

## NuScaleDCRaisPEm Resource

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**From:** Cranston, Gregory  
**Sent:** Friday, June 15, 2018 11:18 AM  
**To:** Request for Additional Information  
**Cc:** Lee, Samuel; Karas, Rebecca; Van Wert, Christopher; Bovol, Bruce; Chowdhury, Prosanta; Schmidt, Colleen; NuScaleDCRaisPEm Resource  
**Subject:** Request for Additional Information No. 9555 eRAI No. 9555 (4.2) Topical Report  
**Attachments:** Request for Additional Information No. 9555 (eRAI No. 9555).pdf

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

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.

**Hearing Identifier:** NuScale\_SMR\_DC\_RAI\_Public  
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## Request for Additional Information No. 9555 (eRAI No. 9555)

Issue Date: 06/15/2018

Application Title: NuScale Topical Report

Operating Company: NuScale

Docket No. PROJ0769

Review Section: 04.02 - Fuel System Design

Application Section: 4.2

### QUESTIONS

04.02-7

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, General Design Criterion (GDC) 2, requires that SSCs important to safety are designed to withstand the effects of earthquakes without the loss of capability to perform their safety functions. The design bases for these SSCs shall reflect: (1) the severity of the historical reports, with sufficient margin to cover the limited accuracy, quantity, and time period for the accumulated data, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena, and (3) the importance of the safety functions to be performed. SRP Section 4.2 Appendix A (II)(1) provides review guidance regarding the review of inputs used to analyze the loads.

Topical report TR-0716-50351-P references the Framatome topical report ANP-10377P "PWR Fuel Assembly Structural Response to Externally Applied Dynamic Excitations" as the methodology for analyzing the NuScale fuel assembly structural response in the NuScale reactor and ensuring compliance with GDC 2. Any licensee referencing ANP-10377P must comply with the nine conditions and limitations listed in Section 5 of the staff's safety evaluation report for ANP-10337P. The staff needs additional information to determine if the NuScale design complies with these conditions and limitations.

1. Provide information to demonstrate that the grid behavior of the NuScale fuel assembly meets ANP-10337P limitation and condition numbers 1, 2 and 9
2. Topical report ANP-10337P limitations 4, 7, and 8 are related to the methods used to calculate fuel assembly component stresses in 3D nonlinear structural models based on deflections calculated in the dynamic models.
  1. Clarify how the limiting NuScale deflection cases were selected for evaluation in 3D structural models.
  2. ANP-10337P limitation and condition number 4 limits the use of time phasing for identification of the most limiting deflection stress states to applications that are similar to the current fleet of fuel assemblies and core designs. The NuScale design is outside the current range of operational experience, so unusual dynamic behavior and unusual deflection shapes are a concern to the staff. If time phasing was used for NuScale, describe how time phasing was used to find the most limiting fuel assembly component stress states. If time phasing was not used, confirm that limitation and condition number 7 was followed.
  3. Confirm that the NuScale 3D load combination was performed consistent with ANP-10337P limitation and condition number 8.

3. Topical report ANP-10337P limitation number 4 also addresses strain energy in the horizontal dynamic model. It also restricts the application of the methodology to the current fleet of fuel and core designs, and the NuScale design is outside this limitation. Provide the following information necessary for the staff to review the strain energy in the horizontal dynamic model of the NuScale fuel assembly.
  1. Identify the maximum lateral deflection and strain energy calculated over the full set of design basis horizontal analyses.
  2. Provide force-deflection data from the lateral stiffness test described in 5.1.1 of TR-0816-51127-P, Revision 1. Provide force-deflection data that encompasses the maximum deflection calculated in the model, or as high of a deflection as was recorded in the lateral stiffness test.
  3. Compare the maximum lateral deflection and strain energy calculated in the horizontal dynamic finite element model to the supporting mechanical test data. Confirm that the calculated lateral deflection is within a range where model behavior agrees with test data, or justify the use of the model outside the range where it agrees with test data.