RAIO-0618-60254

June 01, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
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SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 419 (eRAI No. 9502) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 419 (eRAI No. 9502)," dated April 11, 2018

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. 9502:

- 15-4

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,

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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9502

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9502

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

eRAI No.: 9502
Date of RAI Issue: 04/11/2018

NRC Question No.: 15-4

General Design Criterion (GDC) 10, "Reactor design," in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix A, requires that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits (SAFDLs) are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences (AOOs).

To confirm whether margin to the SAFDLS is met for the Chapter 15 events, the staff needs to understand whether appropriate initiating events and single failures have been considered in the analyses.

Final Safety Analysis Report (FSAR) Section 15.0.0.6.6, Treatment of Non-safety-related systems, states that the application assumes the worst single failure of a control system unless the following conditions are met:

- a single failure in the nonsafety-related system does not impact DBEs.
- a detectable, non-coincident, random independent failure does not disable the system.
- the system is capable of functioning under the licensing assumptions for the event being analyzed.

The staff notes the non-loss of coolant accident (LOCA) topical report, TR-0516-49416, which is incorporated by reference into the FSAR, states, "...if operation of the control system leads to a less severe plant response, then the actions of the control system are not simulated for the transient of interest. Conversely, if operation of the control system causes the event consequences to be more severe, the [plant control system (PCS)] is assumed to operate as designed. Under no circumstances is the control system assumed to malfunction, since such an occurrence would be considered an initiating event."

The staff requests the applicant reconcile the apparent difference between FSAR Section 15.0.0.6.6 and the non-LOCA topical report and identify if any FSAR Section 15 events assume the worst possible failure of a control system. If FSAR Section 15.0.0.6.6 contains the appropriate language, the staff further requests how bullets two and three above are evaluated.

NuScale Response:

The inconsistency noted by the staff resides solely within Final Safety Analysis Report (FSAR) Section 15.0.0.6.6. Consequently, this FSAR Section is revised to reflect the treatment of nonsafety-related equipment in Design Basis Events (DBEs) as stipulated in TR-0516-49416, Non-Loss of Coolant Accident Analysis Methodology. See the attached FSAR markups for the modified text.

Impact on DCA:

FSAR Section 15.0.0.6.6 has been revised as described in the response above and as shown in the markup provided in this response.

- Loss of normal AC either at the time of the initiating event or at the time of the turbine trip. After 24 hours, the ECCS valves move to their fail-safe open position.
- Loss of normal DC power (EDNS) and normal AC - Power to the reactor trip breakers is provided via the EDNS, so this scenario is the same as a loss of normal AC with the addition of reactor trip at the time at which power is lost.
- Loss of the highly reliable DC power system (EDSS), EDNS, and normal AC - this scenario results in a reactor trip, actuation of DHRS, and closure of containment isolation valves. The ECCS valves move to their fail-safe open position upon RCS pressure dropping below the IAB pressure threshold.

Power is assumed available for events if consequences of the event are more limiting.

15.0.0.6.6 Treatment of Nonsafety-Related Systems

Nonsafety-related systems are considered in establishing the initial plant conditions for DBEs and during the initial plant response to those events. The treatment of nonsafety-related equipment in DBEs is as follows:

- Nonsafety-related system normal operation that increases the consequences of the event are modeled.
- Nonsafety-related system normal operation that improves (decreases) the consequences of the event is not modeled.

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- Nonsafety-related system normal operation that does not significantly alter the consequences of the event may be modeled.

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- ~~The potential for failure of n~~Nonsafety-related equipment is evaluated considering the licensing basis assumptions defining the event. These assumptions can include external events, environmental effects, offsite power availability, and ~~the consequences of the limiting single failure postulated~~onsite power availability.

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- ~~Failure of a nonsafety-related system in a worst-state condition is not modeled if:~~ A nonsafety-related system failing to perform its function is considered, but not the failure to a worst-state condition except as an event initiator.
  - ~~a single failure in the nonsafety-related system does not impact DBEs.~~
  - ~~a detectable, non-coincident, random independent failure does not disable the system.~~
  - ~~the system is capable of functioning under the licensing assumptions for the event being analyzed.~~

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~~The assumptions for nonsafety-related system failures are in addition to the most limiting single failure of safety-related mitigating equipment.~~ The reliability of

nonsafety-related systems is also considered when categorizing events by frequency (refer to Section 15.0). Nonsafety-related mechanical and electrical systems are treated in an analogous manner.

Nonsafety-related equipment may be used for event mitigation for the following two circumstances:

- when a detectable and nonconsequential random and independent failure must occur in order to disable the system
- when nonsafety-related components are used as backup protection.

There are three occurrences where nonsafety-related equipment is credited for event mitigation because the nonsafety-related component is used for backup protection. Listed below is the equipment associated with these occurrences. Table 15.0-9 identifies the events in which nonsafety-related equipment is credited for event mitigation.

1) The nonsafety-related secondary main steam isolation valve (MSIV) serves as the backup isolation device to the safety-related MSIV for isolation of the main steam piping penetrating containment when the safety-related MSIV is assumed to fail.

2) The nonsafety-related feedwater regulating valve (FWRV) serves as the backup isolation device to the safety related feedwater isolation valve (FWIV) for isolation of the feedwater system (FWS) piping penetrating the containment when the FWIV is assumed to fail.

3) The nonsafety-related feedwater check valve serves as the backup isolation device to the safety-related feedwater check valve for isolation of the DHRS when reverse flow is experienced during a break in the FWS piping.

Classification information for the secondary MSIVs, FWRVs, and the nonsafety-related feedwater check valves are listed in Section 3.2, Table 3.2-1. The secondary MSIVs are described in Section 10.3.2. The FWRVs and nonsafety-related feedwater check valves are described in Section 10.4.7.

The reactor pool liner, described in Section 9.2.5, is a nonsafety-related component of the reactor pool used as the ultimate heat sink (UHS). Section 9.2.5 describes how the pool liner meets the criteria for event mitigation in that water leakage from the liner is detectable and leakage is a nonconsequential random and independent failure. Therefore, any event that progresses to using DHRS, or convection cooling through the containment vessel to the reactor pool with the use of RVVs and RRVs uses the UHS and the pool liner.

15.0.0.7 Multiple Module Events

Chapter 15 DBEs are analyzed for a single NPM. Chapter 21 discusses the suitability of shared components and the design measures taken to ensure these components do not introduce multi-module risks. Section 19.1 discusses consideration of multi-module events.