NUSCALE POWER™

LO-1215-19879

December 11, 2015

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 Submittal of RA-1215-19837, "Response to Request for Additional Information Letter No. 1 for the Review of NuScale Topical Report, TR-0515-13952, 'Risk Significance Determination,' Revision 0,"
(TAC No. RN6110)

REFERENCES:

1. Letter from NuScale Power, LLC to U.S. Nuclear Regulatory Commission, "Risk Significance Determination," LO-0715-15841, Revision 0, dated July 30, 2015 (ML15211A469).
2. NuScale Topical Report "Risk Significance Determination," TR-0515-13952-NP, Revision 0, dated July, 2015.
3. Letter from U.S. Nuclear Regulatory Commission to NuScale Power, LLC, "Request For Additional Information Letter No. 1 For the Review of the NuScale Topical Report, TR-0515-13952, 'Risk Significance Determination,' Revision 0 (TAC No. RN6110)," dated November 12, 2015.

In a letter dated July 30, 2015 (Reference 1) NuScale Power, LLC (NuScale) submitted the topical report entitled "Risk Significance Determination," Revision 0, (Reference 2). In a letter dated November 12, 2015 (Reference 3), the NRC Staff provided the Requests for Additional Information (RAI) regarding the subject topical report.

The purpose of this letter is to provide NuScale's response to the NRC's RAI. The enclosure to this letter includes NuScale's "Response to Request for Additional Information Letter No. 1 for the Review of NuScale Topical Report, TR-0515-13952, 'Risk Significance Determination,' Revision 0".

This letter makes no regulatory commitments and no revisions to any existing regulatory commitments.

Please feel free to contact Jennie Wike at 541-360-0539 or at jwike@nuscalepower.com if you have any questions.

Sincerely,

Zackary Rad
Director, Regulatory Affairs
NuScale Power, LLC

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NRC

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Enclosure: "Response to Request for Additional Information Letter No. 1 for the Review of NuScale Topical Report, TR-0515-13952, 'Risk Significance Determination,' Revision 0"

Enclosure:

"Response to Request for Additional Information Letter No. 1 for the Review of NuScale Topical Report, TR-0515-13952, 'Risk Significance Determination,' Revision 0"

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NRC RAI Number: 01 NRC RAI Date: November 12, 2015

NRC Review of: Risk Significance Determination, TR-0515-13952-NP, Revision 0

NRC RAI Question Number: 17.04-1

NRC RAI Question

NRC Standard Review Plan section 19.0, "Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors", contained in NUREG-0800 endorses the use of numerical criteria given in NRC Regulatory Guide 1.200 for establishing the significance of contributors to risk modeled in the PRA. This includes numerical thresholds for Risk Achievement Worth (RAW) and Fussell-Vesely (FV) importance. It is stated in section 2.4 of your report that these thresholds have been applied in a preliminary NuScale PRA model with the result being that a large number of systems, structures or components (SSCs) that do not control risk were identified as being risk significant. In Section 2.2 of your report you indicate that identifying dominant contributors to risk with relative importance measures in a plant with a very low predicted risk profile, such as NuScale, is difficult and should be met with skepticism. The staff wishes to confirm that application of the proposed numerical thresholds provides reasonable results regarding identification of significant contributors to risk. Accordingly, please explain how you confirmed that some SSCs identified as being risk significant did not play a role in controlling risk. In addition, provide a list of these SSCs that includes a brief description of their functional capabilities.

NuScale RAI Question Response

Below is the list of systems from the September 2015 version of the NuScale Power, LLC (NuScale) Probabilistic Risk Assessment (PRA) that would be classified as risk-significant under the traditional Regulatory Guide 1.200 thresholds, but when using the proposed NuScale thresholds from the subject topical report (ML15211A469), are not risk-significant. This list also includes an explanation on why these systems did not play a role in controlling risk.

Note: The following information is an illustrative example based on preliminary design and analysis information.

System	Function	Explanation of Low Risk Significance
AC power (medium and low voltage)	Powers non safety-related systems and components and is a backup to the batteries for powering DC buses.	Multiple safety-related system failures (i.e., decay heat removal, reactor safety valves, and emergency core cooling) are required before AC power support for nonsafety systems would be needed.
DC power	Powers the safety-related instrumentation and control and post-accident monitoring systems, and maintains the emergency core cooling system valves in the normal standby position.	Loss of DC power results in safety-related SSCs that function to provide heat transfer to the ultimate heat sink going to their fail-safe position, and fulfilling their safety function.
Demineralized water system	Provides one source of inventory for chemical volume and control system (CVCS) injection to the reactor pressure vessel.	Demineralized water is one of two sources of inventory for CVCS, and CVCS serves a backup function for safety-related systems. Note that the CVCS is captured as risk-significant under the FV criteria for large release frequency (LRF).
Containment isolation (PRA Level-2 function only)	Closes containment isolation valves to isolate containment in the event of a core damage accident.	There are multiple barriers to prevent core damage that result in a low core damage frequency (CDF) (lower than the LRF risk-significance threshold). It is noted here that one of the five regulatory treatment of nonsafety systems (RTNSS) criteria in NUREG-0800, Section 19.3, also provides a containment performance goal.

When assessed collectively in the context of the PRA, the systems listed in the table above are shown to contribute insignificantly to risk based on a sensitivity study whereby credit is given only to the risk-significant systems, safety-related systems, and RTNSS systems; all other systems are assumed to be failed (i.e., set to true in the PRA model). The results show an increase in CDF and LRF, however, both CDF and LRF remain below the Regulatory Guide 1.174 acceptance guidelines for baseline risk and the proposed risk-significant thresholds. Therefore, these systems that would have been identified as being risk significant under the traditional Regulatory Guide 1.200 thresholds do not play a role in controlling risk for the NuScale methodology.

NRC RAI Question Number: 17.04-2

NRC RAI Question

The results of using the NuScale preliminary PRA in conjunction with the traditional values for RAW and FV specified in Regulatory Guide 1.200 to assess risk significance of SSCs are described in Section 2.4 of the report. The staff wishes to confirm that application of the proposed numerical thresholds provides reasonable results regarding identification of significant contributors to risk. In this regard: Were any studies performed to determine the sensitivity of risk categorization results to the values selected for component-level CCDF, system-level CCDF, component-level CLRF, system-level CLRF or total FV? If so, please describe the results of these studies and how they informed the selection of values reported in Table 4-1 of the report; If not, why not?

NuScale RAI Question Response

NuScale did not perform a study to determine the sensitivity of risk categorization results to the values selected for component-level conditional core damage frequency (CCDF), system-level CCDF, component-level conditional large release frequency (CLRF), system-level CLRF, or total FV.

The NuScale criteria for risk significance described in the subject topical report were developed using NRC guidance that relied on absolute-value thresholds and were not designed based on a specific set of NuScale specific risk results. By developing the thresholds from the risk-acceptance guidelines in Regulatory Guide 1.174 Revision 2, NuScale identifies SSCs that are required to maintain CDF and LERF below the safety goals as risk-significant. Implementation of these criteria is independent of design and is consistent with meeting NRC safety goals described in References 6.1.20 and 6.1.28 of the subject topical report. Since the thresholds are below the NRC safety goals, reasonableness of the results is assured. Consequently, a sensitivity study as a function of different thresholds was not conducted.

NRC RAI Question Number: 17.04-3

NRC RAI Question

Uncertainties in the PRA model are accounted for by incorporating margin into the value selected for the component level CCDF as described in Section 3.1.1.1 of the report.

a) On what basis was it concluded that the amount of margin specified in the report was sufficient to account for uncertainties in the PRA model?

b) Does the amount of margin specified in the report apply only to the uncertainties in the NuScale PRA being used to support design certification of NuScale or will it apply to the uncertainties in the PRA holders of a combined license based on the certified NuScale design are required to develop in accordance with 10 CFR 50.71(h)(1)?

NuScale RAI Question Response

a) Preliminary uncertainty results from the NuScale PRA are consistent with PRAs for commercial nuclear power plants in that the uncertainty on CDF spans approximately one order of magnitude (i.e., the range from the 5 percent value for CDF to the 95 percent value for CDF is approximately a factor of ten). Given that the risk metrics being compared to the threshold values are mean values, the span from the mean value to the 95 percent value will be less than half an order of magnitude since the mean value will be approximately a factor of three greater than the median value. Based on the observation that the typical uncertainty on CDF, and subsequently on LRF, spans an order-of-magnitude, then the range between the best estimate value and the 95 percent value is approximately a half order-of-magnitude. This is the basis for the uncertainty margin in the threshold values.

b) NuScale intends to utilize the amount of margin specified in Section 3.1.1.1 of the subject topical report to account for uncertainties in the PRA model supporting the design certification application. Although NuScale has not made a determination on applicability, current industry PRA models do not readily support significant differences in uncertainty estimates, therefore the amount of margin may be used for uncertainties in the PRA for holders of a combined license based on the certified NuScale design.

Impact of NRC RAI Question Response on "Risk Significance Determination," TR-0515-13952-NP, Revision 0:

This RAI Response does not require a revision to the subject topical report.