RAIO-0218-58564

February 07, 2018

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. 179 (eRAI No. 9073) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 179 (eRAI No. 9073)," dated August 12, 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. 9073:

- 03.12-7

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. 9073

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9073

NuScale Power, LLC
1100 NE Circle Blvd., Suite 200 Corvalis, Oregon 97330, Office: 541.360.0500, Fax: 541.207.3928
www.nuscalepower.com

NuScale Power™

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

eRAI No.: 9073
Date of RAI Issue: 08/12/2017

NRC Question No.: 03.12-7

GDC 14 requires that the reactor coolant pressure boundary (RCPB) being designed, fabricated, constructed, and tested to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. NRC Bulletin (BL) 88-08, "Thermal Stresses in Piping Connected to Reactor Cooling Systems," issued June 22, 1988, requests licensees to identify and evaluate the piping systems connected to the RCS susceptible to thermal stratification, cycling, and striping (TASCS) to ensure that the piping will not be subjected to unacceptable thermal stresses.

The operating experience described in the bulletin needs to be incorporated in the design in accordance with 10 CFR 52.47(a)(22). SRP Section 3.12 includes criteria related to this bulletin.

1) The DHRS condensate return piping from the passive condenser penetrates the containment vessel and is routed to the FW piping. It appears that this section of DHRS is not isolable from the FW. When the DHRS is not in operation, this section of DHRS is full with stagnant water at a lower temperature that the FW. Evaluate the DHRS piping for TASCS susceptibility and update the FSAR with the position for the staff to review.

NuScale Response:

The decay heat removal system (DHRS) condensate piping is filled with stagnant water during normal operation. As the stagnant water is at a lower temperature than the connected feedwater piping, the DHRS condensate line is susceptible to thermal stratification, cycling, and striping. Transient computational fluid dynamics analysis shows that the temperature fluctuations in the DHRS condensate piping and DHRS containment penetration cause thermal stresses that are below the fatigue endurance limit for the piping, welds, and containment vessel materials.

Since the DHRS condensate piping is not connected to the reactor coolant system, NRC Bulletin 88-08 and SRP Section 3.12 are not directly applicable. However, in accordance with 10 CFR 52.47 (a)(22), the operating experience from Bulletin 88-08 was incorporated into the piping design specification, requiring that the DHRS condensate piping cyclic loads be addressed in the ASME analysis and design report. FSAR Section 3.12.5.3 has been updated to discuss the required loads due to thermal stratification, cycling, and striping for Class 2 and 3 piping.

Impact on DCA:

The FSAR Tier 2, Section 3.12.5.3 has been revised as described in the response above and as shown in the markup provided in this response.

lines (inside containment) meet the leak-before-break criteria of NUREG 0800 Section 3.6.3 as discussed in Section 3.6, and therefore, pipe breaks of these lines are not postulated. However, DBPB loads do include the impact of small break loss-of-coolant accident (LOCA), main steam, and feedwater line breaks outside the leak-before-break analyzed zone.

Thermal and Pressure Transient Loads

RAI 03.12-7

Thermal and pressure transient loads are included for the analysis of ASME Code Class 1 piping. For ASME Code Class 1 piping, these transient loads are included as Service Level A and B loads and their effects are determined by calculating the primary plus secondary stress intensity ranges as the piping system goes from one load set (such as pressure, temperature, moment, and force loading) to any other load set which follows it in time. The operating experience from NRC Bulletin 88-08 is addressed in Section 3.12.5.7 for Class 1 piping.

RAI 03.12-7

For ASME Code Class 2 and 3 piping, transient loads are also considered in the analyses by using the bounding pressure and temperature ranges in individual load combination cases. Loads created by thermal stratification, cycling, or striping that may occur in unisolable piping are accounted for in the design and analysis of the ASME Class 2 and 3 piping per the operating experience from NRC Bulletin 88-08.

The design and analysis of ASME Code Class 1, 2, and 3 piping systems use the applicable design transients addressed in Section 3.9.1

Hydrotests

All piping systems are subject to hydrostatic testing at a pressure higher than the design pressure upon initial assembly of the piping system. The hydrostatic test loads are included for analysis for applicable load cases. The additional weight of the test fluid is considered for the total load of the hydrostatic test (e.g. if the normal service fluid is gas but the test fluid is liquid).

Load Combinations

Using the methodology and equations from the ASME Section III code (Reference 3.12-1), pipe stresses are calculated for various load combinations. The ASME Code includes design limits for Service Levels A, B, C, and D, and testing. Load combinations for ASME Code Class 1 piping are given in Table 3.12-1. Class 2 and 3 load combinations are given in Table 3.12-2.

3.12.5.4 Combination of Modal Responses

The modal combination methods used in response spectrum analyses for piping are addressed in Section 3.12.3.2.