NuScaleDCRaisPEm Resource

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Sent:	Wednesday, February 14, 2018 9:04 AM
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Subject:	Request for Additional Information No. 368 RAI No. 9242 (4.06)
Attachments:	Request for Additional Information No. 368 (eRAI No. 9242).pdf

Attached please find NRC staff's request for additional information 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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Request for Additional Information No. 368 (eRAI No. 9242)

Issue Date: 02/14/2018
Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 04.06 - Functional Design of Control Rod Drive System
Application Section: 4.06

QUESTIONS

04.06-1

10 CFR 50, Appendix A, General Design Criterion (GDC) 4 requires that structures, systems, and components important to safety be designed to accommodate the effects of, and to be compatible with, the environmental conditions during normal plant operation as well as during postulated accidents. 10 CFR 52.47 requires the information submitted for a design certification to include performance requirements and design information sufficiently detailed to permit procurement specifications and construction and installation specifications by an applicant. In addition, the Standard Review Plan (SRP), Revision 2, Section 4.6 provides guidance regarding the control rod drive cooling system (CRDS); specifically, Review Procedure 3 directs the reviewer to examine descriptions and drawings to confirm that the systems meet the design requirements, and specifies that the CRDS cooling system should be capable of maintaining the CRDS temperature below the applicant's maximum temperature criterion.

Final Safety Analysis Report (FSAR) Tier 2, Section 4.6.1 states the electric coil operating conditions of the CRDS requires active cooling by water through a CRDS cooling water distribution header to cooling tubes in the drive coils of each control rod drive mechanism (CRDM). Section 4.6.1 adds that the cooling requirements for the CRDMs are provided by the reactor component cooling water system (RCCWS) in Section 9.2.2. The staff reviewed FSAR Tier 2, Section 4.6 and Section 9.2.2, but could not find the cooling requirements for the CRDS.

The applicant is requested to provide in the FSAR, maximum temperature criterion for the CRDM, and RCCWS cooling water temperature values and flow rates required to maintain adequate CRDM cooling for normal operation.

04.06-2

GDC 26, "Reactivity Control System Redundancy and Capability," requires two independent reactivity control systems of different design principles that are capable of reliably controlling reactivity changes during normal operation. GDC 29 requires that protection and reactivity control systems be designed to ensure an extremely high probability of functioning in the event of an anticipated operational occurrence. The CRDS is one of those systems, and the areas of review under SRP Section 4.6, "Functional Design of Control Rod Drive System," include functional tests for the CRDS.

Regulatory Guide 1.68, Revision 4, and Design Specific Review Standard (DSRS) Section 14.2 provide guidance for testing of the CRDS. DSRS Section 14.2 states that the applicant should provide test abstracts of SSCs and unique design features, including tests and acceptance criteria.

FSAR Tier 2, Section 14.2 provides the elements of the Initial Test Program (ITP). The information provided regarding these tests are not sufficient to ensure adequacy of the results of the ITP, specifically:

a. FSAR Tier 2, Table 14.2-80 (Test#80), does not include specific acceptance criteria for CRDS performance. No numerical values are specified for ITP rod insertion and withdrawal speeds, the limit for control rod assembly (CRA) position indications within the associated group position or control rod demand position, and the CRA fully withdrawn position. The applicant is requested to provide the design limits within the acceptance criteria of Test #80 or reference a location in the FSAR that provides the values for the design limits.

b. Acceptance criteria 'i' of FSAR Tier 2, Table 14.2-81 (Test #81), does not provide specific acceptance values for drop time. The applicant is requested to provide the drop time within the acceptance criteria of Test #81 or reference a location in the FSAR that provides the values for drop time. In addition, the test should clearly indicate that the drop test involves a "full-height" drop.

c. Acceptance criteria 'ii' of FSAR Tier 2, Table 14.2-81 (Test #81), specifies the "arithmetic average of all CRA drop times are within TS limits." However, RG 1.68 and technical specification (TS) surveillance requirement (SR) 3.1.4.3 do not permit the use of arithmetic averages to satisfy CRA drop time testing. RG 1.68 also adds, "those control rods for which the scram times fall outside the two sigma limit of the scram time data for all control rods should be retested a sufficient number of times (e.g., three times) to reasonably ensure proper performance during subsequent plant operations." Therefore, the applicant is requested to revise Test #81 acceptance criteria 'ii' to ensure each CRA drop time is within specified limits and all control rod drop times fall within the two sigma limit per RG 1.68. In addition, the applicant is requested to revise Test #81 acceptance criteria 'ii' to provide the specific drop time values or surveillance requirement(s) needed to ensure proper operation of the CRDS.

d. RG 1.68 specifies, "to the extent practical, testing should demonstrate control rod scram times at both hot zero power and cold temperature conditions, with flow and no flow conditions in the reactor coolant system as required to bound conditions under which scram might be required."

    i. FSAR Tier 2, Table 14.2-81 (Test #81) specifies that the CRA drop time testing is performed when the reactor coolant system (RCS) is at hot zero power (HZP). However, the staff could not find a test of CRA drop times during cold temperature conditions. Therefore, the applicant is requested to provide a CRA drop time test for cold temperature conditions, or provide justification for how testing during only HZP is bounding and demonstrates the control rods will drop within the required time under cold temperature plant conditions.

    ii. FSAR Tier 2, Table 14.2-81 (Test #81), specifies that the CRA drop time testing is performed when the RCS is at HZP. However, the staff could not find a test of CRA drop times during flow conditions. Therefore, the applicant is requested to add CRA drop time test acceptance criteria to the FSAR Tier 2, Table 14.2-107 (Test #107) and Table 14.2-104 (Test #104), which involve reactor trips at 10-20% reactor thermal power and 100% reactor thermal power, respectively.

RG 1.68 Appendix A, A-5 Power Ascension Tests, item (g), specifies, "Check rod scram times from data recorded during scrams that occur during the startup test phase to determine that the scram times remain within allowable limits." However, the staff could not find this item anywhere in FSAR 14.2, ITP. The applicant is requested to include item (g) in either FSAR 14.2.4 or the Startup Administration Manual (COL Item 14.2-2). If it is to be addressed in the Startup Administrative Manual it can be specified separately. Alternatively, the COL information item could specify that the Startup Administrative Manual will meet RG 1.68 guidelines.