NuScaleDCRaisPEm Resource

From:	Chowdhury, Prosanta
Sent:	Friday, May 4, 2018 4:03 PM
To:	Request for Additional Information
Cc:	Lee, Samuel; Cranston, Gregory; Tabatabai, Omid; Jackson, Diane; Haider, Syed; NuScaleDCRaisPEm Resource
Subject:	Request for Additional Information No. 466 eRAI No. 9482 (06.02.01.01.A)
Attachments:	Request for Additional Information No. 466 (eRAI No. 9482).pdf

Attached please find NRC staff's request for additional information (RAI) concerning review of the NuScale Design Certification Application.

Please submit your technically correct and complete response within 60 days of the date of this RAI to the NRC Document Control Desk.

If you have any questions, please contact me.

Thank you.

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Division of New Reactor Licensing
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U.S. Nuclear Regulatory Commission
301-415-1647

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Request for Additional Information No. 466 (eRAI No. 9482)

Issue Date: 05/04/2018
Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 06.02.01.01.A - PWR Dry Containments, Including Subatmospheric Containments
Application Section: FSAR Section 6.2.1.1 Containment Structure

QUESTIONS

06.02.01.01.A-18

Conservatism in the NPM Initial Conditions for the CNV Safety Analyses

To meet the General Design Criteria (GDCs) 16, 38, and 50 of Appendix A to 10 CFR Part 50 relevant to the containment design basis and guided by the Design-Specific Review Standard (DSRS) for NuScale Small Modular Reactor (SMR) Design Section 6.2.1, the staff is reviewing the applicant's analytical models and assumptions used in the containment response analysis methodology (CRAM) to determine if the licensing-basis safety analyses are acceptably conservative. Specifically, the staff needs to assess the conservatism of the licensing-basis models, constitutive/closure relations, model input parameters, and initial/boundary conditions used for the applicant's NPM design basis event (DBE) containment response analyses, in order to conclude that the results are valid over the applicable range of DBE conditions.

A limiting DBE model is expected to use the most conservative NPM initial and boundary conditions for the CNV safety analyses, based on the most biased reactor operating conditions and the limiting technical specifications. These initial conditions and assumptions should be based on the range of normal operating conditions with consideration given to maximizing the calculated peak containment pressure and temperature. In this regard, the applicant is requested to address the following three questions and update the FSAR, accordingly. The regulatory bases identified above are applicable to all questions in this RAI.

In Table 5-1 of the Containment Response Analysis Methodology Technical Report (TR-0516-49084-P, Rev. 0), the nominal CNV free volume is adjusted by {{ }} percent as a conservative initial condition for the containment response analysis to account for uncertainty in design, blockage in containment by components, such as, piping, etc. However, the base NRELAP5 model described in {{ }} has not been updated for numerous geometry changes reported in {{ }}, so it is not clear that a {{ }} percent CNV free volume adjustment is adequate and would also cover the thermal expansion of the reactor pressure vessel (RPV) under operating conditions. The staff also noted that {{ }} used {{ }} percent conservatism in CNV free volume but that was reduced to {{ }} percent in Rev. 2. Please explain why a {{ }} percent reduction in containment volume is justified for a NRELAP5 base model that may not reflect the current design. If necessary, please update the NRELAP5 base model and resubmit the updated NRELAP5 models and their results for the limiting DBEs for CRAM, as submitted in response to RAI 8783; or justify how the peak CNV pressure and temperature results remain conservative with an outdated base model. When the licensing basis containment analyses are updated, the FSAR and the decks also need to reflect the rise of initial CNV pressure from 2 psia to 3 psia, as was concluded by RAI 8793, Question 29717 (06.02.01-2).

06.02.01.01.A-19

Even though the Final Safety Analysis Report (FSAR) Table 6.2-1 on containment design and operating parameters does not include the containment free volume, Table 6.5-1 on containment vessel key attributes does report containment free volume to be $1.1x10^7$ in^3 or 6365.7 ft^3, which is {{ }}, as confirmed by the staff through an audit. The applicant is requested to update the FSAR to have consistent containment free volume across the DCA.

06.02.01.01.A-20

The reactor pressure vessel (RPV) operating conditions and subsequent CNV response to a primary system release DBE are sensitive to the uncertainty of the SIET test data that were used to develop the NRELAP5 steam generator (STG) model. The applicant is requested to justify that the RPV input parameters (T-hot, T-ave, and pressurizer pressure) used for the containment safety analyses are conservatively biased to bound the STG model uncertainty. In addition, provide the technical bases for selecting the limiting T-hot, T-ave, and pressurizer pressure conditions for the containment analysis, and elaborate on their consistency with technical specifications, safety analysis limits, and trip set points, with an initial reactor power at 102 percent of the rated power. Table 5-1 of the Containment Response Analysis Methodology Technical Report (TR-0516-49084-P, Rev. 0) lists the conservative initial conditions for a primary system release event for containment analyses. The table identifies the primary reactor coolant's average temperature (T-ave) value of {{ }}. If {{ }} is the uncertainty in T-ave, please confirm if it is already included in the T-ave value of {{ }}. Please provide or make available for audit any applicable engineering calculation reports to support the development of the RPV input parameters and uncertainties inquired in this RAI question, with respect to containment peak pressure calculations.