

## NuScaleDCRaisPEm Resource

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**Sent:** Friday, June 02, 2017 6:02 PM  
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**Cc:** NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Karas, Rebecca; Baval, Bruce; Van Wert, Christopher  
**Subject:** RE: Request for Additional Information No. 50, RAI 8851  
**Attachments:** Request for Additional Information No. 50 (eRAI No. 8851).pdf

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

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.

Gregory Cranston, Senior Project Manager  
Licensing Branch 1 (NuScale)  
Division of New Reactor Licensing  
Office of New Reactors  
U.S. Nuclear Regulatory Commission  
301-415-0546

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**Options**

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## Request for Additional Information No. 50 (eRAI No. 8851)

Issue Date: 06/02/2017

Application Title: NuScale Standard Design Certification - 52-048

Operating Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 04.02 - Fuel System Design

Application Section: 4.2

### QUESTIONS

04.02-2

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, Criterion 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 (IV) provides review guidance regarding the review of acceptance criteria used to analyze the fuel structural response to externally applied loads.

Technical Report TR-0816-51127-P Revision 1 provides the fuel and control rod assembly design analysis for the NuFuel-HTP2 fuel assembly. Table 4-8 lists evaluation margins for various fuel assembly components. The staff noted that the allowable stress limits identified are not consistent with ASME NG-3224.1(a). The primary membrane stress limit should be  $1.5 S_m$  and the primary membrane plus bending stress limit should be  $2.25 S_m$ . The guide tube  $S_m$  implied by Table 4-1 is also not consistent with the stress limits listed in Table 4-8.

In order to make an affirmative finding associated with the above regulatory requirement that accounts for all relevant SSCs important to safety, the NRC staff requests the following information to be provided: Revise the table(s) as necessary to report the correct stress margins and allowable limits. If Table 4-8 of TR-0816-51127-P Revision 1 is correct as is, provide further explanation of how the structural analyses of the guide tube relate to ASME Subsection NG.

04.02-3

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, Criterion 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 (III) provides review guidance regarding the determination of strength.

Technical Report TR-0816-51127-P Revision 1 provides the fuel and control rod assembly design analysis for the NuFuel-HTP2 fuel assembly. Table 4-8 lists evaluation margins for various fuel assembly components. The staff notes that the guide tube buckling limit is expressed as a pressure in Table 4-8, but units of compressive force (N or lbf) are expected based on the context.

In order to make an affirmative finding associated with the above regulatory requirement that accounts for all relevant SSCs important to safety, the NRC staff requests the following information to be provided:

- a. If the units are in error, please correct them
- b. If the buckling analysis is really based on compressive pressure loading, provide additional details of the loading conditions and describe the analysis method.

04.02-4

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, Criterion 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 (III) provides review guidance regarding the determination of strength.

Section 4.1.1.1 of TR-0816-51127-P Rev 1 defines a criterion to be used to evaluate fuel rod cladding stress and buckling during the limiting overpressure transient at BOL on page 31. However, it is stated on page 32 that a different (Euler) buckling criterion is met.

In order to make an affirmative finding associated with the above regulatory requirement that accounts for all relevant SSCs important to safety, the NRC staff requests NuScale to provide clarification regarding the criterion used to evaluate fuel rod buckling and update the documentation if necessary.

04.02-5

Title 10 of the Code of Federal Regulations, Part 50, Appendix A, Criterion 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 (III) provides review guidance regarding the determination of strength.

While the NuFuel-HTP2 fuel design is similar to existing fuel designs used by some currently operating power plants, there are differences which could significantly affect the fuel assembly structural response to externally applied loads. It is unclear to the staff how sensitive the analysis is to these differences.

In order to make an affirmative finding associated with the above regulatory requirement that accounts for all relevant SSCs important to safety, the NRC staff requests NuScale to provide the core plate time histories used to evaluate the fuel assembly structural response to externally applied loads.