NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Friday, May 05, 2017 3:48 PM
To: 'RAI@nuscalepower.com'
Cc: NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Karas, Rebecca; Van Wert, Christopher; Schmidt, Jeffrey; Bavol, Bruce
Subject: Request for Additional Information No. 18 (eRAI No. 8778) Section 4.02, SRSB
Attachments: Request for Additional Information No. 18 (eRAI No. 8778).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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From: Cranston, Gregory

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Request for Additional Information No. 18 (eRAI No. 8778)

Issue Date: 05/05/2017

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

04.02-1

In accordance with 10 CFR 50 Appendix A GDC 10, "Reactor design," 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.

To meet the requirements of GDC 10, as it relates to SAFDLs for normal operation, including AOOs, fuel system damage criteria should be included for all known damage mechanisms. Fuel damage criteria should assure that fuel system dimensions remain within operational tolerances and that functional capabilities are not reduced below those assumed in the safety analysis. When applicable, the fuel damage criteria should consider high burnup effects based on irradiated material properties data. Complete damage criteria should address, in part, that the cumulative number of strain fatigue cycles on the structural members of the fuel assembly (e.g. grids, guide tubes, thimbles, fuel rods, control rods, etc.) should be significantly less than the design fatigue lifetime, which is based on appropriate data and includes a safety factor of 2 on stress amplitude or a safety factor of 20 on the number of cycles; otherwise, other proposed limits must be justified.

The staff notes that in TR-0816-51127, Revision 1, "NuFuel-HTP2 Fuel and Control Rod Assembly Designs," the applicant has considered load following in the fuel rod fatigue analysis (see Table 4-3), but no discussion is provided to justify the current thermal-mechanical models for load follow use. For example, it is unclear to the staff from the information provided if the fission gas release model was designed to model load following and was approved for this purpose. However, in FSAR Tier 2, Section 4.3.2.4.16, the applicant states that while power maneuvering operations within the capabilities of the rod control system are anticipated, continuous load following operation using the control rod assemblies is not anticipated. Based on the docketed information, the staff is unable to determine if the NuScale DCA requests approval for load following; therefore, the staff cannot determine if the fuel and control rod assembly designs have been adequately designed to incorporate fatigue effects from load following such that the requirements of GDC 10 are met.

1) Does NuScale request NRC approval for load follow (i.e. power maneuvering) use for the NuScale SMR design?
    a. If no, the staff requests the applicant to clearly identify in FSAR Section 4.2 that load following will not be used.
    b. If yes, the staff requests the applicant to clearly identify in FSAR Section 4.2 that load following will be used, describe the type of load following (e.g. daily load follow), and to justify the thermal–mechanical models and analysis for the NuScale fuel design for the requested load follow use. Additionally, the impacts of load follow operation on control rod nuclear lifetime (FSAR section 4.3) and initialization of postulated accident analyses (FSAR Section 15) should be addressed in their respective sections.
    c. If the applicant intends to leave the choice for load following operations up to the COL holder, the staff requests the applicant to include an appropriate COL information item that discusses the information needed to be submitted by the COL applicant for NRC review.