RAIO-0918-61807

Docket No. 52-048

September 17, 2018

U.S. Nuclear Regulatory Commission
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11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Supplemental Response to NRC Request for Additional Information No. 362 (eRAI No. 9315) on the NuScale Design Certification Application

REFERENCES:
1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 362 (eRAI No. 9315)," dated February 05, 2018
2. NuScale Power, LLC Response to NRC "Request for Additional Information No. 362 (eRAI No.9315)," dated April 06, 2018
3. NuScale Power, LLC Supplemental Response to NRC "Request for Additional Information No. 362 (eRAI No.9315)," dated June 6, 2018

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

The Enclosure to this letter contains NuScale's supplemental response to the following RAI Question from NRC eRAI No. 9315:

- 03.08.02-14

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
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Enclosure 1: NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9315

Enclosure 1:

NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9315

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

eRAI No.: 9315
Date of RAI Issue: 02/05/2018

NRC Question No.: 03.08.02-14

10 CFR 52.47 requires the design certification applicant to include a description and analysis of the structures, systems, and components with sufficient detail to permit understanding of the system designs.

Per NuScale FSAR Tier 2, Section 6.3.2.3, the emergency core cooling system (ECCS) components (including valves, hydraulic lines, and actuator assemblies) are Quality Group A, Seismic Category I components designed to ASME BPV Code, Section III, Subsection NB.

For consistency, Table 3.2-1, Classification of Structures, Systems, and Components, should be revised to clarify the specified ECCS valves are intended to include the valves, hydraulic lines, and actuator assemblies being Quality Group A, Seismic Category I components.

Per FSAR Tier 2, Section 6.3.2.2, the body of the ECCS actuator assembly serves as both a containment vessel (CNV) pressure boundary and reactor coolant pressure boundary (RCPB). General Design Criteria (GDCs) 14 and 16 require that:

- The reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.
- Reactor containment and associated systems shall be provided to establish an essentially leak- tight barrier against the uncontrolled release of radioactivity to the environment and to assure that the containment design conditions important to safety are not exceeded for as long as postulated accident conditions require.

The ECCS actuator assembly currently protects both the CNV boundary and RCPB; therefore it is crucial that the welds and actuator assembly itself be designed to ensure and extremely low probability of leakage or failure in accordance with GDCs 14 and 16.

The NRC staff requests the applicant to clarify the inservice inspection (ISI) that will be performed to provide assurance of the structural integrity of the containment nozzle to safe end welds and safe end to ECCS actuator assembly welds, i.e. will they be full volumetric? FSAR Tier 2, Table 6.6-1, Examination Categories, should also be revised to include this information.

Also, will the material the actuator assembly body is manufactured from be volumetrically examined as part of the valve fabrication requirements? And what are the fabrication NDE requirements for the entire RCPB portion for this valve?

Also, Per FSAR 6.3.2.2, Equipment and Component Descriptions, valve bonnet seals on each pilot valve establish the pressure boundaries internal to the valve assembly body. And in TR-1116-51962-NP "NuScale Containment Leakage Integrity Assurance Technical Report," Section 3.2 "Containment Penetrations," it describes a portion of the ECCS actuator pressure boundary that is accomplished by a bolted enclosure (body-to-bonnet) with a dual metal o-ring seal.

In generic technical specifications (TS) Subsection 3.4.5, "RCS Operational LEAKAGE," LCO 3.4.5 states that RCS operational LEAKAGE shall be limited to: a) no pressure boundary LEAKAGE, b) 0.5 gpm unidentified LEAKAGE, c) 2 gpm identified LEAKAGE from the RCS, and d) 150 gallons per day primary to secondary LEAKAGE.

The NRC staff requests that the applicant clarify the periodic testing and inspection provisions it will implement to ensure no leakage past the O-ring seals of the ECCS actuator pressure boundary during normal operating conditions. Also, explain how LCO 3.4.5 limits a), b), and c) would apply to leakage past the ECCS actuator O-ring seals or through the valve body. Explain how such RCS leakage outside of containment would be detected, identified, and quantified during operation." Were such leakage to occur without being identified but within the limit of LCO 3.4.5, what would the possible consequences be at the onset of an event?

NuScale Response:

A NRC public call was held on July 18, 2018 with NRC project managers and reviewers to discuss the inservice examination methods required for the emergency core cooling system (ECCS) trip/reset valve-to-safe end weld, as well as the examination methods for the valve body. The NRC staff has requested a volumetric inservice inspection requirement for the valve-to-safe end weld, which is beyond the ASME Boiler and Pressure Vessel Code (B&PVC) Class 1 requirement.

A 1/2 inch nominal pipe size (NPS) stagnant hydraulic line supplies the ECCS trip/reset valve, which extends the reactor coolant system (RCS) pressure boundary outside of the containment vessel (CNV) pressure boundary. The response provided in RAI 9362, question 03.08.02-15 provided the technical justification that the ASME B&PVC requirements are acceptable. Summarizing that response the fluid in the hydraulic lines connected to the valve are a static flow path, the hydraulic line wall forms the RCS boundary not the valve-to-safe end weld, the hydraulic lines and valve are not subjected to RCS transient conditions, no external transient conditions are created by the reactor pool, and the only mechanical loading would be created by a seismic event. So the only credible method to initiate flaw growth would occur on the outside of the weld. The valve-to-safe end weld will have a preservice volumetric examination after the attachment weld is made to check for any fabrication flaws. Therefore, the surface examination required by the ASME B&PVC is acceptable.

NuScale's position is that the ASME B&PVC Class 1 requirements are sufficient for the NuScale design and that there are examples in the operating fleet where small RCS pressure boundary lines extend outside of the containment boundary and do not require volumetric examination.

Many examples exist in the current fleet of nuclear plants. The most prominent example is the Control Rod Drive (CRD) system for boiling water reactors (BWRs). The CRD system provides water for cooling the control rod drives that use reactor water to move the control rods (insert and withdraw). Each control rod has an associated hydraulic control unit (HCU) that ensures each rod can move independently. Each CRD HCU (e.g. Monticello has 121 HCUs) is connected to a control rod drive that has both an insert and withdraw line (e.g. total of 242 for Monticello). Each insert and withdraw line connects to the drive and comes from below the reactor and exits the containment and proceeds to the east and west banks of HCUs. There are no valves between the containment and the HCU banks (estimated to be approximately 30' -40' of piping outside containment). Each of these lines is ¾ inch to 1 inch in diameter.

The Inservice Inspection (ISI) Plans (ML12060A298) do not contain volumetric examination requirements for the CRD insert and withdraw lines. The Monticello CRD Housing welds are not volumetrically or surface examined per the ISI plan. The CRD housing welds are located near the location where the insert and withdraw lines enter the CRD Mechanism.

The CRD insert/withdraw lines would be a similar example to the NuScale ECCS trip/reset valve configuration as the CRD insert/withdraw lines are reactor coolant pressure boundary (RCPB) lines (connected to the reactor) and are stagnant until the operator repositions a control rod. When the control rod is repositioned the HCU water is used to provide hydraulic force to move the rod. Actual rod movement is controlled by gripper fingers.

In the current fleet of nuclear plants these RCPB lines which extend outside of containment have ISI programs which conform to existing ASME B&PVC Class 1 requirements and provide reasonable assurance of RCPB integrity without requiring volumetric inspection of welds outside of containment.

Impact on DCA:

There are no impacts to the DCA as a result of this response.