

NuScaleTRRaisPEm Resource

From: Cranston, Gregory
Sent: Monday, September 11, 2017 11:13 AM
To: RAI@nuscalepower.com
Cc: NuScaleTRRaisPEm Resource; Lee, Samuel; Skarda, Raymond; Karas, Rebecca; Schmidt, Jeffrey; Chowdhury, Prosanta; Bovol, Bruce
Subject: Request for Additional Information Letter No. 9086 (eRAI No. 9086) Topical Report Thermal Hydraulic Stability
Attachments: Request for Additional Information No. 9095 (eRAI No. 9095).pdf

Attached please find NRC staff's request for additional information concerning review of the NuScale Topical Report.

Please submit your 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.

Hearing Identifier: NuScale_SMR_DC_TR_Public
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Subject: Request for Additional Information Letter No. 9086 (eRAI No. 9086) Topical Report Thermal Hydraulic Stability
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Options

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Request for Additional Information No. 9095 (eRAI No. 9095)

Issue Date: 09/10/2017

Application Title: NuScale Topical Report

Operating Company: NuScale

Docket No. PROJ0769

Review Section: 01 - Introduction and Interfaces

Application Section: 1

QUESTIONS

01-41

Title 10 of the Code of Federal Regulations (CFR), Part 50, Appendix A, General. Design Criterion (GDC) 10, "Reactor design," states 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 are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences. GDC12, "Suppression of reactor power oscillations," requires that oscillations be either not possible or reliably detected and suppressed. The Design-Specific Review Standard (DSRS), 15.9.A, "Design-Specific Review Standard for NuScale SMR Design, Thermal Hydraulic Stability Review Responsibilities," indicates that the applicant's analyses should correctly and accurately identify all factors that could potentially cause instabilities and their consequences. The analyses should also demonstrate that design features that are implemented prevent unacceptable consequences to the fuel.

Section 5.5.6.1, Fluid Properties," of the topical report (TR), TR-0516-49417-P, indicates that fluid properties are based on curve fits of the necessary fluid properties over the expected range of analysis. The fits are verified by comparison to a 1995 implementation of the IAPWS property formulations. Thermal-hydraulic modeling issues have been observed with applying the 1997 IAPWS standard at least, to conditions where the liquid becomes highly superheated.

In order to make an affirmative finding NRC staff requests NuScale to:

- 1) Provide the range over which the fluid property curves have been verified.
- 2) Compare the verification range to the range of conditions necessary for stability analysis.
The analysis range described by this response should address relevant (i.e., credited) TS limits and MPS setpoints that constrain thermal-hydraulic conditions in the power module.
- 3) Does the range of application consider conditions where the liquid becomes highly superheated?
 - If so, does this present any concern or issue when computational performance in this regime?
 - Address any such computational performance issues with respect to ensuring accurate and acceptable calculation of key figures of merit using PIM.