

NuScaleDCRaisPEm Resource

From: Chowdhury, Prosanta
Sent: Friday, May 11, 2018 11:24 AM
To: Request for Additional Information
Cc: Lee, Samuel; Cranston, Gregory; Franovich, Rani; Karas, Rebecca; Burja, Alexandra; NuScaleDCRaisPEm Resource
Subject: Request for Additional Information No. 474 eRAI No. 9507 (15.04.01)
Attachments: Request for Additional Information No. 474 (eRAI No. 9507).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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301-415-1647

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Request for Additional Information No. 474 (eRAI No. 9507)

Issue Date: 05/11/2018

Application Title: NuScale Standard Design Certification - 52-048

Operating Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 15.04.01 - Uncontrolled Control Rod Assembly Withdrawal from a Subcritical or Low Power Startup Condition

Application Section: FSAR Section 15.4.1

QUESTIONS

15.04.01-4

General Design Criterion (GDC) 10, "Reactor design," in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix A, requires that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits (SAFDLs) are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences (AOOs). GDC 13 requires the provision of instrumentation to monitor variables and systems over their anticipated ranges of normal operation, including the effects of AOOs, and of appropriate controls to maintain listed variables and systems within prescribed operating ranges.

The staff audited engineering calculation (EC)-0000-2910, "Uncontrolled Control Rod Assembly Withdrawal From A Subcritical Or Low Power Startup Condition," which supports FSAR Section 15.4.1 of the same title, and noted that it contained an assumption regarding **[]**. The staff is unable to confirm that the analysis is conservative with the ODI remaining open because a different **[]** could affect trip timing and therefore conservatism of the analysis. Therefore, demonstrate that these setpoints adequately protect the analytical limits, and confirm that the analysis remains conservative. Update the FSAR as necessary.

15.04.01-5

GDC 10 requires that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that SAFDLs are not exceeded during any condition of normal operation, including the effects of AOOs. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," (SRP) Section 15.4.1, "Uncontrolled Control Rod Assembly Withdrawal from a Subcritical or Low Power Startup Condition," provides the staff guidance in determining compliance with GDC 10 and states that the postulated initial reactor coolant flow, pressure and inlet temperature (i.e., the extremes of postulated conditions) should be consistent with the rod and power configuration to give minimum departure from nucleate boiling ratio (DNBR) conditions.

The staff notes that FSAR Tier 2, Table 15.4-2, "Key Inputs for Limiting MCHFR Case (15.4.1 Uncontrolled CRA Withdrawal from Subcritical or Low Power Condition)," does not list the value of reactor coolant flow assumed for the analysis. In addition, it is unclear whether the nominal pressurizer pressure is limiting because it appears inconsistent with the behavior of critical heat flux as a function of pressure when using the NSP2 correlation, as discussed in TR-0116-21012-P, "NuScale Power Critical Heat Flux Correlation NSP2." Furthermore, the staff notes that the biased-high pressurizer level listed in Table 15.4-2 is inconsistent with what is specified

for the event-specific methodology in TR-0516-49416-P, "Non-Loss-of-Coolant Accident Analysis Methodology." To ensure that the limiting results have been identified:

1. Update Table 15.4-2 to include the RCS flow.
2. Demonstrate the conservatism of the pressurizer pressure and level biases, for instance through sensitivity study results.
3. Address the inconsistency in pressurizer level biasing between Table 15.4-2 and TR-0516-49416-P.
4. Update the FSAR and/or TR-0516-49416-P as appropriate.

15.04.01-6

GDC 10 requires that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that SAFDLs are not exceeded during any condition of normal operation, including the effects of AOOs. SRP Section 15.4.1 provides the staff guidance in determining compliance with GDC 10 and states that the power distribution or peaking factors used in the neutron kinetics and hot pin thermal calculations must provide a conservative representation of the control rod configuration under consideration.

It is not clear from FSAR Section 15.4.1 whether limiting axial and radial power shapes were used in the subchannel analysis for this event. Furthermore, from the staff's audit of EC-0000-3080, "Subchannel Analysis of an Uncontrolled Control Rod Assembly Withdrawal from a Subcritical or Low Power," which supports the conclusions in FSAR Section 15.4.1, it appears the axial power shape used for the analysis corresponds to the 25% power shape in EC-0000-2347, "Steady State Subchannel Analysis." Justify use of the 25% power shape for this event that initiates at 1 MW, and confirm that the subchannel analysis used the limiting axial and radial power shapes. Update the FSAR as necessary, and include a statement that the limiting axial and radial power shapes were used.