NuScaleTRRaisPEm Resource

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Sent:	Friday, February 02, 2018 4:22 PM
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Subject:	Request for Additional Information Letter No. 9333 (eRAI No. 9333) Topical Report Thermal Hydraulic
Attachments:	Request for Additional Information No. 9333 (eRAI No. 9333).pdf

Attached please find NRC staff's request for additional information concerning review of the NuScale Topical Report.

Please submit your 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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Request for Additional Information No. 9333 (eRAI No. 9333)

Issue Date: 02/02/2018
Application Title: NuScale Topical Report
Operating Company: NuScale
Docket No. PROJ0769
Review Section: 01 - Introduction and Interfaces
Application Section: 1

QUESTIONS

01-66

Title 10 of the Code of Federal Regulations (CFR), Part 50.34, “Contents of Application; technical information,” requires licensees to submit safety analyses that demonstrate how a given reactor complies with associated safety criteria. NuScale has submitted the PIM stability analysis methodology for NRC review and approval such that it may be used to demonstrate that the NuScale power module complies with the requirements of GDC 12 of 10 CFR 50 Appendix A. In reviewing that method, according to SRP 15.0.2, “Review of Transient and Accident Analysis Methods,” the reviewer must ensure that the field equations of the evaluation model are adequate to describe the set of physical phenomena that occur in the accident and ensure that the closure relationships are valid over the full range of conditions encountered.

According to software verification test results audited by NRC staff, it appears that there are certain analysis conditions that result in errors in the energy conservation, either on a nodal basis or on the basis of the entire system. These errors are encountered only under particular code uses. Per NuScale’s own quality procedures, these limitations on the conditions that can be accurately analyzed are supposed to be reflected in the code user’s manual. These documented limitations would then, also per NuScale’s procedures, preclude the code from being applied to analyze conditions that would violate the field equation accuracy. However, it does not appear as if the associated code limitations are documented in the PIM user’s manual provided in the stability topical report (TR), TR-0516-49417-P, or in NuScale’s most recent user’s manual for PIM.

In order to make an affirmative finding with regard to the above regulatory requirement important to safety, NRC staff requests that NuScale update the PIM user’s manual to include limitations on the use of the code consistent with the limitations identified during the initial software verification testing with respect to energy conservation and steam generator modeling options.

01-67

Title 10 of the Code of Federal Regulations (CFR), Part 50.34 “Contents of Application; technical information,” requires licensees to submit safety analyses that demonstrate how a given reactor complies with associated safety criteria. NuScale has submitted the PIM stability analysis methodology for NRC review and approval such that it may be used to demonstrate that the NuScale power module complies with the requirements of General Design Criteria (GDC) 12 of Title 10 CFR 50 Appendix A. SRP 15.0.2, “Review of Transient and Accident Analysis Methods,” which provides guidance for the review of transient and accident analysis methods, directs the reviewer to review the quality assurance program, and in particular the software configuration control and testing procedures to ensure compliance with the requirements of Title 10 CFR 50 Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Reprocessing Plants”.

During the NRC staff audit of the software test plan and associated procedures for PIM, the staff found that the regression testing requirements leave PIM susceptible to a condition the staff refers to as “code drift.” Code drift refers to a process whereby multiple, subsequent changes to an evaluation model or code result in a significant change in the results. Code drift can occur if each change results in only a small difference in the results from version to version in each change, but the difference continues to accumulate in a consistent direction. Title 10 CFR 50.46a(3)(i) codifies this concept for evaluation models (EMs) used for loss-of-coolant-accident (LOCA) analyses. For LOCA EMs, the impact to the figure of merit (peak cladding temperature in this case) must be integrated with each change (including error corrections) made to the EM. In this sense, because the integrated effect of the changes are considered, the reporting requirements are triggered when the accumulated effect becomes significant. Without tracking of the integrated effect of changes, it would be possible for changes to accumulate such that each change from an approved version results in code drift and a significant difference goes undetected.

In order to make an affirmative finding with regard to the above regulatory requirement mportant to safety, the NRC staff requests that NuScale describe how code drift is avoided through the regression testing process of PIM. In this description provide a description of the specific test cases, reference solutions, and acceptance criteria applied. Further, provide a brief description of any updates to the software test plan that may arise as a result of response to this request.