RAIO-0918-61830

September 17, 2018

Docket: PROJ0769

U.S. Nuclear Regulatory Commission
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11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Supplemental Response to NRC Request for Additional Information No. 9091 (eRAI No. 9091) on the NuScale Topical Report, "Evaluation Methodology for Stability Analysis of the NuScale Power Module," TR-0516-49417, Revision 0

REFERENCES:
1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 9091 (eRAI No. 9091)," dated September 10, 2017
2. NuScale Power, LLC Response to NRC "Request for Additional Information No. 9091 (eRAI No.9091)," dated November 09, 2017
3. NuScale Topical Report, "Evaluation Methodology for Stability Analysis of the NuScale Power Module," TR-0516-49417, Revision 0, dated July 2016

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

The Enclosure to this letter contains NuScale's supplemental response to the following RAI Question from NRC eRAI No. 9091:

- 01-35

This supplemental response is associated with a July 11, 2018 teleconference.

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 Paul Infanger at 541-452-7351 or at pinfanger@nuscalepower.com.

Sincerely,

Zackary W. Rad
Director, Regulatory Affairs
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Enclosure 1: NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9091

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Enclosure 1:

NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9091

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Response to Request for Additional Information
Docket: PROJ0769

eRAI No.: 9091
Date of RAI Issue: 09/10/2017

NRC Question No.: 01-35

Title 10, the code of federal regulations (CFR), Part 50, Appendix A, General Design Criterion (GDC) 12- 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 10.4, “Stability Analysis Application Methodology,” of topical report (TR), TR-0516-49417-P, states that a final analysis will be provided separately for the final design and that an application of the methodology with a full analysis scope is expected to support or disposition the stability impact of future NuScale power module design changes. The full scope of analysis will have to account for any plant design changes, however, core design changes will take place every cycle. To clarify the scope of the analysis and to reconcile the language of Sections 10.2, “General Stability Characteristics,” and 10.4, “Stability Analysis Application Methodology,” of the Stability TR, a listing of PIM models and PIM inputs that are fuel-design specific and would be subject to revision with the introduction of a new fuel assembly design are needed.

In order to make an affirmative finding NRC staff requests NuScale to:
1) Provide a complete listing of PIM model parameters and input parameters that are fuel-design specific.
2) Provide a list of all PIM model parameters that are subject to revision with the introduction of a new fuel assembly design.
Explain how such changes implemented with respect to the Q/A plan, and including: design control, documentation, software configuration control and testing, error identification, and corrective actions.

Explain how such changes are evaluated to determine if the changes constitute a change or departure from the method of evaluation in safety analysis.
3) Describe the process by which analyses are evaluated for potential re-analysis and how these analyses are re- performed for cases where there are changes in fuel-design-specific parameters.

NuScale Response:

This response supplements the original RAI 01-35 (eRAI 9091) response which was submitted to the NRC on November 9, 2017 (ML17313B220). NuScale has modified Topical Report TR-0516-49417, Evaluation Methodology for Stability Analysis of the NuScale Power Module, Section 10.4 to clarify that stability methodology can be used for alternative fuel designs only if the alternative fuel designs are hydraulically compatible with the reference fuel design.

Impact on Topical Report:

Topical Report TR-0516-49417, Evaluation Methodology for Stability Analysis of the NuScale Power Module, has been revised as described in the response above and as shown in the markup provided in this response.

In order to utilize the methodology described in this report, the applicability of the regional exclusion stability protection solution by satisfying the condition that the conservative maximum (positive) MTC is within the value used for the generic analysis and the riser subcooling is within the technical specification value must be confirmed on a cycle-specific basis.

10.4.1 Stability Analysis Application Methodology Conditions

The following conditions and limitations must be met for a stability analysis using the methodology in this report:

- Fuel designs that are different than the reference design used in this topical report must be hydraulically compatible with the reference fuel design.
- The assumed decay heat must be a conservative value for the conditions at which stability is being calculated as described in Section 10.4.
- A default boiling coefficient value of γ = 5000 kg/m^3-s must be used. Any modification to the boiling model must preserve the degree of the intended conservatism which reduces subcooled boiling in a single-channel core application.
- A core average pellet-clad gap conductance must be determined in accordance with the methodology defined in Section 5.6.4.3 of this topical report. Different gap conductance values are used if obtained from a qualified thermo-mechanical code calculation.
- Nuclear parameters used in the stability analysis must be the limiting values over the entire cycle, whether this is beginning of cycle (BOC), end of cycle (EOC), or any time during the cycle.

11.0 Summary and Conclusions

A methodology for the evaluation of the stability of the NPM has been presented. The stability phenomena are considered from the fundamental level and screened for applicability to NPM. The ranking of these phenomena is the guide for the computational models developed for the stability analysis and is assessed versus NIST-1 data and supported by first principles analysis of trends.

No assumptions are made with regard to stability trends being in any way similar to past experience, particularly with BWRs. Important differences between BWR and the NPM stability trends are identified, namely: ~~{{~~

- Negative moderator reactivity feedback is stabilizing in the case of the NPM, unlike BWRs. Note that a small positive moderator reactivity coefficient, which is destabilizing, is possible in principle for low exposure high boron and low-moderator temperature.~~}}~~$^{2(a),(c),ECI}$