RAIO-0717-54773

July 05, 2017 Docket No. 52-048

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 18 (eRAI No. 8778) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 18 (eRAI No. 8778)," dated May 05, 2017

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) response to the referenced NRC Request for Additional Information (RAI).

The Enclosure to this letter contains NuScale's response to the following RAI Question from NRC eRAI No. 8778:

- 04.02-1

This letter and the enclosed response make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Darrell Gardner at 980-349-4829 or at dgardner@nuscalepower.com.

Sincerely,

Jennie Wike
Manager, Regulatory Affairs
NuScale Power, LLC

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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 8778

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 8778

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Response to Request for Additional Information

eRAI No.: 8778
Date of RAI Issue: 05/05/2017

NRC Question No.: 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 criter ia 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 tub es, 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 fo llow), 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.

NuScale Response:

The NuScale Power Module is designed to perform normal power maneuvers. Electric power output can be adjusted with turbine bypass to the condenser. Further, core power maneuvering can be accomplished with control rods and/or soluble boron concentration changes. All power maneuvers are performed within the limits of the Technical Specifications, thereby ensuring that the initial conditions for the safety analyses remain valid.

Final Safety Analysis Report (FSAR) Sections 4.2, 4.3, and 4.4 will be revised to clarify that daily load follow, where core thermal power is used to respond to changes in electrical load, is allowed using soluble boron concentration changes and soluble boron concentration changes with control rod movement within core operating limitations. In addition, the NuScale technical report, TR-0816-51127, “NuFuel-HTP2™ Fuel and Control Rod Assembly Designs,” will be revised to confirm the acceptability of thermal-mechanical impacts of these assumed daily load follow operations, and to address control rod lifetime. The postulated daily load follow cycle for this evaluation will consist of operation at 100 percent power, followed by a two-hour power reduction to 20 percent power where power is maintained for the next ten hours, followed by a return to full power over the next two hours. This cyclic load following will be assumed for 90 percent of each fuel cycle.

Impact on DCA:

The revisions to FSAR Sections 4.2, 4.3, and 4.4 and the NuScale technical report, TR-0816-51127, "NuFuel-HTP2™ Fuel and Control Rod Assembly Designs" will be provided in approximately six months following completion of the supporting analyses.