RAIO-0319-65001

March 28, 2019

Docket No. 52-048

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

SUBJECT: NuScale Power, LLC Supplemental Response to NRC Request for Additional Information No. 433 (eRAI No. 9474) on the NuScale Design Certification Application

REFERENCES:

1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 433 (eRAI No. 9474)," dated April 23, 2018
2. NuScale Power, LLC Response to NRC "Request for Additional Information No. 433 (eRAI No.9474)," dated September 24, 2018
3. NuScale Power, LLC Supplemental Response to NRC "Request for Additional Information No. 433 (eRAI No. 9474)," dated February 14, 2019
4. NuScale Power, LLC Supplemental Response to NRC "Request for Additional Information No. 433 (eRAI No. 9474)," dated March 13, 2019

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. 9474:

- 06.02.06-22

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
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Enclosure 1: NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9474

Enclosure 1:

NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9474

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

eRAI No.: 9474
Date of RAI Issue: 04/23/2018

NRC Question No.: 06.02.06-22

The regulatory bases for the question below are:

10 CFR 50.12 Specific Exemptions, (a)(1) The Commission may…grant exemptions from the requirements of the regulations which …will not present an undue risk to the public health and safety.

10 CFR 52.47, Contents of Applications; technical information, (a) The application must contain a final safety analysis report (FSAR) that describes the facility, presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems, and components and of the facility as a whole, and must include the following information: (2) A description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished. The description shall be sufficient to permit understanding of the system designs and their relationship to the safety evaluations.

10 CFR 52.47 Contents of Applications; technical information,

(a)(2)(iv) which states, in part "The applicant shall perform an evaluation and analysis of the postulated fission product release, using the expected demonstrable containment leak rate … to evaluate the offsite radiological consequences."

10 CFR 50, GDC 16—Containment design. 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.

10 CFR 50, Appendix J, defines La as the maximum allowable containment leakage rate in weight percent per day at peak containment accident pressure, Pa. The combined leakage rate of all penetrations and valves subject to Type B and C tests shall be less than 0.60 La.

This is a followup to RAI 271-9147, question 6.2.6-4.

10 CFR 50, Appendix J, requires that primary reactor containments meet the containment leakage test requirements to provide for preoperational and periodic verification by tests of the leak-tight integrity of the primary reactor containment, and systems and components which penetrate containment.

NuScale, has selected La to be 0.20 weight percent of the containment air mass per day at the peak containment accident pressure, Pa. La is established as a safety analysis operational limit and the containment Technical Specification limit for operability for the NuScale design. This maximum allowed leakage rate is the basis for the accident radiological leakage to the environment.

NuScale is requested to describe how the maximum allowable leak rate, La, will be demonstrated. Typically this would be shown through a combination of preoperational and periodic Types A, B and C testing. Since NuScale has requested an exemption from Appendix J Type A test requirements, this demonstration should include the technical basis for concluding that Types B and C testing are sufficiently representative of accident conditions to provide confidence that the test results from Types B and C assure that the assumed leak rate, La, would not be exceeded. Additionally, as required by 10 CFR 50, Appendix J, the acceptance criteria for Types B and C tests is to show that the expected leakage from all local penetrations, Types B and C, is less than 0.60 La. This demonstration should consider the differences in test volume pressurization during Type A and Types B and C testing and their potential impact on the test results. For example, the stresses on a bolted connection would be significantly different during Type A testing, where the containment volume is held at accident pressure, than a Type B test, where only the volume between a double o-ring seal is pressurized.

NuScale Response:

The staff requested restoration of the following text, which was removed from TR-1116-51692, "NuScale Containment Integrity Assurance Technical Report", Section 5.3.1, by the markup change included in the response to eRAI 9474, Question 06.02.06-22, transmitted by NuScale letter RAIO-0918-61923, dated September 24, 2018.

"The CNV flange is tested twice after it it reassembled. The first time will be in the refueling area to ensure the new CNV flange O-rings are installed properly and are sealed. The as-left test occurs after the NPM is moved to the operating bay. The as-left test ensures that CNV movement had no adverse effect on the CNV flange seal"

The markup change to TR-1116-51692 restores the above text to the report.

Impact on DCA:

Technical Report TR-1116-51962, NuScale Containment Leakage Integrity Assurance, has been revised as described in the response above and as shown in the markup provided in this response.

not opened and no bolts were manipulated, and if the as-found test was within CLIP acceptance criteria, then no further tests on that penetration are necessary.

The CNV flange is tested twice after it is reassembled. The first time will be in the refueling area to ensure the new CNV flange O-rings are installed properly and are sealed. The as-left test occurs after the NPM is moved to the operating bay. The as-left test ensures that CNV movement had no adverse effect on the CNV flange seal. After the CNV closure flange seal is tested, then the CNV head manway cover can be reinstalled and tested.

5.3.2 Electrical Penetration Assemblies

The EPA sheath modules are installed and tested at the factory. Glass-to-metal seals (penetrations), exclusive of the flange-to-nozzle seals, are designed for leakage rates not to exceed 1.0×10^{-3} standard cm^3/s (1.27×10^{-4} SCFH) of dry nitrogen at design pressure and at ambient temperature, including after any design basis event (Reference 7.1.11). Glass-to-metal seals typically achieve leak rates in the undetectable range, 1.0×10^{-7} standard cm^3/s of dry nitrogen at design pressure and at ambient temperature. The glass-to-metal module seal is an established sealing technology that is not vulnerable to thermal or radiation aging and does not require periodic maintenance or testing. The module-to-EPA seal ~~does not require periodic testing. It would only be tested after completing maintenance activities that affect the seal~~is periodically tested at the Type B testing frequency discussed in Section 5.5.2. The EPA flange seal is the same double O-ring seal design of all Type B penetration seals. The required installation acceptance criterion for leakage rate of each EPA is 1.0×10^{-2} standard cm^3/s (1.27×10^{-3} SCFH) per Reference 7.1.11. The leakage margin allotment for Type B testing is preliminarily selected to be 50 times the installation acceptance criterion. This leakage margin for EPA contribution to overall containment leakage supports maintaining overall containment leakage to less than (0.60) L_a.

5.3.3 Ports and Manways

All CNV access port seals and manway seals are the identical double O-ring design. The leakage performance of these seals is expected to be similar to the EPAs based on an evaluation of leakage performance for off-the-shelf metal seals.

5.3.4 Emergency Core Cooling System Pilot Valve Bodies

There are six NPS 3 containment penetrations for the ECCS trip and reset valve assemblies. ~~The valve bodies normally form part of the RCPB and a~~A Type B test is required at the double ~~O-ring~~ seal between the valve bonnet and body (see Figure 3-7). The rest of these valve bodies are self-contained metal barriers that form part of the containment pressure boundary. Leakage criteria for these seals is small compared to the other Type B boundaries due to the smaller size of the seals.

5.3.5 Containment Vessel Flange

The CNV closure flange is a large double O-ring design (~45-foot circumference). This seal maintains the containment boundary between upper and lower CNV assemblies (see Figure 3-2). The CNV closure flange leakage limit for the CLIP is estimated to be