NuScaleDCRaisPEm Resource

From: Chowdhury, Prosanta
Sent: Wednesday, May 2, 2018 12:11 PM
To: Request for Additional Information
Cc: Lee, Samuel; Cranston, Gregory; Franovich, Rani; Karas, Rebecca; Schmidt, Jeffrey; NuScaleDCRaisPEm Resource
Subject: Request for Additional Information No. 458 eRAI No. 9522 (15)
Attachments: Request for Additional Information No. 458 (eRAI No. 9522).pdf

Attached please find NRC staff's request for additional information (RAI) concerning review of the NuScale Design Certification Application.

Please submit your technically correct and complete response within 60 days of the date of this RAI to the NRC Document Control Desk.

If you have any questions, please contact me.

Thank you.

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Office of New Reactors
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301-415-1647

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Request for Additional Information No. 458 (eRAI No. 9522)

Issue Date: 05/02/2018
Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 15 - Introduction - Transient and Accident Analyses
Application Section:

QUESTIONS

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.