will be defined by each individual NPM as it is placed into service. Some preservice testing may be completed in the factory prior to shipping the reactor module to the site These tests will be described in the Preservice Testing Plan. The Preservice Testing Plan and IST program plans will be coordinated to eliminate overlap, redundancy and excessive testing. The initial 10-year examination and test interval will commence at generation of nuclear heat for the first reactor module. The initial ten year test interval may be less than ten years for reactor modules 02-12. The licensee may consider submitting a request for extension of the test interval from the NRC if there is considerable time between installation and start-up of NPMs.
2. Scope Valve IST is consistent with ASME OM, Subsection ISTC, Appendix I and Appendix II. The valves selected for inclusion in this testing plan are those active or passive ASME Class 1, Class 2, and Class 3 valves and pressure relief devices (and their actuating and position indicating systems) which are required to perform a specific function: a. in shutting down a reactor to the safe shutdown condition, or b. in maintaining the safe shutdown condition, or c. in mitigating the consequences of an accident Excluded from this testing plan are: a. valves used only for operating convenience such as vent, drain, instrument and test valves, or b. valves used only for system control, such as pressure regulating valves, or c. valves used only for system or component maintenance d. skid-mounted valves which are tested as part of the major component e. Category A and Category B safety and relief valves are excluded from the requirements of ISTC 3700 and ISTC 3500, valve testing requirements. Further, the valve actuating system test scope does not include external control and protection systems responsible for sensing plant conditions and providing signals for valve operation.

Table 3.9-15: NuScale Power Plant Inservice Testing Plan (Example Plan to be used in development of COL IST Plan)

3. Valve testing table format

Detailed information and testing requirements for the valves included in this IST plan are summarized in tables, with a separate table for each plant system which contains valves within the scope of the plan. These systems are:

- chemical and volume control system
- condensate and feedwater system
- containment system
- decay heat removal system
- emergency core cooling system
- main steam system
- safety and relief valves

The information presented in the valve test tables includes:

a. Valve groups - Valves are grouped by system, safety significance, valve type, actuator type, manufacturer, model number. Each group has a unique group number to facilitate the implementation of the inservice test program.

b. Valve identification - Valve identification includes the valve number field and a brief description of the valve safety function. In each table, the valves are arranged in numerical order by the four digit location number which forms the root of each valve number.

All valves listed in this IST plan are common for each nuclear power module (NPM). Valve numbering, except for the prefix, is the same for all NPMs. The prefix for all valves will start with "01" through "12," depending on the NPM.

c. Risk ranking - A valve will either be ranked as high- or low-safety significant. This was determined by expert panel review and included the NuScale Probability Risk Assessment Group.

d. Size - The size field indicates the nominal valve size in inches.

e. Code Class - The code class field indicates the ASME Boiler and Pressure Vessel Code, Section III classification.

f. Category - The category field indicates the classification of the valve according to characteristics described in ASME OM Code, 2012 Edition, Subsection ISTC-1300. See Valve Table ISTC-3500-1 for a listing of valve categories and their meanings.

g. Function - The function field indicates the manner in which a valve accomplishes its required safety function(s). "A" denotes an active valve and "P" denotes a passive valve with the terms defined as follows:

Active valves - Valves which are required to change obturator position to accomplish their required safety function(s).

Passive valves - Valves which maintain obturator position and are not required to change obturator position to accomplish their required safety function(s).

Obturator - Valve closure member (disk, gate, plug, ball, etc.).

h. Safety function position - The safety function position field indicates the position (open or closed) to which a valve must move or remain in to accomplish its required safety function(s). The open and closed positions are indicated by "O" and "C," respectively.

~~Table 3.9-15: NuScale Power Plant Inservice Testing Plan (Example Plan to be used in development of COL IST Plan)~~

~~i. Test Parameters/Schedule - The test parameters/schedule field denotes the ASME OM code test requirements and test frequencies for valves in the IST plan. The test parameters include leak test, exercise test, fail-safe test, and position verification test. Not all test parameters are applicable to all valves. Rather, the parameters to be tested for any valve are dependent on the valve and actuator type, category, and function. Valves that have both an open and a closed safety function position, and for which the test requirements or frequencies are different in the two positions, have their open and closed test requirements identified separately. Test parameters that are not applicable to a particular valve are indicated "N/A."~~

~~Check valves are exercise tested in both the open and closed direction regardless of safety function position or valve safety significance. Nonsafety-function exercise tests for high-safety-significant check valves shall be performed at least once every two years.~~

~~In cases where the performance of a valve full-stroke exercise test is limited to transitions or refueling outages, a table footnote is provided which justifies this determination. See the Valve Table Index at the end of this section for a listing of test parameters and schedule acronyms and their meanings.~~

~~j. Footnotes - Footnotes containing additional valve testing information are located at the back of each system valve table and are referenced in the tables by the footnote number in parentheses.~~

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Table 3.9-15: ASME Class 1, 2, and 3 Active Valve List

Valve No.	Description	ASME Class	Function[1]
Chemical and Volume Control System			
CVC-AOV-0101	Demineralized Water Supply Isolation Valve	3	3
CVC-AOV-0119	Demineralized Water Supply Isolation Valve	3	3
Containment System			
CVC-ISV-0323	Pressurizer Spray Outboard Containment Isolation Valve	1	1, 2, 3, 4
CVC-ISV-0325	Pressurizer Spray Inboard Containment Isolation Valve	1	1, 2, 3, 4
CVC-ISV-0329	Chemical and Volume Control System Injection Outboard Containment Isolation Valve	1	1, 2, 3, 4
CVC-ISV-0331	Chemical and Volume Control System Injection Inboard Containment Isolation Valve	1	1, 2, 3, 4
CVC-ISV-0334	Chemical and Volume Control System Discharge Inboard Containment Isolation Valve	1	1, 2, 3, 4
CVC-ISV-0336	Chemical and Volume Control System Discharge Outboard Containment Isolation Valve	1	1, 2, 3, 4
CVC-ISV-0401	RPV High Point Degasification Inboard Containment Isolation Valve	1	1, 2, 3, 4
CVC-ISV-0403	RPV High Point Degasification Outboard Containment Isolation Valve	1	1, 2, 3, 4
CE-ISV-0101	Containment Evacuation Inboard Containment Isolation Valve	2	2, 3, 4
CE-ISV-0102	Containment Evacuation Outboard Containment Isolation Valve	2	2, 3, 4
CFD-ISV-0129	Containment Flooding & Drain Outboard Containment Isolation Valve	2	2, 3, 4
CFD-ISV-0130	Containment Flooding & Drain Inboard Containment Isolation Valve	2	2, 3, 4
RCCW-ISV-0184	Reactor Component Cooling Water Inlet Outboard Containment Isolation Valve	2	2, 3, 4
RCCW-ISV-0185	Reactor Component Cooling Water Inlet Inboard Containment Isolation Valve	2	2, 3, 4
RCCW-ISV-0190	Reactor Component Cooling Water Outlet Inboard Containment Isolation Valve	2	2, 3, 4
RCCW-ISV-0191	Reactor Component Cooling Water Outlet Outboard Containment Isolation Valve	2	2, 3, 4
FW-ISV-1003	Feedwater Isolation Valve	2	2, 3, 4
FW-ISV-2003	Feedwater Isolation Valve	2	2, 3, 4
FW-CKV-1002	Feedwater Isolation Check Valve	2	3
FW-CKV-2002	Feedwater Isolation Check Valve	2	3
MS-ISV-1005	Main Steam Isolation Valve	2	2, 3, 4
MS-ISV-2005	Main Steam Isolation Valve	2	2, 3, 4
MS-ISV-1006	Main Steam Isolation Bypass Valve	2	2, 3, 4
MS-ISV-2006	Main Steam Isolation Bypass Valve	2	2, 3, 4
Decay Heat Removal System			
DHR-HOV-1002A	Decay Heat Removal System Actuation Valve	2	3, 4
DHR-HOV-1002B	Decay Heat Removal System Actuation Valve	2	3, 4
DHR-HOV-2002A	Decay Heat Removal System Actuation Valve	2	3, 4
DHR-HOV-2002B	Decay Heat Removal System Actuation Valve	2	3, 4
Emergency Core Cooling System[2]			
ECC-HOV-0101A	Reactor Vent Valve A	1	1, 3, 4
ECC-HOV-0101B	Reactor Vent Valve B	1	1, 3, 4
ECC-HOV-0101C	Reactor Vent Valve C	1	1, 3, 4
ECC-HOV-0104A	Reactor Recirculation Valve A	1	1, 3, 4
ECC-HOV-0104B	Reactor Recirculation Valve B	1	1, 3, 4
Safety and Relief Valves			

Table 3.9-15: ASME Class 1, 2, and 3 Active Valve List (Continued)

Valve No.	Description	ASME Class	Function[1]
RCS-PSV-0003A	Reactor Safety Valve A	1	1, 3
RCS-PSV-0003B	Reactor Safety Valve B	1	1, 3
SGS-PSV-1002	Steam Generator System Thermal Relief Valve	2	2
SGS-PSV-2002	Steam Generator System Thermal Relief Valve	2	2

1 - Function 1 - Reactor coolant pressure boundary
2 - Containment isolation
3 - Accident mitigation
4 - Safe shutdown

2 - Trip and reset valves are included with each RVV and RRV.

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Table 3.9-16: Example Inservice Testing Valve Table Index

VALVE FUNCTIONS	
A - Active	
P - Passive	
SAFETY FUNCTION POSITIONS	
O - Open	
C - Closed	
VALVE CATEGORIES	
Category A -	Valves for which seat leakage is limited to a specific maximum amount in the closed position for fulfillment of their required safety function(s).
Category B -	Valves for which seat leakage in the closed position is inconsequential for fulfillment of their required safety function(s).
Category C -	Valves which are self-actuating in response to some system characteristic, such as pressure (relief valves) or flow direction (check valves), for fulfillment of their required safety function(s).
Category D -	Valves which are actuated by an energy source capable of only one operation, such as rupture disks or explosively actuated valves, for fulfillment of their required safety function(s). (There are no Category D valves or pressure relief devices in the NuScale IST plan).
NOTE:	Seat tightness determination is performed as part of the performance test for Category C pressure relief devices (SRV) and may be performed as a method of close exercise test for check valves (CV). However, pressure relief devices and check valves are further classified as Category A only if there is a safety analysis criteria existing for valve seat leakage such as for pressure relief devices or check valves performing containment isolation functions or reactor coolant system pressure isolation functions.
Leak Test	
LT -	Leak test Category A valve (other than containment isolation valves) per the requirements of ISTC-3630.
LTJ -	Leak test Category A containment isolation valve per the requirements of ISTC 3620.
Exercise Test	
MT -	Exercise power operated Category A or B valve full-stroke to its safety function position(s) and measure stroke time per the requirements of ISTC-3510.
ET -	Exercise Category A or B valve full-stroke to its safety function position(s) per the requirements of ISTC-3510.
CV -	Exercise Category C check valve full-stroke to its safety function position(s) per the requirements of ISTC-3510.
CVD -	Disassemble Category C check valve to verify operability per the requirements of ISTC-5220.
SRV -	Performance test Category C safety or relief valve per the requirements of ISTC-5230 and Appendix I.
DD -	Dual direction test/verification shall be performed in accordance with ISTC-5220. Frequency is determined by Appendix II.
Fail Safe Test	
FO -	Fail safe test Category A or B valve in the open direction per the requirements of ISTC-3560.
FC -	Fail safe test Category A or B valve in the closed direction per the requirements of ISTC-3560.
Position Verification Test	
PIT -	Test Category A, B, C or D valve position verification per ISTC-3700.

Table 3.9-16: Example Inservice Testing Valve Table Index (Continued)

Test Frequency	
3MO -	Perform exercise test (and fail safe test, if applicable) nominally every three months.
CS -	Perform exercise test (and fail safe test, if applicable) during each transition. Such exercise is not required if the time period since the previous full-stroke exercise is less than three months. Valve exercising during transition shall commence within 48 hours of achieving transition, and continue until all testing is complete or the plant is ready to return to power. For extended outages, testing need not be commenced in 48 hours provided all valves required to be tested during transition will be tested prior to plant startup.
RF -	Perform exercise test (and fail safe test, if applicable) during each refueling outage.
TS -	Perform test at the applicable technical specification frequency.
24MO -	Perform test at least once every refueling outage.
NYR -	Perform test at least once every N years. For position verification tests (PIT), N equals two years. For pressure relief device performance tests (SRV), N nominally equals five years or ten years for Class 1 or Class 2 and Class 3 devices, respectively. However, other test frequencies may apply for pressure relief devices. See ASME OM Code 2012 Edition, Appendix I. (The only pressure relief devices in the NuScale IST plan are Class 1).

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Table 3.9-16: Valve Inservice Test Requirements per ASME OM Code

Valve No.	Description[1]	Valve / Actuator[1]	Safety Position	Safety Function(s)[2]	ASME Class / IST Category	IST Type and Frequency[3]	Valve Group[4]	Notes
Chemical and Volume Control System								
CVC-AOV-0101	Demineralized Water Supply Isolation Valve	BALL Remote AO	Closed	Active Boron Dilution Prevention	Class 3 Category B	Position Verification Test/2 Years Exercise Full Stroke/Quarterly Failsafe Test/Quarterly Operability Test	1	5, 19
CVC-AOV-0119	Demineralized Water Supply Isolation Valve	BALL Remote AO	Closed	Active Boron Dilution Prevention	Class 3 Category B	Position Verification Test/2 Years Exercise Full Stroke/Quarterly Failsafe Test/Quarterly Operability Test	1	5, 19
Condensate and Feedwater System								
FW-FCV-1006	Feedwater Regulating Valve	FCV Remote AO	Closed	Active Feedwater Isolation Containment Isolation Decay Heat Removal Boundary	Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	2	6, 18, 19
FW-FCV-2006	Feedwater Regulating Valve	FCV Remote AO	Closed	Active Feedwater Isolation Containment Isolation Decay Heat Removal Boundary	Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	2	6, 18, 19
FW-CKV-1007	Backup Feedwater Check Valve	Nozzle Check	Closed	Active Decay Heat Removal Boundary	Category C	Check Exercise/ Refueling	8	7
FW-CKV-2007	Backup Feedwater Check Valve	Nozzle Check	Closed	Active Decay Heat Removal Boundary	Category C	Check Exercise/ Refueling	8	7
Containment System								
CVC-ISV-0323	Pressurizer Spray Outboard Containment Isolation Valve	BALL Remote HO	Closed	Active Reactor Coolant Pressure Boundary Containment Isolation	Class 1 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/ Quarterly Containment Isolation Leak Test Operability Test	3	8, 19

Table 3.9-16: Valve Inservice Test Requirements per ASME OM Code (Continued)

Valve No.	Description[1]	Valve / Actuator[1]	Safety Position	Safety Function(s)[2]	ASME Class / IST Category	IST Type and Frequency[3]	Valve Group[4]	Notes
CVC-ISV-0325	Pressurizer Spray Inboard Containment Isolation Valve	BALL Remote HO	Closed	Active Reactor Coolant Pressure Boundary Containment Isolation	Class 1 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/ Quarterly Containment Isolation Leak Test Operability Test	3	8, 19
CVC-ISV-0329	Chemical and Volume Control System Injection Outboard Containment Isolation Valve	BALL Remote HO	Closed	Active Reactor Coolant Pressure Boundary Containment Isolation	Class 1 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/Cold Shutdown Containment Isolation Leak Test Operability Test	3	8, 19
CVC-ISV-0331	Chemical and Volume Control System Injection Inboard Containment Isolation Valve	BALL Remote HO	Closed	Active Reactor Coolant Pressure Boundary Containment Isolation	Class 1 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/ Quarterly Containment Isolation Leak Test Operability Test	3	8, 19
CVC-ISV-0334	Chemical and Volume Control System Discharge Inboard Containment Isolation Valve	BALL Remote HO	Closed	Active Reactor Coolant Pressure Boundary Containment Isolation	Class 1 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/Cold Shutdown Containment Isolation Leak Test Operability Test	3	8, 19
CVC-ISV-0336	Chemical and Volume Control System Discharge Outboard Containment Isolation Valve	BALL Remote HO	Closed	Active Reactor Coolant Pressure Boundary Containment Isolation	Class 1 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/ Quarterly Containment Isolation Leak Test Operability Test	3	8, 19
CVC-ISV-0401	RPV High Point Degasification Inboard Containment Isolation Valve	BALL Remote HO	Closed	Active Reactor Coolant Pressure Boundary Containment Isolation	Class 1 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/ Quarterly Containment Isolation Leak Test Operability Test	3	8, 19
CVC-ISV-0403	RPV High Point Degasification Outboard Containment Isolation Valve	BALL Remote HO	Closed	Active Reactor Coolant Pressure Boundary Containment Isolation	Class 1 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/ Quarterly Containment Isolation Leak Test Operability Test	3	8, 19

Table 3.9-16: Valve Inservice Test Requirements per ASME OM Code (Continued)

Valve No.	Description[1]	Valve / Actuator[1]	Safety Position	Safety Function(s)[2]	ASME Class / IST Category	IST Type and Frequency[3]	Valve Group[4]	Notes
CE-ISV-0101	Containment Evacuation Inboard Containment Isolation Valve	BALL Remote HO	Closed	Active Containment Isolation	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/Cold Shutdown Containment Isolation Leak Test Operability Test	3	8, 19
CE-ISV-0102	Containment Evacuation Outboard Containment Isolation Valve	BALL Remote HO	Closed	Active Containment Isolation	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/ Quarterly Containment Isolation Leak Test Operability Test	3	8, 19
CFD-ISV-0129	Containment Flooding & Drain Outboard Containment Isolation Valve	BALL Remote HO	Closed	Active Containment Isolation	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/ Quarterly Containment Isolation Leak Test Operability Test	3	8, 19
CFD-ISV-0130	Containment Flooding & Drain Inboard Containment Isolation Valve	BALL Remote HO	Closed	Active Containment Isolation	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/ Quarterly Failsafe Test/ Quarterly Containment Isolation Leak Test Operability Test	3	8, 19
RCCW-ISV-0184	Reactor Component Cooling Water Inlet Outboard Containment Isolation Valve	BALL Remote HO	Closed	Active Containment Isolation	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Containment Isolation Leak Test Operability Test	3	8, 9, 19
RCCW-ISV-0185	Reactor Component Cooling Water Inlet Inboard Containment Isolation Valve	BALL Remote HO	Closed	Active Containment Isolation	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Containment Isolation Leak Test Operability Test	3	8, 9, 19
RCCW-ISV-0190	Reactor Component Cooling Water Outlet Inboard Containment Isolation Valve	BALL Remote HO	Closed	Active Containment Isolation	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Containment Isolation Leak Test Operability Test	3	8, 9, 19

Table 3.9-16: Valve Inservice Test Requirements per ASME OM Code (Continued)

Valve No.	Description[1]	Valve / Actuator[1]	Safety Position	Safety Function(s)[2]	ASME Class / IST Category	IST Type and Frequency[3]	Valve Group[4]	Notes
RCCW-ISV-0191	Reactor Component Cooling Water Outlet Outboard Containment Isolation Valve	BALL Remote HO	Closed	Active Containment Isolation	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Containment Isolation Leak Test Operability Test	3	8, 9, 19
FW-ISV-1003	Feedwater Isolation Valve	BALL Remote HO	Closed	Active Feedwater Isolation Containment Isolation Decay Heat Removal Boundary	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	4	10, 18, 19
FW-ISV-2003	Feedwater Isolation Valve	BALL Remote HO	Closed	Active Feedwater Isolation Containment Isolation Decay Heat Removal Boundary	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	4	10, 18, 19
FW-CKV-1002	Feedwater Check Valve	Nozzle Check	Closed	Active Feedwater Isolation Decay Heat Removal Boundary	Class 2 Category C	Check Exercise/ Refueling	8	11
FW-CKV-2002	Feedwater Check Valve	Nozzle Check	Closed	Active Feedwater Isolation Decay Heat Removal Boundary	Class 2 Category C	Check Exercise/ Refueling	8	11
MS-ISV-1005	Main Steam Isolation Valve	BALL Remote HO	Closed	Active Steam Line Isolation Containment Isolation Decay Heat Removal Boundary	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	4	12, 18, 19
MS-ISV-2005	Main Steam Isolation Valve	BALL Remote HO	Closed	Active Steam Line Isolation Containment Isolation Decay Heat Removal Boundary	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	4	12, 18, 19

Table 3.9-16: Valve Inservice Test Requirements per ASME OM Code (Continued)

Valve No.	Description[1]	Valve / Actuator[1]	Safety Position	Safety Function(s)[2]	ASME Class / IST Category	IST Type and Frequency[3]	Valve Group[4]	Notes
MS-ISV-1006	Main Steam Isolation Bypass Valve	BALL Remote HO	Closed	Active Steam Line Isolation Containment Isolation Decay Heat Removal Boundary	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	3	12, 18, 19
MS-ISV-2006	Main Steam Isolation Bypass Valve	BALL Remote HO	Closed	Active Steam Line Isolation Containment Isolation Decay Heat Removal Boundary	Class 2 Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	3	12, 18, 19
Decay Heat Removal System								
DHR-HOV-1002A	Decay Heat Removal System Actuation Valve	BALL Remote HO	Open	Active Decay Heat Removal	Class 2 Category B	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Test	4	13, 19
DHR-HOV-1002B	Decay Heat Removal System Actuation Valve	BALL Remote HO	Open	Active Decay Heat Removal	Class 2 Category B	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Test	4	13, 19
DHR-HOV-2002A	Decay Heat Removal System Actuation Valve	BALL Remote HO	Open	Active Decay Heat Removal	Class 2 Category B	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Test	4	13, 19
DHR-HOV-2002B	Decay Heat Removal System Actuation Valve	BALL Remote HO	Open	Active Decay Heat Removal	Class 2 Category B	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Test	4	13, 19
Emergency Core Cooling System								
ECC-HOV-0101A	Reactor Vent Valve A	GLOBE Remote HO	Open/ Closed	Active Core Cooling Recirculation Path Reactor Coolant Pressure Boundary	Class 1 Category BC	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Test	5	14, 19

Table 3.9-16: Valve Inservice Test Requirements per ASME OM Code (Continued)

Valve No.	Description[1]	Valve / Actuator[1]	Safety Position	Safety Function(s)[2]	ASME Class / IST Category	IST Type and Frequency[3]	Valve Group[4]	Notes
ECC-HOV-0101B	Reactor Vent Valve B	GLOBE Remote HO	Open/ Closed	Active Core Cooling Recirculation Path Reactor Coolant Pressure Boundary	Class 1 Category BC	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Test	5	14, 19
ECC-HOV-0101C	Reactor Vent Valve C	GLOBE Remote HO	Open/ Closed	Active Core Cooling Recirculation Path Reactor Coolant Pressure Boundary	Class 1 Category BC	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Test	5	14, 19
ECC-HOV-0104A	Reactor Recirculation Valve A	GLOBE Remote HO	Open/ Closed	Active Core Cooling Recirculation Path Reactor Coolant Pressure Boundary	Class 1 Category BC	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Test	5	14, 19
ECC-HOV-0104B	Reactor Recirculation Valve B	GLOBE Remote HO	Open/ Closed	Active Core Cooling Recirculation Path Reactor Coolant Pressure Boundary	Class 1 Category BC	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Test	5	14, 19
Main Steam System								
MS-AOV-1003	Backup Main Steam Isolation Valve	GATE Remote AO	Closed	Active Steam Line Isolation Containment Isolation Decay Heat Removal Boundary	Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	6	15, 18, 19
MS-AOV-2003	Backup Main Steam Isolation Valve	GATE Remote AO	Closed	Active Steam Line Isolation Containment Isolation Decay Heat Removal Boundary	Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	6	15, 18, 19
MS-AOV-1004	Backup Main Steam Isolation Bypass Valve	GATE Remote AO	Closed	Active Steam Line Isolation Containment Isolation Decay Heat Removal Boundary	Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	7	15, 18, 19

Table 3.9-16: Valve Inservice Test Requirements per ASME OM Code (Continued)

Valve No.	Description[1]	Valve / Actuator[1]	Safety Position	Safety Function(s)[2]	ASME Class / IST Category	IST Type and Frequency[3]	Valve Group[4]	Notes
MS-AOV-2004	Backup Main Steam Isolation Bypass Valve	GATE Remote AO	Closed	Active Steam Line Isolation Containment Isolation Decay Heat Removal Boundary	Category A	Position Verification Test/2 Years Exercise Full Stroke/Cold Shutdown Failsafe Test/Cold Shutdown Operability Leak Test Operability Test	7	15, 18, 19
Safety and Relief Valves								
RCS-PSV-0003A	Reactor Safety Valve A	SAFETY Pilot Operated Self Actuating	Open/ Closed	Overpressure Protection Reactor Coolant Pressure Boundary	Class 1 Category BC	Position Verification Test, 2 Years (alternated) Class 1 Safety Valve Test/ 5 Years and 20% in 2 Years	9	16
RCS-PSV-0003B	Reactor Safety Valve B	SAFETY Pilot Operated Self Actuating	Open/ Closed	Overpressure Protection Reactor Coolant Pressure Boundary	Class 1 Category BC	Position Verification Test, 2 Years (alternated) Class 1 Safety Valve Test/ 5 Years and 20% in 2 Years	9	16
SGS-PSV-1002	Steam Generator System Thermal Relief Valve	THERMAL RELIEF Self Actuating	Open/ Closed	Thermal Overpressure Protection Steam Generator System Pressure Boundary	Class 2 Category AC	Class 2/3 Relief Valve Test/ 10 Years and 20% in 4 Years	10	17
SGS-PSV-2002	Steam Generator System Thermal Relief Valve	THERMAL RELIEF Self Actuating	Open/ Closed	Thermal Overpressure Protection Steam Generator System Pressure Boundary	Class 2 Category AC	Class 2/3 Relief Valve Test/ 10 Years and 20% in 4 Years	10	17

Notes:

1.

AO	air operated	CIV	containment isolation valve
CNV	containment vessel	CVCS	chemical and volume control system
DHRS	decay heat removal system	DWS	demineralized water system
ECCS	emergency core cooling system	FCV	feedwater check valve
FWIV	feedwater isolation valve	FWRV	feedwater regulating valve
HO	hydraulic operated	LRWS	liquid radioactive waste system
MCR	main control room	MPS	module protection system
MSIV	main steam isolation valve	MSIBV	main steam isolation bypass valve
NPM	NuScale Power Module	PORV	power operated relief valve
PSCIV	primary system CIV	RCCW	reactor component cooling water
RPV	reactor pressure vessel	RRV	reactor recirculation valve
RVV	reactor vent valve	SG	steam generator
SSCIV	secondary system CIV		

2. The NuScale design does not use safety-related electric power to mitigate accidents or for the safe shutdown of the NuScale Power Module; therefore, all valves listed as having an active safety function have an active-to-failed function to transfer to its safe position on loss of motive power. Valves with an active function are tested by observing the operation of the actuator upon loss of valve actuating power.

3. Cold Shutdown Outage as defined in ISTA-2000 is Mode 3, safe shutdown, with all reactor coolant temperatures < 200 °F. The term “cold shutdown” is used throughout Section 3.9.6 for clarity with the OM Code requirements.

4. Valve Groups: Valves are grouped as required by OM Mandatory Appendices I, II and IV. Pressure Relief Devices (Mandatory Appendix I) are grouped by valve type, valve function, and Code class. Check valves (Mandatory Appendix II) are grouped by valve type and valve size. POVs (Mandatory Appendix IV) are grouped by actuator type, obturator type, valve size, and safety significance.

Mandatory Appendix	Group No.	Valve
IV	1	AOV, Ball, LSS
IV	2	Nonsafety-related, AOV, FCV, LSS
IV	3	HOV [small actuator type], Ball, HSS (CVCS only) and LSS
IV	4	HOV [large actuator type], Ball, LSS
IV	5	PORV, Globe, HSS
IV	6	Nonsafety-related, AOV, Gate, 12-inch, LSS
IV	7	Nonsafety-related, AOV, Gate, 4-inch, LSS
II	8	Nozzle check valve, 4-inch, normally closed
I	9	Class 1 safety valve
I	10	Class 2 pressure relief valve

5. CVCS Makeup and Module Isolation Valves (Section 9.3.4.2.2): These two safety-related, air operated valves are in series in the common DWS/LRWS makeup line to the CVCS makeup pumps. The valves close automatically on an MPS signal to mitigate an inadvertent boron dilution event.

6. Feedwater Regulating Valves (Section 10.4.7.2.2): The FWRVs are nonsafety-related, not risk-significant backup isolation valves to the safety-related FWIVs and are credited in safety analysis. These valves have the same design pressure and temperature as the RCS. These valves cannot be full-stroke or part-stroke exercised during plant operation because closing the valves interrupts feedwater flow, resulting in possible steam generator level transients, and may initiate a turbine or NPM trip.

7. Backup Feedwater Check Valves (Section 10.4.7.2.2): The backup feedwater check valves are nonsafety-related, not risk-significant backup check valves to the safety-related FCV and are credited in safety analysis. These valves are credited for rapid acting to the safety function position (closed) to preserve DHRS inventory on a loss of feedwater. The backup FCVs are normally closed, nozzle check valves. The FWRV is credited with providing the backup DHRS/feedwater boundary and has specific leakage criteria. The backup FCV maintains the DHRS boundary until the FWRV is fully closed and, therefore, has no specific leakage criteria. These valves cannot be full-stroke or part-stroke exercised closed during plant operation because closing the valves interrupts feedwater flow, resulting in possible steam generator level transients, and may initiate a turbine or NPM trip. The nozzle check design is a spring-to-close design. Nonintrusive testing can be used to verify valve closure during plant shutdown or during cold shutdown. Normal feedwater operation satisfies the open exercise (nonsafety direction) for these valves pursuant to ISTC-3550, Valves in Regular Use, at a frequency that satisfies requirements of the OM Code by periodically measuring FW flow and pressure to confirm the valves are fully open.

8. Primary System Containment Isolation Valves (Section 6.2.4.2.2, Figure 6.2-5): PSCIVs are HO to open, nitrogen gas to close. These valves are located on nozzle penetrations on the CNV head and are intended to satisfy the requirements of GDC 55 and 56. All PSCIVs are designed with two valve actuators installed in a single valve body that is welded directly to the CNV nozzle safe-end. The valves close automatically on an MPS signal or loss of power to isolate containment and preserve RCS inventory. When the valve is deenergized, parallel hydraulic vent paths open, allowing fluid to vent from the valve actuator. This allows the nitrogen gas cylinder to

overcome hydraulic pressure and to close the valve. The nitrogen cylinder is sealed and monitored in the MCR. The exercise test and operability test (Note 19) shall determine the state of the nitrogen cylinder (pressure, temperature), the state of the orbturator (stroke time, diagnostics), and the state of each hydraulic vent path (by testing each vent path individually). These valves have a test insert that allows 10 CFR 50 Appendix J, Type C testing locally in the direction of containment accident pressure.

9. The RCCW CIVs (Section 6.2.4.2.2) cannot be full stroked during normal operation because this will interrupt cooling flow the CRDMs. The CRDMs operate in the containment vacuum and depend on RCCW cooling for heat removal. Interrupting cooling flow to the CRDMs can cause overheating and lead to a possible rod drop.

10. Feedwater Isolation Valves (Section 6.2.4.2.2, Figure 6.2-6b): FWIVs are HO to open, nitrogen gas to close. These valves are located on two nozzle penetrations on the CNV head and are intended to satisfy the requirements of GDC 57. The FWIV is designed with the actuator installed inboard and a feedwater check valve installed outboard in the same valve body. The valve is welded directly to the CNV nozzle safe-end. The valves close automatically on a MPS signal or loss of power to isolate the feedwater line and preserve DHRS inventory. When the valve is deenergized, parallel hydraulic vent paths open, allowing fluid to vent from the valve actuator. This allows the nitrogen gas cylinder to overcome hydraulic pressure and close the valve. The nitrogen cylinder is sealed and monitored in the MCR. The exercise test and operability test (Note 19) shall determine the state of the nitrogen cylinder (pressure, temperature), the state of the orbturator (stroke time, diagnostics), and the state of each hydraulic vent path (by testing each vent path individually). These valves have a test insert that allows Technical Specification leakage testing (Note 18) locally in the direction of DHRS pressure. These valves cannot be full-stroke or part stroke exercised during plant operation because closing the valves interrupts feedwater flow resulting in possible steam generator level transients and may initiate a turbine or NPM trip.

11. Feedwater Check Valves (Section 6.2.4.2.1, Figure 6.2-6b): The feedwater check valves are credited for rapid acting to the safety function position (closed) to preserve DHRS inventory on a loss of feedwater. The FCVs are normally closed nozzle check valves. The FWIV is credited with providing the primary DHRS/feedwater boundary and has specific leakage criteria. The FCV maintains the DHRS boundary until the FWIV is fully closed and therefore, has no specific leakage criteria. The FCV is located in the same valve body as the FWIV and is located outboard of the two (FWIV located nearest the CNV). These valves cannot be full-stroke or part stroke exercised closed during plant operation because closing the valves interrupts feedwater flow resulting in possible steam generator level transients and may initiate a turbine or NPM trip. The FWIV/FCV body is equipped with a test insert that allows leakage testing following system shutdown. The closed exercised test will be performed at cold shutdown with a leak test to verify the valve is fully closed. Normal feedwater operation will satisfy the open exercise (nonsafety direction) for these valves pursuant to ISTC-3550, Valves in Regular Use, at a frequency that satisfies requirements of the OM Code by periodically measuring FW flow to confirm the valve obturator is fully open.

12. Main Steam Isolation Valves and Bypass (Section 6.2.4.2.2, Figure 6.2-6a): MSIVs and MSIBVs are HO to open, nitrogen gas to close. These valves located on the two main steam nozzle penetrations on the CNV head and are intended to satisfy the requirements of GDC 57. One actuator is located in a single valve body that is welded to a ASME Class 2 pipe. The valves close automatically on a MPS signal or loss of power to isolate the feedwater line and preserve DHRS inventory (the MSIBV is normally closed). When the valve is deenergized, parallel hydraulic vent paths open allowing fluid to vent from the valve actuator. This allows the nitrogen gas cylinder to overcome hydraulic pressure and close the valve. The nitrogen cylinder is sealed and monitored in the MCR. The exercise test and operability test (Note 19) shall determine the state of the nitrogen cylinder (pressure, temperature), the state of the orbturator (stroke time, diagnostics), and the state of each hydraulic vent path (by testing each vent path individually). These valves have a test insert that allows Technical Specification leakage testing (Note 18) locally in the direction of DHRS pressure. These valves cannot be full-stroke or part stroke exercised during plant operation because closing the valves interrupts steam flow resulting in possible steam generator pressure and level transients and may initiate a turbine or NPM trip.

13. Decay Heat Removal System Actuation Valves (Section 5.4.3.2.1): DHRS actuation valves are HO to close, nitrogen gas to open. These valves located on two closed loops outside the CNV and are intended to satisfy the requirements of GDC 57. There are two valves in parallel in each loop, four valves total. Either valve is designed to fulfill the system safety function requirement. The valves open automatically on a MPS signal or loss of power to initiate decay heat removal circulation through the DHRS condenser and corresponding SG. When the valve is deenergized, parallel hydraulic vent paths open allowing fluid to vent from the valve actuator. This allows the nitrogen gas cylinder to overcome hydraulic pressure and open the valve. The nitrogen cylinder is sealed and monitored in the MCR. The exercise test and operability test (Note 19) shall determine the state of the nitrogen cylinder (pressure, temperature), the state of the orbturator (stroke time, diagnostics), and the state of each hydraulic vent path (by testing each vent path individually). These valves cannot be full-stroke or part stroke exercised during plant operation because opening the valves would unnecessarily subject the SG nozzles to thermal transients from the decay heat condenser condensate flow.

14. Emergency Core Cooling Valves (Section 6.3.2.2, Figure 6.3-3): The ECCS RRVs and RVVs are PORVs that each consist of a main valve, a trip pilot, a reset pilot and an inadvertent actuation block. These components are considered as one valve assembly and are exercised tested as a unit during cold shutdown. However, operability testing per Note 19 may be performed separately to provide additional diagnostic information to assess valve performance. These valves cannot be full or partial stroke exercised during plant operation because cycling a valve opens an RCS vent path resulting in a potential loss of core cooling. The active safety function of the valves is to open and remain open when actuated. The closed safety function to support the reactor coolant pressure boundary is passive. The reset pilot is a nonsafety function and is not inservice tested as part of the ASME OM Code IST program. The trip valve is tested during failsafe and exercise testing.

    RRVs and RVVs do not have specific leakage criteria. Seat tightness will be in accord with the requirements of the OM Code Mandatory Appendix I. ECCS valve seat leakage will be RCS unidentified leakage and must meet Technical Specification surveillance criteria. Owner's as-left seat tightness criteria should be no observed leakage utilizing the methods prescribed in OM Mandatory Appendix I, Table I-8220-1. The associated pilot valve bodies form part of the reactor coolant and containment boundaries and are subject to 10 CFR 50 Appendix J Type B testing.

    ISTC-5110 Power Operated Relief Valves - RRVs and RVVs have attributes of both power operated valves (ISTC-5100) and relief valves (ISTC-5240). Operability testing per Note 19 includes a functional test of the inadvertent actuation block at normal RCS pressure to confirm that the ECCS valve does not open. Testing also includes an operational test to demonstrate that the valves not exercise tested will open on low RCS pressure even though the trip valves remain energized (closed).

15. Backup Main Steam Isolation Valves and Bypass (Section 10.3.2.2): The backup MSIVs and MSIBVs are nonsafety-related, not risk significant backup isolation valves to the safety-related MSIVs and MSIBVs and are credited in safety analysis. These valves have the same design pressure and temperature as the RCS. These valves cannot be full-stroke or part stroke exercised during plant operation because closing the valves would interrupt steam flow resulting in possible steam generator pressure and level transients and may initiate a turbine or NPM trip.

16. Reactor Safety Valves (Section 5.1.3.5): These valves are not exercised for inservice testing; their position indication components are tested by local inspection without valve exercise. RSVs do not have specific leakage criteria. Seat tightness will be in accord with the requirements of the OM Code Mandatory Appendix I. Any RSV seat leakage will be RCS unidentified leakage and must meet Technical Specification surveillance criteria. Owner's as-left seat tightness criteria shall be no observed leakage utilizing the methods prescribed in OM Mandatory Appendix I, Table I-8220-1.

17. Steam Generator System Thermal Relief Valves (Section 5.4.1.2): These thermal relief valves are located inside containment on each SG system feedwater header.

18. All secondary systems containment isolation valves and backup isolation valves close to complete the decay heat removal system boundary. All of these valves have specific leakage criteria and are tested per NuScale Technical Specification surveillance test (Technical Specification SR 3.7.1.2 and SR 3.7.2.2).

19. These valves are subject to operability testing per the requirements of 10 CFR 50.55a. The test frequencies are to be established in accordance with the intent ASME OM Code - 2017, Mandatory Appendix IV. The approach detailed in Mandatory Appendix IV shall be applied to both AOVs and HOVs.

    OM Mandatory Appendix IV and this Plan address the attributes of a successful POV program as delineated in NRC Regulatory Issue Summary (RIS) 2000-3, "Resolution of Generic Safety Issue 158: Performance of Safety-Related Power Operated Valves Under Design Basis Conditions." See subsection 3.9.6.2.2 (3) for the factors to be considered in the evaluation of operability testing.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Table 3.9-17: ~~Chemical and Volume Control System Valves in the Example Inservice Testing Program~~Not Used

~~Valve Number~~	~~Risk Ranking~~	~~Size~~	~~Code Class~~	~~Category~~	~~Function~~	~~Safety Function Position~~	~~Test Parameters and Schedule~~				~~Remarks~~
							~~Leak Test~~	~~Exercise Test~~	~~Fail Safe Test~~	~~Position Verification Test~~	
~~GROUP 1: Ball valve / air operated~~											
~~CVC-AOV-0101~~	~~Low~~	~~2~~	~~3~~	~~B~~	~~A~~	~~C~~	~~N/A~~	~~MT/3MO~~	~~FC/3MO~~	~~PIT/2YR~~	~~Boron dilution prevention~~
~~CVC-AOV-0119~~	~~Low~~	~~2~~	~~3~~	~~B~~	~~A~~	~~C~~	~~N/A~~	~~MT/3MO~~	~~FC/3MO~~	~~PIT/2YR~~	~~Boron dilution prevention~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Table 3.9-18: Condensate and Feedwater System Valves in the Example Inservice Testing ProgramNot Used

Valve Number	Risk Ranking	Size	Code Class	Category	Function	Safety Function Position	Test Parameters and Schedule				Remarks
							Leak Test	Exercise Test	Fail Safe Test	Position Verification Test	
GROUP 2: Flow control valve / air operated											
FW-FCV-1006	LOW	6	NC (1)	A	A	C	TS	MT/24MO (2)	FC/24MO (3)	PIT/ 2YR	Feedwater isolation, backup containment isolation, backup DHRS boundary
FW-FCV-2006	LOW	6	NC (1)	A	A	C	TS	MT/24MO (2)	FC/24MO (3)	PIT/ 2YR	Feedwater isolation, backup containment isolation, backup DHRS boundary
GROUP 3: Nozzle check valve											
FW-CKV-1007	LOW	6	NC (1)	C	A	C	N/A	CV/24MO (4) DD/24MO (5)	N/A	N/A	Feedwater isolation, backup DHRS boundary
FW-CKV-2007	LOW	6	NC (1)	C	A	C	N/A	CV/24MO (4) DD/24MO (5)	N/A	N/A	Feedwater isolation, backup DHRS boundary

Notes:
1. These valves are non-ASME Code Class (RG 1.26 Quality Group D) and provide a defense-in-depth function to single isolation valves.
2. FW-FCV-1006/2006, feedwater regulating valves are full-stroke exercised under transition conditions. These valves cannot be full-stroke exercised during plant operation because closing the valves interrupts feedwater flow, resulting in severe steam generator level transients and may initiate a turbine or reactor module trip.
3. ISTC-3560 Fail-safe valves - Valves with fail-safe actuators shall be tested in accordance with the exercising frequency in ISTC-3510.
4. FW-CKV-1007/2007, Feedwater check valves are full-stroke exercised under transition conditions. These valves cannot be full-stroke exercised during plant operation because closing the valves to perform the test will interrupt feedwater flow with a potential for severe steam generator level transients and a potential turbine and reactor trip.
5. ISTC-3550 Valve in regular use - this valve operates in the course of reactor module operation at a frequency that satisfies the requirements of the IST plan.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Table 3.9-19: ~~Containment System Valves in the Example Inservice Testing Program~~ Not Used

~~Valve Number~~	~~Risk Ranking~~	~~Size~~	~~Code Class~~	~~Category~~	~~Function~~	~~Safety Function Position~~	~~Test Parameters and Schedule~~				~~Remarks~~
							~~Leak Test~~	~~Exercise Test~~	~~Fail Safe Test~~	~~Position Verification Test~~	
~~GROUP 4: Ball valve / hydraulic operated to open / nitrogen gas to close~~											
~~CVC-ISV-0323~~	~~HIGH~~	~~2~~	~~1~~	~~A~~	~~A~~	~~C~~	~~LT LTJ~~	~~MT/24MO (1)~~	~~FC/24MO (6)~~	~~PIT/ 2YR~~	~~Reactor coolant pressure boundary, containment isolation~~
~~CVC-ISV-0325~~	~~HIGH~~	~~2~~	~~1~~	~~A~~	~~A~~	~~C~~	~~LT LTJ~~	~~MT/24MO (1)~~	~~FC/24MO (6)~~	~~PIT/ 2YR~~	~~Reactor coolant pressure boundary, containment isolation~~
~~CVC-ISV-0329~~	~~HIGH~~	~~2~~	~~1~~	~~A~~	~~A~~	~~C~~	~~LT LTJ~~	~~MT/24MO (1)~~	~~FC/24MO (6)~~	~~PIT/ 2YR~~	~~Reactor coolant pressure boundary, containment isolation~~
~~CVC-ISV-0331~~	~~HIGH~~	~~2~~	~~1~~	~~A~~	~~A~~	~~C~~	~~LT LTJ~~	~~MT/24MO (1)~~	~~FC/24MO (6)~~	~~PIT/ 2YR~~	~~Reactor coolant pressure boundary, containment isolation~~
~~CVC-ISV-0334~~	~~HIGH~~	~~2~~	~~1~~	~~A~~	~~A~~	~~C~~	~~LT LTJ~~	~~MT/24MO (1)~~	~~FC/24MO (6)~~	~~PIT/ 2YR~~	~~Reactor coolant pressure boundary, containment isolation~~
~~CVC-ISV-0336~~	~~HIGH~~	~~2~~	~~1~~	~~A~~	~~A~~	~~C~~	~~LT LTJ~~	~~MT/24MO (1)~~	~~FC/24MO (6)~~	~~PIT/ 2YR~~	~~Reactor coolant pressure boundary, containment isolation~~
~~CVC-ISV-0401~~	~~HIGH~~	~~2~~	~~1~~	~~A~~	~~A~~	~~C~~	~~LT LTJ~~	~~MT/24MO (1)~~	~~FC/24MO (6)~~	~~PIT/ 2YR~~	~~Reactor coolant pressure boundary, containment isolation~~
~~CVC-ISV-0403~~	~~HIGH~~	~~2~~	~~1~~	~~A~~	~~A~~	~~C~~	~~LT LTJ~~	~~MT/24MO (1)~~	~~FC/24MO (6)~~	~~PIT/ 2YR~~	~~Reactor coolant pressure boundary, containment isolation~~
~~CE-ISV-0101~~	~~LOW~~	~~2~~	~~2~~	~~A~~	~~A~~	~~C~~	~~LTJ~~	~~MT/24MO (1)~~	~~FC/24MO (6)~~	~~PIT/ 2YR~~	~~Containment isolation~~
~~CE-ISV-0102~~	~~LOW~~	~~2~~	~~2~~	~~A~~	~~A~~	~~C~~	~~LTJ~~	~~MT/24MO (1)~~	~~FC/24MO (6)~~	~~PIT/ 2YR~~	~~Containment isolation~~
~~CFD-ISV-0129~~	~~LOW~~	~~2~~	~~2~~	~~A~~	~~A~~	~~C~~	~~LTJ~~	~~MT/24MO (1)~~	~~FC/24MO (6)~~	~~PIT/ 2YR~~	~~Containment isolation~~

Table 3.9-19: ~~Containment System Valves in the Example Inservice Testing Program (Continued)~~Not Used

Valve Number	Risk Ranking	Size	Code Class	Category	Function	Safety Function Position	Test Parameters and Schedule				Remarks
							Leak Test	Exercise Test	Fail Safe Test	Position Verification Test	
CFD-ISV-0130	LOW	2	2	A	A	C	LTJ	MT/24MO (1)	FC/24MO (6)	PIT/ 2YR	Containment isolation
RCCW-ISV-0184	LOW	2	2	A	A	C	LTJ	MT/24MO (1)	FC/24MO (6)	PIT/ 2YR	Containment isolation
RCCW-ISV-0185	LOW	2	2	A	A	C	LTJ	MT/24MO (1)	FC/24MO (6)	PIT/ 2YR	Containment isolation
RCCW-ISV-0190	LOW	2	2	A	A	C	LTJ	MT/24MO (1)	FC/24MO (6)	PIT/ 2YR	Containment isolation
RCCW-ISV-0191	LOW	2	2	A	A	C	LTJ	MT/24MO (1)	FC/24MO (6)	PIT/ 2YR	Containment isolation
GROUP 5: Ball valve / hydraulic operated to open / nitrogen gas to close											
FW-ISV-1003	LOW	4	2	A	A	C	LT	MT/24MO (2)	FC/24MO (6)	PIT/ 2YR	Feedwater isolation, containment isolation, DHRS boundary
FW-ISV-2003	LOW	4	2	A	A	C	LT	MT/24MO (2)	FC/24MO (6)	PIT/ 2YR	Feedwater isolation, containment isolation, DHRS boundary
GROUP 6: Nozzle check valve											
FW-CKV-1002	LOW	4	2	B/C	A	C	LT	CV/24MO (3) DD/24MO (5)	N/A	N/A	Feedwater isolation, DHRS boundary
FW-CKV-2002	LOW	4	2	B/C	A	C	LT	CV/24MO (3) DD/24MO (5)	N/A	N/A	Feedwater isolation, DHRS boundary
GROUP 7: Ball valve / hydraulic operated to open / nitrogen gas to close											
MS-ISV-1005	LOW	12	2	A	A	C	LT	MT/24MO (4)	FC/24MO (6)	PIT/ 2YR	Steam line isolation, containment isolation, DHRS boundary
MS-ISV-2005	LOW	12	2	A	A	C	LT	MT/24MO (4)	FC/24MO (6)	PIT/ 2YR	Steam line isolation, containment isolation, DHRS boundary

Table 3.9-19: Containment System Valves in the Example Inservice Testing Program (Continued)Not Used

Valve Number	Risk Ranking	Size	Code Class	Category	Function	Safety Function Position	Test Parameters and Schedule				Remarks
							Leak Test	Exercise Test	Fail Safe Test	Position Verification Test	
GROUP 8: Ball valve / hydraulic operated to open / nitrogen gas to close											
MS-ISV-1006	LOW	2	2	A	P	C	LT	N/A	N/A	PIT/ 2YR	Steam line isolation, containment isolation, DHRS boundary
MS-ISV-2006	LOW	2	2	A	P	C	LT	N/A	N/A	PIT/ 2YR	Steam line isolation, containment isolation, DHRS boundary

Notes:
1. Containment isolation valves (CVC-ISV-0323, 0325, 0329, 0334, 0336, 0401, 0403, CE-ISV-0101, 0102, CFD-ISV-0129, 0130, RCCW-ISV-0184, 0185, 0190, 0191) are full-stroke exercised at transition. These valves cannot be full-stroke exercised during plant operation because closing a containment isolation valve causes a reactor module trip.
2. FW-ISV-1003/2003, Feedwater isolation valves are full-stroke exercised at transition. These valves cannot be full-stroke exercised during plant operation because closing the valves interrupts feedwater flow resulting in severe steam generator level transients and potentially initiating a turbine and reactor trip.
3. FW-CKV-1002/2002, Feedwater isolation check valves are full-stroke exercised at transition. These valves cannot be full-stroke exercised during plant operation because closing the valves interrupts feedwater flow, resulting in severe steam generator level transients and potentially initiating a turbine and reactor trip.
4. MS-ISV-1005/2005, Main steam isolation valves (MSIV) are full-stroke exercised at transition. These valves cannot be full-stroke exercised during plant operation because closing a MSIV causes steam generator pressure and level transients and potentially initiating a turbine and reactor trip.
5. ISTC-3550 Valve in regular use - This valve operates in the course of reactor module operation at a frequency that satisfies the requirements of this IST plan.
6. ISTC-3560 Fail-safe valves - Valves with fail-safe actuators shall be tested in accordance with the exercising frequency in ISTC-3510.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Table 3.9-20: Decay Heat Removal System Valves in the Example Inservice Testing ProgramNot Used

Valve Number	Risk Ranking	Size	Code Class	Category	Function	Safety Function Position	Test Parameters and Schedule				Remarks
							Leak Test	Exercise Test	Fail Safe Test	Position Verification Test	
GROUP 9: Ball valve / hydraulic operated to open / nitrogen gas to close											
DHR-HOV-1002A	LOW	6	2	B	A	O	N/A	MT/24MO (1) SRV/5YR	FC/24MO (2)	PIT/ 2YR	Decay heat removal
DHR-HOV-1002B	LOW	6	2	B	A	O	N/A	MT/24MO (1) SRV/5YR	FC/24MO (2)	PIT/ 2YR	Decay heat removal
DHR-HOV-2002A	LOW	6	2	B	A	O	N/A	MT/24MO (1) SRV/5YR	FC/24MO (2)	PIT/ 2YR	Decay heat removal
DHR-HOV-2002B	LOW	6	2	B	A	O	N/A	MT/24MO (1) SRV/5YR	FC/24MO (2)	PIT/ 2YR	Decay heat removal

Notes:
1. DHR-HOV-1002A/B and DHR-HOV-2002A/B, Decay heat removal actuation valves are full-stroke exercised at transition. These valves cannot be full-stroke exercised during plant operation because such testing would unnecessarily subject the steam generator nozzles to thermal transients from decay heat condenser condensate flow.
2. ISTC-3560 Fail-safe valves - Valves with fail-safe actuators shall be tested in accordance with the exercising frequency in ISTC-3510.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Table 3.9-21: ~~Emergency Core Cooling System Valves in the Example Inservice Testing Program~~ Not Used

~~Valve Number~~	~~Risk Ranking~~	~~Size~~	~~Code Class~~	~~Category~~	~~Function~~	~~Safety Function Position~~	~~Test Parameters and Schedule~~				~~Remarks~~
							~~Leak Test~~	~~Exercise Test~~	~~Fail Safe Test~~	~~Position Verification Test~~	
~~GROUP 10: Globe valve / hydraulic operated / remote actuated~~											
~~ECC-HOV-0101A~~	~~HIGH~~	~~6~~	~~1~~	~~B/C~~	~~A~~	~~O/C~~	~~TS (1)~~	~~MT/24MO (2) SRV/5YR (3)~~	~~FC/24MO (4)~~	~~PIT/ 2YR (5)~~	~~Core cooling recirculation path, reactor coolant pressure boundary~~
~~ECC-HOV-0101B~~	~~HIGH~~	~~6~~	~~1~~	~~B/C~~	~~A~~	~~O/C~~	~~TS (1)~~	~~MT/24MO (2) SRV/5YR (3)~~	~~FC/24MO (4)~~	~~PIT/ 2YR (5)~~	~~Core cooling recirculation path, reactor coolant pressure boundary~~
~~ECC-HOV-0101C~~	~~HIGH~~	~~6~~	~~1~~	~~B/C~~	~~A~~	~~O/C~~	~~TS (1)~~	~~MT/24MO (2) SRV/5YR (3)~~	~~FC/24MO (4)~~	~~PIT/ 2YR (5)~~	~~Core cooling recirculation path, reactor coolant pressure boundary~~
~~GROUP 11: Globe valve / hydraulic operated / remote actuated~~											
~~ECC-HOV-0104A~~	~~HIGH~~	~~4~~	~~1~~	~~B/C~~	~~A~~	~~O/C~~	~~TS (1)~~	~~MT/24MO (2) SRV/5YR (3)~~	~~FC/24MO (4)~~	~~PIT/ 2YR (5)~~	~~Core cooling recirculation path, reactor coolant pressure boundary~~
~~ECC-HOV-0104B~~	~~HIGH~~	~~4~~	~~1~~	~~B/C~~	~~A~~	~~O/C~~	~~TS (1)~~	~~MT/24MO (2) SRV/5YR (3)~~	~~FC/24MO (4)~~	~~PIT/ 2YR (5)~~	~~Core cooling recirculation path, reactor coolant pressure boundary~~

Table 3.9-21: Emergency Core Cooling System Valves in the Example Inservice Testing Program (Continued)Not Used

Valve Number	Risk Ranking	Size	Code Class	Category	Function	Safety Function Position	Test Parameters and Schedule				Remarks
							Leak Test	Exercise Test	Fail Safe Test	Position Verification Test	

Notes:

1. The Reactor vent valves and reactor recirculation valves do not have specific leakage criteria. The associated pilot valve bodies form part of the reactor coolant and containment boundaries and are subject to technical specification leakage requirements and Appendix J Type B testing, respectively.

REACTOR VENT VALVE	TRIP VALVE	RESET VALVE
ECC-HOV-0101A	ECC-SV-102A	ECC-SV-103A
ECC-HOV-0101B	ECC-SV-102B	ECC-SV-103B
ECC-HOV-0101C	ECC-SV-102C ECC-SV-107	ECC-SV-103C

REACTOR RECIRCULATION VALVE	TRIP VALVE	RESET VALVE
ECC-HOV-0104A	ECC-SV-105A	ECC-SV-106A
ECC-HOV-0104B	ECC-SV-105B	ECC-SV-106B

2. ISTC-3510 Exercising Test Frequency - Reactor vent valves and reactor recirculation valves shall be tested once per fuel cycle. The associated pilot valves are considered part of the main valve. ECC-HOV-0101A/B/C, reactor vent valves and ECC-HOV 0104A/B, reactor recirculation valves are full-stroke exercised at refueling in the open direction only. These valves cannot be full-stroke or partial-stroke exercised during plant operation because cycling the valves opens an RCS vent path. These valves open and remain open when actuated. The closed safety function is passive.
3. SRV testing includes a functional test of the inadvertent actuation block valve at normal RCS pressure. Testing also includes an augmented functional test to demonstrate that the valves not SRV tested will open on low RCS pressure even though the trip valves remain energized (closed).
4. ISTC-3560 Fail-safe valves - Valves with fail-safe actuators shall be tested in accordance with the exercising frequency in ISTC-3510. The fail-safe test also tests the associated trip valve.
5. ISTC-3700 Position verification testing - Reactor vent valves, reactor recirculation valves and all associated trip and reset valves have remote position indicators and shall be tested for position verification.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Table 3.9-22: ~~Main Steam System Valves in the Example Inservice Testing Program~~Not Used

~~Valve Number~~	~~Risk Ranking~~	~~Size~~	~~Code Class~~	~~Category~~	~~Function~~	~~Safety Function Position~~	~~Test Parameters and Schedule~~				~~Remarks~~
							~~Leak Test~~	~~Exercise Test~~	~~Fail Safe Test~~	~~Position Verification Test~~	
~~GROUP 12: Gate valve / air operated~~											
~~MS-AOV-1003~~	~~LOW~~	~~12~~	~~NC (1)~~	~~A~~	~~A~~	~~C~~	~~TS~~	~~MT/24MO (2)~~	~~FC/24MO (3)~~	~~PIT/ 2YR~~	~~Steam line isolation, backup containment isolation, backup DHRS boundary~~
~~MS-AOV-2003~~	~~LOW~~	~~12~~	~~NC (1)~~	~~A~~	~~A~~	~~C~~	~~TS~~	~~MT/24MO (2)~~	~~FC/24MO (3)~~	~~PIT/ 2YR~~	~~Steam line isolation, backup containment isolation, backup DHRS boundary~~
~~GROUP 13: Gate valve / air operated~~											
~~MS-AOV-1004~~	~~LOW~~	~~4~~	~~NC (1)~~	~~A~~	~~P~~	~~C~~	~~TS~~	~~N/A~~	~~N/A~~	~~PIT/ 2YR~~	~~Steam line isolation, backup containment isolation, backup DHRS boundary~~
~~MS-AOV-2004~~	~~LOW~~	~~4~~	~~NC (1)~~	~~A~~	~~P~~	~~C~~	~~TS~~	~~N/A~~	~~N/A~~	~~PIT/ 2YR~~	~~Steam line isolation, backup containment isolation, backup DHRS boundary~~

~~Notes:~~
~~1. These valves are non-ASME Code Class (RG 1.26 Quality Group D) and provide a defense-in-depth function to single containment isolation valves.~~
~~2. MS-AOV-1003/2003, Secondary main steam isolation valves are full-stroke exercised at transition. These valves cannot be full-stroke exercised during plant operation because closing a secondary MSIV causes steam generator pressure and level transients and, most likely, a turbine and reactor trip.~~
~~3. ISTC-3560 Fail-safe valves - Valves with fail-safe actuators shall be tested in accordance with the exercising frequency in ISTC-3510.~~

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Table 3.9-23: Safety and Relief Valves in the Example Inservice Testing ProgramNot Used

Valve Number	Risk Ranking	Size	Code Class	Category	Function	Safety Function Position	Test Parameters and Schedule				Remarks
							Leak Test	Exercise Test	Fail Safe Test	Position Verification Test	
GROUP 14: Safety valve / pilot operated / self-actuating											
RCS-PSV-0003A	HIGH	4	1	C	A	O/C	N/A	SRV/5YR	N/A	SRV/5YR	Overpressure protection, reactor coolant pressure boundary
RCS-PSV-0003B	HIGH	4	1	C	A	O/C	N/A	SRV/5YR	N/A	SRV/5YR	Overpressure protection, reactor coolant pressure boundary
Group 15: Relief Valve / Self-actuating											
SGS-PSV-1002	LOW	1 1/2	2	C	A	O/C (1)	N/A	SRV/10YR	N/A	N/A	Thermal Overpressure Protection, SGS Pressure
SGS-PSV-2002	LOW	1 1/2	2	C	A	O/C (1)	N/A	SRV/10YR	N/A	N/A	Thermal Overpressure Protection, SGS Pressure Boundary

NOTES

1. SGS-PSV-1002/2002 provide thermal overpressure protection to the SGS and DHRS when both of these systems are inoperable only, and all control rods are on the bottom. Unintended containment isolation during flushing evolutions may result in overpressure conditions caused by changes in fluid temperature. These thermal relief valves provide SGS and DHRS protection. These devices are not credited for overpressure protection when the SGS or DHRS are operable and are not credited for protecting any system during a design basis event. Overpressure protection during SGS and DHRS operability is provided by system design pressure and the reactor safety valves. These valves are included here due to the significance of the systems protected.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Table 3.9-24: Example - NuScale Power Plant Augmented Inservice Testing PlanNot Used

1. General Information

1.1 Introduction

The example augmented inservice testing plan, hereafter referred to as the augmented IST plan, has been prepared to summarize the test program for certain components identified as part of NuScale's DRAP. This augmented testing plan is applicable to NuScale Power Plant modules 1 through 12.

1.2 Code Edition

This example augmented IST plan meets specific aspects of the ASME OM Code 2012 as endorsed by 10 CFR 50.55a, based on the augmented quality requirements of the component as defined by NuScale's DRAP.

1.3 Dates of Test Interval

The preservice test and preservice test period will be defined by each individual reactor module as it is placed into service. Preservice testing is performed to verify the augmented quality requirement.

The 10-year examination and test interval for the augmented IST plan will follow that of the IST plan.

2. Scope

The scope of the augmented IST plan is derived from the requirements for important functions that are met by components having augmented quality requirements that shall meet specific aspects of the ASME OM Code 2012 Edition as endorsed by 10 CFR 50.55a(f)(4).

Valve augmented IST is consistent with ASME OM, Subsection ISTC, Appendix I and Appendix II as modified by the expert panel review. The valves selected for inclusion in this augmented testing plan are those active or passive valves and pressure relief devices (and their actuating and position indicating systems) that are required to perform a specific augmented function during a design basis or beyond-design-basis event:

a. in shutting down a reactor to the safe shutdown condition, or
b. in maintaining the safe shutdown condition, or
c. in mitigating the consequences of an accident

Excluded from this testing plan are

a. valves used only for operating convenience such as vent, drain, instrument and test valves
b. valves used only for system control, such as pressure regulating valves
c. valves used only for system or component maintenance
d. skid-mounted valves that are tested as part of the major component
e. Category A and Category B Safety and relief valves, which are excluded from the requirements of ISTC 3700 and ISTC 3500 valve testing requirements.

Further, the valve actuating system test scope does not include external control and protection systems responsible for sensing plant conditions and providing signals for valve operation.

The nonsafety-related valves that have augmented quality requirements in the scope of this testing plan were identified by expert panel review.

3. Valve Testing Table Format

Detailed information and testing requirements for the valves included in the augmented IST plan are summarized in tables. A separate table has been prepared for each plant system which contains valves within the scope of the plan. These systems are:

- the chemical and volume control system
- the condensate and feedwater system
- the reactor coolant system

4. Abbreviations

Abbreviations used in the following tables are defined in Table .

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Table 3.9-25: ~~Example Augmented Inservice Testing Valve Program - Chemical and Volume Control System~~Not Used

Valve Number	Risk Ranking	Size	Code Class	Category	Function	Safety Function Position	Test Parameters and Schedule				Remarks
							Leak Test	Exercise Test	Fail Safe Test	Position Verification Test	
GROUP 1: Ball valve / air-operated											
CVC-AOV-0339	LOW	2	3	A	A	C	LTJ (1)	MT/3MO	FC/3MO	PIT/ 2YR	Containment isolation
GROUP 2: Globe valve / solenoid operated											
CVC-AOV-0406	LOW	1/2	3	A	A	C	LTJ (1)	MT/3MO	FC/3MO	PIT/ 2YR	Containment isolation
GROUP 3: Nozzle check valve											
CVC-CKV-0352	LOW	2 1/2	3	A/C	A	C	LTJ (1)	CV/24MO DD/24MO (2)	N/A	N/A	Containment isolation
CVC-CKV-0353	LOW	2	3	A/C	A	C	LTJ (1)	CV/24MO DD/24MO (2)	N/A	N/A	Containment isolation

Notes:
1. These valves provide a defense-in-depth function to containment isolation valves in accordance with Regulatory Guide 1.26 for a Quality Group C/D class break. These valves have specific leakage criteria similar to containment isolation valves, but are not considered part of the containment isolation boundary.
2. ISTC-3550 Valve in regular use - This valve operates in the course of reactor module operation at a frequency that satisfies the requirements of the IST plan.

RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-16

Table 3.9-26: ~~Example Augmented Inservice Testing Valve Program - Reactor Coolant System~~Not Used

~~Valve Number~~	~~Risk Ranking~~	~~Size~~	~~Code Class~~	~~Category~~	~~Function~~	~~Safety Function Position~~	~~Test Parameters and Schedule~~				~~Remarks~~
							~~Leak Test~~	~~Exercise Test~~	~~Fail Safe Test~~	~~Position Verification Test~~	
~~GROUP 4: Nozzle check valve~~											
~~RCS-CKV-0332~~	~~LOW~~	~~2~~	~~1~~	~~C~~	~~A~~	~~C~~	~~N/A~~	~~CV/8YR (1)~~	~~N/A~~	~~N/A~~	~~Reactor coolant pressure boundary, containment isolation (beyond-design-basis)~~
~~GROUP 5: Excess flow nozzle check valve~~											
~~RCS-CKV-0323~~	~~LOW~~	~~2~~	~~1~~	~~C~~	~~A~~	~~C~~	~~N/A~~	~~CVD/8YR (1)~~	~~N/A~~	~~N/A~~	~~Reactor coolant pressure boundary, containment isolation (beyond-design-basis)~~
~~RCS-CKV-0333~~	~~LOW~~	~~2~~	~~1~~	~~C~~	~~A~~	~~C~~	~~N/A~~	~~CVD/8YR (1)~~	~~N/A~~	~~N/A~~	~~Reactor coolant pressure boundary, containment isolation (beyond-design-basis)~~
~~RCS-CKV-0400~~	~~LOW~~	~~2~~	~~1~~	~~C~~	~~A~~	~~C~~	~~N/A~~	~~CVD/8YR (1)~~	~~N/A~~	~~N/A~~	~~Reactor coolant pressure boundary, containment isolation (beyond-design-basis)~~

~~Notes:~~
~~1. These valves are tested once every eight years on a staggered test basis. The excess flow closure function cannot be performed. Flow required is in excess of system capability as it is required to simulate pressurized pipe rupture outside containment with failure of both containment isolation valves; therefore, a valve disassembly examination is performed pursuant to ISTC-5221(c)(4).~~