RAIO-0717-54813

July 11, 2017

Docket No. 52-048

U.S. Nuclear Regulatory Commission
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SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 57 (eRAI No. 8865) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 57 (eRAI No. 8865)," dated June 09, 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. 8865:

- 16-1

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 Steven Mirsky at 240-833-3001 or at smirsky@nuscalepower.com.

Sincerely,

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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 8865

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 8865

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

eRAI No.: 8865
Date of RAI Issue: 06/09/2017

NRC Question No.: 16-1

NuScale FSAR Tier 2, Section 6.2.4.2.2, “Component Description,” describes the actuation system of the containment isolation valves (CIVs) as a gas-hydraulic system:

“Hydraulic actuators are used for both PSCIV and SSCIV designs….Maintaining the hydraulic system pressure supplies the force to keep the valve in the open position. Pre-charged, nitrogen-filled cylinders are mounted on the "closed" side of each actuator. The gases in the cylinders are compressed as part of the valve opening action. Compression of the gas in each cylinder provides the passive stored energy used for valve closure.”

Containment isolation is a function relied upon to mitigate a design basis accident. Knowing the pressure in each actuator is a means to determine that the passive stored energy used for valve closure is adequate. RG 1.206 Section 6.2.4, “Containment Isolation System,” states that an applicant should discuss the assurance of operability of valves and valve operators. However, the NuScale FSAR does not describe the operator’s ability to monitor (e.g., indication and alarm) each containment isolation valve’s gas pressure to ensure the valve is operable.

10 CFR 50.36, “Technical Specifications,” requires, in part, that a technical specification limiting condition for operation be established (e.g., for a system that is part of the primary success path and which functions or actuates to mitigate a design basis accident) and will include surveillance requirements, in part, to ensure the limiting conditions of operation will be met. The NuScale Technical Specifications describe CIV limiting conditions for operation but do not discuss surveillance requirements related to isolation valve gas pressure.

Therefore, based on the regulation and guidance cited above, the NRC staff requests that the NuScale design certification applicant provide information in the FSAR on the assurance of operability of CIV valves and valve operators, and in the FSAR and Technical Specifications for how the operator can assure that the isolation valve can perform its safety function (e.g., gas-spring is sufficiently charged and available to support valve closure). The information is needed in order for the staff to make a regulatory decision regarding the adequacy of assuring that the CIVs are able to perform their safety functions.

NuScale Response:

FSAR Section 6.2.4.1 provides the design bases for the Containment Isolation System. This section was revised to include a description of the nitrogen accumulator pressure indication and alarms that are continuously available in the main control room.

In addition to the surveillance testing required by LCO 3.6.2, the plant design as described in revised section 6.2.4 continuously monitors and indicates pressure in the main control room. This continuous monitoring obviates the need for additional testing. If an alarm is received, the operations and alarm response procedures described in FSAR Chapter 13, "Conduct of Operations," will ensure that the appropriate response is initiated in a timely manner to investigate the condition, enter any applicable Condition of the technical specifications, and initiate the Required Actions that are appropriate.

The NuScale Technical Specifications require OPERABILITY of the containment isolation valves (CIVs) as described in LCO 3.6.2, "Containment Isolation Valves," and the associated Bases. To further assure and further clarify the OPERABILITY role of accumulators, the LCO section of the Bases for 3.6.2 was revised to include:

Containment isolation valve OPERABILITY requires any associated nitrogen accumulator to be maintained at a pressure that is adequate to close the valve within the specified time.

This location was selected to clarify and reinforce the need to maintain adequate pressure in the accumulators consistent with section 4.2.4.d of TSTF-GG-05-01, Rev. 1, "Writer's Guide for Plant-Specific Improved Technical Specifications." This section of the Writer's Guide indicates that the LCO section of the Bases is the appropriate location to "[d]iscuss any other facets of the LCO that may be required, for example:...conditions required...[and] parameter requirements...."

These changes to the FSAR and Technical Specification Bases provide assurance of OPERABILITY of the CIV valves and valve operators including the associated nitrogen accumulators.

Impact on DCA:

FSAR Section 6.2.4, "Containment Isolation System," and the Bases for Technical Specifications Limiting Condition for Operation 3.6.2, "Containment Isolation Valves," have been revised as described in the response above and as shown in the markup provided in this response.

signal or loss of power. Stored energy in a nitrogen accumulator closes a PSCIV when the hydraulic pressure is vented. The SSCIVs are similar except that these valves have one hydraulically-operated valve and each division is powered from one hydraulic skid. Nitrogen accumulator pressure indication for each CIV with associated alarms is provided in the main control room.

6.2.4.2 System Design

6.2.4.2.1 General Description

The containment pressure boundary includes the steel CNV (described in Sections 3.8.2 and 6.1) and the CIVs and barriers that close the penetrations in the CNV. Table 6.2-4, "Containment Penetrations," provides a listing of the containment penetrations and associated isolation data. A schematic of CNV penetrations is provided in Figure 6.2-3a and Figure 6.2-3b.

The passive containment isolation barriers use the following design features.

The piping between a CNV safe-end and a CIV consists of the main steam lines from the containment nozzle safe-end to an MSIV and a MSIBV, including the tees to the DHRS piping. Unlike the other CIVs, the MSIVs and bypass valves are not welded to a safe-end on the CNV top head. The short length of piping is leak tight based on the welded design (as described in Section 3.6.2.5), and this piping is provided to allow for a tee for each of the two DHRS piping branch lines (as shown in Figure 6.2-6a).

The ECCS valve actuator assemblies are welded on the outside of the CNV to a nozzle safe-end. The containment boundary is formed by the body of the valve actuator assembly (valve manifold) and by a sealed valve bonnet. Each trip and reset valve has double metal O-ring seals with a port between the seals for periodic testing of the seal leakage rate.

The DHRS closed piping outside of the containment is leak tight based on the welded design described in Section 5.4.3. The piping design meets ASME BPVC, Section III, Class 2, Subsection NC requirements, and the applicable criteria of NRC Branch Technical Position 3-4, Revision 2, as described in Section 3.6.2.

The flange connection closures on the CNV are the covers for the access and inspection ports, manways, and electrical penetrations assemblies (EPAs). The closure flanges are provided with double metal O-ring seals with a port between the seals for periodic testing of the seal leakage rate.

The containment isolation components with moving parts are the CIVs which function to provide a means of isolating process flow paths that are not required for safe shutdown or accident mitigation and that pass through containment penetrations. These valves minimize the release of fission products to the environment during design basis events while allowing process flows into and out of the CNV during normal operations.

BASES

APPLICABLE SAFETY ANALYSES (continued)

fission products to the environment is controlled by the rate of containment leakage. The allowable leakage rate for the CNTS is 0.20% of containment air weight of the original content of containment air the first day after the DBA, which thereafter the CNTS leakage rate is 0.1% per day. This leakage rate is defined in 10 CFR 50, Appendix J (Ref. 1), as L_a, the maximum allowable containment leakage rate at the calculated peak containment internal pressure P_a following a DBA. This allowable leakage rate forms the basis for the acceptance criteria imposed on the SRs associated with containment penetrations.

It is assumed that, within 7 seconds after the accident, isolation of the containment is complete and leakage terminated except for the design leakage rate L_a. The containment isolation of 7 seconds includes signal delay, and containment isolation valve stroke times.

The containment isolation valves satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Containment isolation valves form a part of the containment boundary. The containment isolation valve safety function is to minimize the loss of reactor coolant inventory and establish the containment boundary during a DBA.

Containment isolation valves consist of automatic, power-operated isolation valves. The ACTION STATEMENTS allow the use of manual valves and blind flanges to restore containment isolation. Containment isolation valves are categorized as active containment isolation devices that, following an accident, either receive a containment isolation signal to close, or close as a result from a differential pressure.

The automatic isolation valves are required to have isolation times within limits and to actuate upon a containment isolation signal or loss of power. Isolation valves are verified OPERABLE through the INSERVICE TESTING PROGRAM. Containment isolation valve OPERABILITY requires any associated nitrogen accumulator to be maintained at a pressure that is adequate to close the valve within the specified time.

The normally closed isolation valves are considered OPERABLE when manual valves are closed, automatic valves are de-activated and secured in the closed position or blind flanges are in place, and closed systems are intact.