



July 02, 2018

Docket No. 52-048

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

SUBJECT: NuScale Power, LLC Supplemental Response to NRC Request for Additional Information No. 321 (eRAI No. 9092) on the NuScale Design Certification Application

REFERENCES: 1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 321 (eRAI No. 9092)," dated January 04, 2018
2. NuScale Power, LLC Response to NRC "Request for Additional Information No. 321 (eRAI No.9092)," dated February 21, 2018

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. 9092:

- 15.04.01-3

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@nuscalspower.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Zackary W. Rad".

Zackary W. Rad
Director, Regulatory Affairs
NuScale Power, LLC

Distribution: Gregory Cranston, NRC, OWFN-8G9A
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Enclosure 1: NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9092



RAIO-0718-60732

Enclosure 1:

NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9092

Response to Request for Additional Information Docket No. 52-048

eRAI No.: 9092

Date of RAI Issue: 01/04/2018

NRC Question No.: 15.04.01-3

Standard Review Plan (SRP) Section 15.4.1, “Uncontrolled Control Rod Assembly Withdrawal from a Subcritical or Low Power Startup Position;” SRP Section 15.4.2, “Uncontrolled Control Rod Assembly Withdrawal at Power;” and SRP Section 15.4.3, “Control Rod Misoperation (System Malfunction or Operator Error),” provide guidance for complying with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix A, “General Design Criteria [(GDC)] for Nuclear Power Plants,” 10, “Reactor design;” 13, “Instrumentation and control;” 17,

“Electric power systems;” 20, “Protection system functions;”; and 25, “Protection system requirements for reactivity control malfunctions.” Per the above SRP sections, the reviewer is to evaluate whether the initial conditions and parameter values selected for each analysis are justified. In addition, the reviewer is to evaluate the sequence of events to ensure it is justified based upon expected values of relevant monitored parameters and instrument indications.

Reactor coolant system (RCS) pressure is one acceptance criterion for anticipated operational occurrences. The staff notes that Final Safety Analysis Report (FSAR) Tier 2, Sections 15.4.1 through 15.4.3, evaluate limiting RCS pressure scenarios but do not provide the key inputs or the sequence of events for these scenarios. To enable the staff to evaluate whether the initial conditions/parameter values and sequence of events for the limiting RCS pressure scenarios are justified, please provide the following:

1. Key inputs for the limiting RCS pressure cases in FSAR Tier 2, Sections 15.4.1 through 15.4.3 (similar to those provided for the limiting maximum critical heat flux ratio (MCHFR) cases in FSAR Tier 2, Tables 15.4-2, 15.4-4, 15.4-6, and 15.4-8)
 2. Sequence of events for the limiting RCS pressure cases in FSAR Tier 2, Sections 15.4.1 through 15.4.3 (similar to those for the limiting MCHFR cases in FSAR Tables 15.4-1, 15.4-3, 15.4-5, and 15.4-7).
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NuScale Response:

This response supplements the docketed response originally provided to Request for Additional



Information (RAI) Set No. 321 (eRAI No. 9092) by NuScale letter RAIO-0218-58787 dated February 21, 2018. Pursuant to a conference call between NRC staff and NuScale on May 8, 2018, NuScale has revised text in the response as well as certain text and tables in FSAR Section 15.4 to address errors identified by NRC staff and the NuScale corrective action process.

The previous response had a listing of the tables that were added to FSAR Section 15.4. The NRC staff identified an error in the numbering. The list of tables added to FSAR Section 15.4 is revised as follows:

The following tables have been added to FSAR Section 15.4:

- Table 15.4-25: Sequence of Events for Limiting RCS Pressure Case (15.4.1 Uncontrolled Control Rod Assembly Withdrawal from a Subcritical or Low Power or Startup Condition)
- Table 15.4-26: Key Inputs for Limiting RCS Pressure Case (15.4.1 Uncontrolled Control Rod Assembly Withdrawal from a Subcritical or Low Power or Startup Condition)
- Table 15.4-27: Sequence of Events for Limiting RCS Pressure Case (15.4.2 Uncontrolled Control Rod Assembly Withdrawal at Power)
- Table 15.4-28: Key Inputs for Limiting RCS Pressure Case (15.4.2 Uncontrolled Control Rod Assembly Withdrawal at Power)
- Table 15.4-29: Sequence of Events for Limiting RCS Pressure Case (15.4.3 Control Rod Misoperation, Single Control Rod Assembly Withdrawal)
- Table 15.4-30: Key Inputs for Limiting RCS Pressure Case (15.4.3 Control Rod Misoperation, Single Control Rod Assembly Withdrawal)

FSAR Table 15.4-25 and Table 15.4-30 were modified to correct typos identified by NRC staff. The NRC staff noted that the values in FSAR Table 15.4-1 did not coincide with the associated FSAR Figures. The corrective action process identified Table 15.4-1 as having incorrect values. Table 15.4-1 was corrected to provide the sequence of events for the limiting minimum critical heat flux ratio case of the uncontrolled control rod assembly withdrawal event.

Impact on DCA:

FSAR Section 15.4.1, FSAR Table 15.4-1, Table 15.4-25 and Table 15.4-30 have been revised as described in the response above and as shown in the markup provided in this response.

RAI 15.04.01-3S1

Table 15.4-1: Sequence of Events for Limiting MCHFR Case (15.4.1 Uncontrolled CRA Withdrawal from Subcritical or Low Power Condition)

Event	Time [s]
Rod withdrawal initiates	0
High power (25%) limit reached	2204.102
Reactor trip actuation	2206.104
Maximum power/ MCHFR	2207.104
MCHFR	105
Scram complete	2209.106

RAI 15.04.01-3, RAI 15.04.01-3S1

Table 15.4-25: Sequence of Events for Limiting RCS Pressure Case (15.4.1 Uncontrolled Control Rod Assembly Withdrawal from a Subcritical or Low Power or Startup Condition)

Event	Time [s]
Rod withdrawal initiates	0
High power (25%) <u>pressurizer pressure</u> limit reached	949 8
Reactor trip actuation	951 0
Maximum power reached	951 0
Reactor trip complete	953
Maximum RCS pressure reached	963

RAI 15.04.01-3, RAI 15.04.01-3S1

Table 15.4-30: Key Inputs for Limiting RCS Pressure Case (15.4.3 Control Rod Misoperation, Single Control Rod Assembly Withdrawal)

Parameter	Nominal	Bias
Initial power	160 MW	+2%
RCS flowrate	See Table 15.0-6 for range	1205.2 lbm/s (low ¹)
RCS pressure	1850 psia	+70 psia
Pressurizer level	60%	+8%
MTC	-7.0 pcm/°F ²	Least Negative
FTC	-1.4 pcm/°F	Least Negative

¹ RCS flow rate is near the minimum for 102% power.

² Power dependent MTCs are used in the single CRA withdrawal analyses. The -7 pcm/°F value corresponds to the initial power of ~~75~~100%.