NuScaleDCRaisPEm Resource

From:	Cranston, Gregory
Sent:	Monday, August 07, 2017 9:58 AM
To:	RAI@nuscalepower.com
Cc:	NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Lupold, Timothy; Tsirigotis, Alexander; Vera Amadiz, Marieliz
Subject:	RE: Request for Additional Information No. 154, RAI 8938 (3.12)
Attachments:	Request for Additional Information No. 154 (eRAI No. 8938).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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Created By: Gregory.Cranston@nrc.gov

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
"Tsirigotis, Alexander" <Alexander.Tsirigotis@nrc.gov>
Tracking Status: None
"Vera Amadiz, Marieliz" <Marieliz.VeraAmadiz@nrc.gov>
Tracking Status: None
"RAI@nuscalepower.com" <RAI@nuscalepower.com>
Tracking Status: None

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Request for Additional Information No. 154 (eRAI No. 8938)

Issue Date: 08/07/2017
Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 03.12 - ASME Code Class 1, 2, and 3 Piping Systems and Piping Components and TheirAssociated Supports
Application Section: 3.12

QUESTIONS

03.12-1

SECY-90-377 and the NRC white paper on piping level of detail for design certification (ML14065A067) discuss the design information that is required at design certification without the need for design acceptance criteria (DAC) for the NRC staff to be able to make a final safety determination on piping issues at the design certification stage that meets the applicable requirements of 10 CFR 52. Specific to FSAR Tier 2, Section 3.12, provide the following information to support the staff's safety determination.

1) To demonstrate that the piping, which has been structurally evaluated based on the graded approach described in FSAR Tier 2, Section 14.3.2.3, conforms to the requirements of ASME Boiler and Pressure Vessel Code (BPV Code) Section III, mandated by 10 CFR 50.55a, provide the following information in response to this request. The information need not be included in the FSAR unless the applicant chooses to do so.

   a) A tabulated, quantitative summary of the calculated maximum stresses and fatigue usage factors (if applicable) with a comparison to ASME BPV Code allowable stress values for each code equation. Include only maximum stresses and data at critical locations, including anchors, flued head anchor penetrations, nozzles, penetrations, flanged connections, valve and relief valve connections, branching pipe connections and pipe supports. List all applicable loads in load combination cases for each service level and code equation.

   b) For equipment nozzles, a tabulated quantitative summary of the calculated reaction loads compared to specific nozzle allowable values.

   c) For containment penetrations, quantitative maximum calculated results compared to allowable values from the penetration structural qualifications which include loads from both sides of the penetration.

03.12-2

According to SRP Section 3.12, Subsection II.D.x, the design of sliding type supports, such as guides or box supports, should include evaluation of the friction loads induced by the pipe on the support.

FSAR Tier 2, Section 3.12.6.9, "Consideration of Friction Forces" states that friction forces on supports are considered only due to deadweight and thermal loads and no other loads are considered to produce friction.

Friction force is developed and determined by the applied pipe force normal to the support member surface multiplied by the appropriate coefficient of friction. Friction forces to be considered are those that are produced by resulting piping signed loads. Signed loads are those which act in one direction. These are considered for producing significant friction loads and should be accounted for in the pipe support design. Cyclic loads, such as those from earthquake or other reversing dynamic loads are not considered to produce significant friction forces and friction forces from these loads can be ignored. For examples of reversing and nonreversing dynamic loads see ASME Sect. III, Fig. NB-3213-1 and Fig. NC-3622-1.

Example of loads to be considered for producing frictional loads are those from deadweight, thermal expansion loads, pipe anchor or support movement (due to temperature or pressure) loads and from any nonreversing dynamic loads such as those from relief/safety valve open end discharge loads.

1) Revise the FSAR to describe how the frictional forces on supports are determined from the above described loads, or provide a technical justification for omitting any of these loads/forces.

2) Document in the FSAR that friction loads from deadweight and thermal expansion loads are to be considered for all loading conditions or provide a technical justification for not including these friction forces from any loading condition.

03.12-3

According to SRP Section 3.12, Subsection II.D.xi, pipe support gaps should account for the diametrical expansion of the pipe due to pressure and temperature.

FSAR Tier 2, Section 3.12.6.10, “Pipe Support Gaps and Clearances” states that a nominal cold condition gap of 1/16 inch is included radially for all pipe supports. This gaps allow for unrestraint radial thermal expansion of the pipe as well as unrestrained pipe rotation.

1) Discuss in the FSAR how the specified pipe support gap will be checked against the maximum combined radial growth of the pipe due to temperature and pressure to assure that adequate clearance exists to avoid binding, particularly for the 12” NPS main steam line.

2) The statement in the FSAR that “a nominal cold condition radial gap of 1/16 inch is included in all pipe supports” does not accommodate pipe supports that are designed to support deadweight. Modify the pipe support gap statement in the FSAR for deadweight supports.

03.12-4

ASME BPV Section III, mandated by 10 CFR 50.55a, requires that piping analysis considers combinations of various loadings, including deadweight, pressure, seismic, thermal expansion and transient loads. Thermal expansion tables in ASME Section II, Part D, Properties (Customary) - Materials, show that the reference or ambient temperature for linear thermal expansion is 70 °F. Accordingly, SRP 3.12, Subsection II.C.xvii states that the stress-free reference temperature for a piping system is defined as a temperature of 70 °F. For piping systems that operate at temperatures

above 70°F, a thermal expansion analysis should be performed in accordance with ASME Section III. It also states that if a higher stress-free reference temperature is selected, the applicant should justify the higher temperature. The justification will be reviewed on a case by case basis to confirm that this higher temperature is suitable for the piping configuration, design support loads, piping displacement, etc.

FSAR Tier 2, Section 3.12.5.3 identifies the 70 °F pipe temperature as the stress-free temperature for a piping system. It also states that thermal analysis for ASME Class 2 and 3 piping systems with operating temperature equal to or less than 150 °F do not required thermal analysis except when required due to interface with other piping. FSAR Tier 2, Section 3.12.5.14, "Minimum Temperature for Thermal Analyses," states that NuScale piping systems with operating temperature equal to or less than 150 °F do not require analysis for thermal effects and it is inconsistent with FSAR Section 3.12.5.3 in that it does not differentiate between classes of pipe.

1) According to SRP 3.12 a justification by the applicant is required for establishing a temperature for piping, other than 70 °F, below which piping thermal analysis is not needed. The justification needs to show that at this higher than 70 °F temperature the piping configuration can accommodate thermal expansion with insignificant amount of stress and that it is suitable for support design loads and piping displacement. The applicant is requested to provide in the FSAR a technical justification on this subject for staff's review.

2) Revise FSAR Section 3.12.5.14 to be consistent with FSAR Section 3.12.5.3.

3) Discuss in the FSAR the type of interface with other piping that would require analysis for thermal expansion for piping equal to or less than 150 °F that is mentioned in FSAR Section 3.12.5.3.