RAIO-1018-62120

October 11, 2018

Docket: PROJ0769

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

SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 9575 (eRAI No. 9575) 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. 9575 (eRAI No. 9575)," dated August 14, 2018
2. 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) 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. 9575:

- 15.09-9

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
NuScale Power, LLC

Distribution: Gregory Cranston, NRC, OWFN-8G9A
Samuel Lee, NRC, OWFN-8G9A
Bruce Bavol, NRC, OWFN-8G9A

Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9575

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9575

NuScale Power, LLC
1100 NE Circle Blvd., Suite 200 Corvalis, Oregon 97330, Office: 541.360.0500, Fax: 541.207.3928
www.nuscalepower.com

Response to Request for Additional Information
Docket: PROJ0769

eRAI No.: 9575
Date of RAI Issue: 08/14/2018

NRC Question No.: 15.09-9

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.

In RAI 9218, the staff requested that the applicant explain how the following limitation from NuScale Topical Report, "Evaluation Methodology for Stability Analysis of the NuScale Power Module," TR-0516-49417, Revision 0, July 2016 for the PIM stability methodology would be met by a COL applicant:

The stability analysis methodology presented in the topical report is valid without consideration of a specific control system design provided the design of the module control system satisfies the following requirement: Any closed- loop control systems are designed and examined with respect to their impact on reactor stability by ensuring the respective control parameters (e.g., gain and time constants) are set to avoid any destabilizing effects.

In response to the RAI, the applicant provided language for a COL item (7.0-1) that states:

A COL applicant that references the NuScale Power Plant design certification is responsible for demonstrating the stability of the NuScale Power Module (NPM) during normal and power maneuvering operations for closed-loop module control system (MCS) subsystems that use reactor power as a control input.

The COL Item 7.0-1 appears to consider only a subset of the closed-loop control systems; that subset being only those subsystems that use reactor power as a control input. The limitation described in the topical report appears to more broadly consider any closed-loop control systems.

Therefore, the staff requests the following supplemental information:

- Explain the discrepancy between the COL Item 7.0-1 language and the language of the limitation in the topical report.
- Provide a listing of the closed-loop control systems and identify which control systems use reactor power as a control input.
- For those closed-loop control systems identified above that do not use reactor power as a control input explain why the control parameters do not need to be examined with respect to their impact on stability.

NuScale Response:

Response to First Bullet Item

The topical report applies a restriction formulated in the most general way. That is, any closed-loop control system is to be analyzed to disposition any destabilizing effect. The COL Item 7.0-1 language is more specific considering that, in practice, only a subset of the reactor controls has the potential to affect reactor stability. As an example, pressurizer pressure is controlled with a closed feedback loop, that must satisfy its control circuit stability requirement, but it does not impact the oscillatory stability of the core power and primary coolant flow rate. On the other hand, control of feedwater flow and average coolant temperature rely on including reactor power as part of a closed-loop feedback.

Response to Second Bullet Item

The NuScale power plant normal operation and power maneuvering control functions are provided by the following MCS functions for each NPM as described in FSAR Tier 2, Section 7.0.4.5:

1. turbine trip, throttle and governor valve control
2. turbine bypass valve control
3. feedwater pump speed control
4. feedwater regulating valve control

5. control rod drive system control
6. RCS boron concentration (chemical shim) control
7. pressurizer pressure control
8. pressurizer level control

The above functions 1, 2, 3, 4, 5, and 8 require reactor power as input. Control functions 3, 4, and 5 are anticipated to involve power feedback processes where the control action modulates reactivity on a time scale that may overlap with primary coolant flow oscillation period.

Response to Third Bullet Item

The control of the pressurizer pressure does not perturb the primary coolant flow rate or its temperature. As long as the pressure is controlled such that the riser subcooling margin is protected by a reactor trip, there is no impact on the stability of the coolant flow.

The chemical shim control in response to cycle depletion is very slow compared with the flow oscillation period and therefore cannot impact the flow stability.

Impact on Topical Report:

There are no impacts to the Topical Report TR-0516-49417, Evaluation Methodology for Stability Analysis of the NuScale Power Module, as a result of this response.