NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Friday, August 18, 2017 8:01 AM
To: RAI@nuscalepower.com
Cc: NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Lupold, Timothy; Wu, Cheng-Ih; Vera Amadiz, Marieliz
Subject: RE: Request for Additional Information No. 182, RAI 9039 (3.9.1)
Attachments: Request for Additional Information No. 182 (eRAI No. 9039).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.

Gregory Cranston, Senior Project Manager
Licensing Branch 1 (NuScale)
Division of New Reactor Licensing
Office of New Reactors
U.S. Nuclear Regulatory Commission
301-415-0546

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Recipients:
"NuScaleDCRaisPEm Resource" <NuScaleDCRaisPEm.Resource@nrc.gov>
Tracking Status: None
"Lee, Samuel" <Samuel.Lee@nrc.gov>
Tracking Status: None
"Chowdhury, Prosanta" <Prosanta.Chowdhury@nrc.gov>
Tracking Status: None
"Lupold, Timothy" <Timothy.Lupold@nrc.gov>
Tracking Status: None
"Wu, Cheng-Ih" <Cheng-Ih.Wu@nrc.gov>
Tracking Status: None
"Vera Amadiz, Marieliz" <Marieliz.VeraAmadiz@nrc.gov>
Tracking Status: None
"RAI@nuscalepower.com" <RAI@nuscalepower.com>
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Request for Additional Information No. 182 (eRAI No. 9039)

Issue Date: 08/18/2017
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Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 03.09.01 - Special Topics for Mechanical Components
Application Section:

QUESTIONS

03.09.01-1

The staff reviewed DCD Section 3.9.1.1 to ensure that the relevant requirements of GDC 1, 2, 14, 15 and 10 CFR Part 50, Appendix S were met in regard to including a complete list of transients to be used in the design and fatigue analysis of ASME Code Class 1 and core support components, supports and reactor internals within the reactor coolant pressure boundary. The design transients define thermal-hydraulic conditions (i.e., pressure, temperature, and flow) for the NPM. Bounding thermal-hydraulic design transients are defined for components of the reactor coolant pressure boundary (RCPB).DCD Table 3.9-1, Summary of Design Transients, lists the design transients by ASME service level and includes the number of occurrences or cycles for each design transient based on a plant life of 60 years.

Load combinations and their acceptance criteria are given in Section 3.9.3 for mechanical components and associated supports and in Section 3.12 for piping systems. The Service Level A and B transients are representative events that are expected to occur during plant operation. These transients are severe or frequent enough to be evaluated for component cyclic behavior and equipment fatigue life, and the analyzed conditions are based on a conservative estimate of the frequency of occurrences as listed in Table 3.9-1 and magnitude of temperature and pressure changes. However, Table 3.9-1 does not include the seismic operating basis earthquake (OBE) load and cycles which is significant for performing a fatigue analysis. Clarify (1) whether the numbers in the last column of Table 3.9-1 is the number of occurrences or cycles for the named event, if so, the “events” should change to “Cycles,” and (2) whether a note should be added to Table 3.9-1 to address OBE for the fatigue analysis based on the discussion in Sections 3.7.3 and 3.12.4, “20 cycles of SSE” or “312 cycles of one third SSE (equivalent OBE)” to be used in lieu of one SSE and five OBE as required by fatigue analysis.

03.09.01-2

Generic Design Criterion (GDC) 1 to 10CFR50 requires that components important to safety be designed to high quality standard. The transient conditions selected for equipment design evaluation are based on the conservative estimates on the magnitude and frequency of temperature and pressure transients resulting from various operating conditions in the plant that may occur. The applicant is requested to provide the basis for assuming 90 cycles of turbine trip without bypass and 180 cycles of turbine trip with bypass. On each turbine trip, the stop valves close. Also confirm if the pressure transients due to turbine trips cover the transients due to stop valve closure which was considered to generate severe dynamic loads in the PWR practice.

03.09.01-3

DCD Section 3.9.1.1.1 discusses power ascent and descent between 0 and 15 percent of full power at which the control systems are placed in automatic mode. The maximum load ramp is specified to be limited to 0.5 percent of full power per minute. It appears that one is the reverse of the other. These two are identified as Transient 3 and Transient 4 respectively. The numbers of transient occurrences are described in DCD Table 3.9-1, "Summary of Design Transients."

GDC 14 and 15 apply as components important to safety are design to postulated transients anticipated during the design life of the plant. With the guidance of SRP 3.9.1 section III.2, the reviewer compared information on similar and previously licensed applications and notes that there are deviations from the previous accepted practice. The applicant is requested to provide the basis as to why the occurrences for the ascent event is 700 and for the decent event is 300. Also, provide additional information and a justification that the assumed numbers of occurrences for these two events for NuScale are different from that of the previous accepted standard PWR (600 occurrences for both events).

03.09.01-4

In accordance with GDC 14 and 15, components important to safety are designed to have a low probability of abnormal leakage and to withstand operational occurrences, i.e. postulated transients anticipated during the design life of the plant.

In DCD Table 3.9-1, NuScale assumed 15 cycles for inadvertent pressurizer spray. The applicant is requested to provide a justification for using 15 cycles instead of 30 cycles as is typical for a standard PWR plant for this transient.

03.09.01-5

Per 10 CFR Part 50, Appendix B requirements, appropriate quality standards are specified and included in design documents and design methods for the design and analysis of Seismic Category I, ASME Code Class 1, 2, 3, and core support structures and non-Code structures. Identify the computer programs used for calculating stresses and cumulative usage factors for Class 1, 2, and 3 components including staff endorsed environmental effects on the fatigue methodology. Confirm that the analyses for ASME Section III Class 1 components and piping for the fatigue evaluation include environmental effects in accordance with the guidance in Regulatory Guide 1.207 and NUREG/CR-6909.