RAIO-1218-63938

December 21, 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. 458 (eRAI No. 9522) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 458 (eRAI No. 9522)," dated May 02, 2018

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

The Enclosures to this letter contain NuScale's response to the following RAI Question from NRC eRAI No. 9522:

- 15-13

Enclosure 1 is the proprietary version of the NuScale Response to NRC RAI No. 458 (eRAI No. 9522). NuScale requests that the proprietary version be withheld from public disclosure in accordance with the requirements of 10 CFR § 2.390. The enclosed affidavit (Enclosure 3) supports this request. Enclosure 2 is the nonproprietary version of the NuScale response.

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

If you have any questions on this response, please contact Paul Infanger at 541-452-7351 or at pinfanger@nuscalepower.com.

Sincerely,

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

Distribution: Gregory Cranston, NRC, OWFN-8G9A
Samuel Lee, NRC, OWFN-8G9A
Rani Franovich, NRC, OWFN-8G9A

Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9522, proprietary

Enclosure 2: NuScale Response to NRC Request for Additional Information eRAI No. 9522, nonproprietary

Enclosure 3: Affidavit of Zackary W. Rad, AF-1218-63939

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9522, proprietary

Enclosure 2:

NuScale Response to NRC Request for Additional Information eRAI No. 9522, nonproprietary

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

eRAI No.: 9522
Date of RAI Issue: 05/02/2018

NRC Question No.: 15-13

10 CFR 50 Appendix A, GDC 34, Residual heat removal, and NuScale's PDC 34, in FSAR Section 3.1.4.5, state,

> *A system to remove residual heat shall be provided. The system safety function shall be to transfer fission product decay heat and other residual heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded.*

The long-term cooling technical report, TR-0916-51299, supports Final Safety Analysis Report (FSAR) Section 15.0.5, "Long Term Decay and Residual Heat Removal," when the emergency core cooling system (ECCS) is used for long term decay heat removal following either a non-loss of coolant accident (LOCA) or LOCA event up to 72 hours. The primary acceptance criteria for the analysis are 1) Collapsed liquid level is maintained above the active fuel and 2) fuel cladding temperature is maintained at an acceptable level such that the specified acceptable fuel design limits (SAFDLs) are preserved.

Section 5.3.3 of TR-0916-51299, which supports FSAR Section 15.0.5, "Long Term Decay Heat Removal," appears to present the non-LOCA steam generator tube rupture case for the decay heat removal system (DHRS) maximum cooldown where the ECCS valves are opened at 24 hours. The staff believes the purpose of this case is to demonstrate that collapsed liquid level is maintained above the active fuel thereby ensuring adequate core cooling. The staff has the following questions related to this scenario:

1. The second paragraph in Section 5.3.3, states, "As illustrated by the results presented in this section, and sensitivities where ECCS valves opened at the inadvertent actuation block (IAB) release pressure, the effects of steam generator tube failure (SGTF) and DHRS with the maximum cooldown case does not significantly affect the previous maximum cooldown conclusions." The staff is seeking clarification as this paragraph seems to be referring to a case where the IAB opens which is unlikely to be at 24 hours.

2. Figure 5-36 shows that reactor coolant system (RCS) core inlet temperature drops at 40 hours while the others plots in Section 5.3.3 are stable (remain constant). Provide justification as to the change in RCS core inlet temperature at 40 hours.

3. Table 5-1 provides the assumptions associated with the SGTF maximum cooldown case. The staff notes that in Section 5.3, Demonstration of Limit Results, the applicant states that, "100 percent of the [American Nuclear Society (ANS)] decay heat standard [i.e., ANS-73], including actinide contribution, is a conservatively high assumed decay heat assumed in this scenario." The use of a 1.0 multiplier for the maximum cooldown appears to be non-conservative based on the results of the maximum line break cooldown given in Figure 5-18, Riser Collapsed Liquid Level, where a 0.8 decay heat multiplier yielded a lower liquid level. Therefore, the staff seeks clarification as to why the using a 1.0 multiplier is conservative.

4. Based on the discussion in Section 5.1, the SGTF non-LOCA event was chosen due to the loss of inventory. However, the chemical and volume control system line break outside of containment has a greater mass loss than the SGTF. Therefore, the staff is seeking additional information as to why the SGTF would lead to the lowest collapsed liquid level for a non-LOCA event.

5. It is unclear to the staff how the maximum SGTF cooldown event progression prior to ECCS actuation is different than that assumed in FSAR Section 15.6.3, SGTF, especially with regard to the assumption when alternating current (AC) power is lost and the effect on RCS inventory.

NuScale Response:

Section 5 of TR-0916-51299 was revised to include updated results for steam generator tube failure (SGTF) event as indicated in the response to RAI 9516, question 15-26, submitted in NuScale letter RAIO-1218-63931, dated December 21, 2018. With this revision, SGTF results are now presented in Section 5.6.4 (previously, SGTF results were presented in Section 5.3.3). Note that the revised SGTF case represented in Section 5.6.4 was performed with the boundary conditions to minimize the collapsed liquid level above the top of active fuel. Responses to the specific question are provided below.

1. The SGTF results previously presented in Section 5.3.3 are from a scenario where AC power is lost but DC power is available such that ECCS actuation is delayed until the 24 hour timer is reached. The statement in question is referring to a separate sensitivity case that wasn't presented in the LTC TR where DC power is assumed unavailable such that the ECCS valves open once the IAB release pressure is reached. The updated discussion in Section 5.6.4 refers only to the SGTF case presented in that section.

2. The previous analysis employed a {{

   }}2(a),(c) At around 40 hours, this flow pattern reversed to a more realistic flow path of net up flow through the core region and down flow through the reflector coolant volumes. The flow pattern reversal caused the change in the inlet flow temperature previously observed in Figure 5-36. As discussed in the updated Section 4.0, the updated LTC model features a single channel core region which prevents the previously observed flow reversal pattern and subsequent sudden change in core inlet temperature.

3. The previous analysis evaluated two primary scenarios: maximum cooldown and minimum cooldown. The updated discussion in Section 5 now evaluates three primary scenarios: maximum temperature, minimum temperature, and minimum level. For the minimum temperature scenario, decay heat is biased low. For the minimum level scenario, decay heat is biased high, therefore, the SGTF event described in Section 5.6.4 of the LTC technical report used decay heat biased high.

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}}2(a),(c)

4. The updated Section 5.3.1 provides a discussion of electric power availability assumed for LTC analysis. For a chemical and volume control system break outside of containment, only the loss of AC power is considered, leading to ECCS actuation after the 24 hour timer (assuming loss of AC and DC power at time zero would cause immediate containment isolation and mitigate the break). The SGTF event considers both power scenarios, with the loss of AC and DC power at time zero being limiting. Losing DC power at time zero causes earlier ECCS actuation on IAB setpoint, and earlier ECCS actuation is limiting for level as decay heat is higher during the time period that level is most challenged. This effect has a stronger influence on minimum collapsed level than the difference in total inventory lost.

5. FSAR Section 15.6.3.3.2 discusses that no loss of power is limiting for the mass release scenario. However, with no loss of power the module will remain on DHRS cooling without ECCS actuation, which is outside the scope of the LTC technical report. The updated Section 5.3.1 provides a discussion of electric power availability assumed for LTC analysis in order to achieve ECCS actuation during non-LOCA events. As discussed above in the response to question #4, losing DC power at time zero is limiting for minimum collapsed level for the SGTF event for long term cooling. In this case, the effect of earlier ECCS actuation and higher decay heat has a stronger influence on collapsed level than the difference in total inventory lost.

Impact on DCA:

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

Enclosure 3:

Affidavit of Zackary W. Rad, AF-1218-63939

NuScale Power, LLC

AFFIDAVIT of Zackary W. Rad

I, Zackary W. Rad, state as follows:

1. I am the Director, Regulatory Affairs of NuScale Power, LLC (NuScale), and as such, I have been specifically delegated the function of reviewing the information described in this Affidavit that NuScale seeks to have withheld from public disclosure, and am authorized to apply for its withholding on behalf of NuScale.
2. I am knowledgeable of the criteria and procedures used by NuScale in designating information as a trade secret, privileged, or as confidential commercial or financial information. This request to withhold information from public disclosure is driven by one or more of the following:
   a. The information requested to be withheld reveals distinguishing aspects of a process (or component, structure, tool, method, etc.) whose use by NuScale competitors, without a license from NuScale, would constitute a competitive economic disadvantage to NuScale.
   b. The information requested to be withheld consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), and the application of the data secures a competitive economic advantage, as described more fully in paragraph 3 of this Affidavit.
   c. Use by a competitor of the information requested to be withheld would reduce the competitor's expenditure of resources, or improve its competitive position, in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.
   d. The information requested to be withheld reveals cost or price information, production capabilities, budget levels, or commercial strategies of NuScale.
   e. The information requested to be withheld consists of patentable ideas.
3. Public disclosure of the information sought to be withheld is likely to cause substantial harm to NuScale's competitive position and foreclose or reduce the availability of profit-making opportunities. The accompanying Request for Additional Information response reveals distinguishing aspects about the method by which NuScale develops its long term cooling analysis.

   NuScale has performed significant research and evaluation to develop a basis for this method and has invested significant resources, including the expenditure of a considerable sum of money.

   The precise financial value of the information is difficult to quantify, but it is a key element of the design basis for a NuScale plant and, therefore, has substantial value to NuScale.

   If the information were disclosed to the public, NuScale's competitors would have access to the information without purchasing the right to use it or having been required to undertake a similar expenditure of resources. Such disclosure would constitute a misappropriation of NuScale's intellectual property, and would deprive NuScale of the opportunity to exercise its competitive advantage to seek an adequate return on its investment.

4. The information sought to be withheld is in the enclosed response to NRC Request for Additional Information No. 458, eRAI 9522. The enclosure contains the designation "Proprietary" at the top of each page containing proprietary information. The information considered by NuScale to be proprietary is identified within double braces, "{{ }}" in the document.
5. The basis for proposing that the information be withheld is that NuScale treats the information as a trade secret, privileged, or as confidential commercial or financial information. NuScale relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC § 552(b)(4), as well as exemptions applicable to the NRC under 10 CFR §§ 2.390(a)(4) and 9.17(a)(4).
6. Pursuant to the provisions set forth in 10 CFR § 2.390(b)(4), the following is provided for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld:
   a. The information sought to be withheld is owned and has been held in confidence by NuScale.
   b. The information is of a sort customarily held in confidence by NuScale and, to the best of my knowledge and belief, consistently has been held in confidence by NuScale. The procedure for approval of external release of such information typically requires review by the staff manager, project manager, chief technology officer or other equivalent authority, or the manager of the cognizant marketing function (or his delegate), for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside NuScale are limited to regulatory bodies, customers and potential customers and their agents, suppliers, licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or contractual agreements to maintain confidentiality.
   c. The information is being transmitted to and received by the NRC in confidence.
   d. No public disclosure of the information has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or contractual agreements that provide for maintenance of the information in confidence.
   e. Public disclosure of the information is likely to cause substantial harm to the competitive position of NuScale, taking into account the value of the information to NuScale, the amount of effort and money expended by NuScale in developing the information, and the difficulty others would have in acquiring or duplicating the information. The information sought to be withheld is part of NuScale's technology that provides NuScale with a competitive advantage over other firms in the industry. NuScale has invested significant human and financial capital in developing this technology and NuScale believes it would be difficult for others to duplicate the technology without access to the information sought to be withheld.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 21, 2018.

Zackary W. Rad