

NuScaleDCRaisPEm Resource

From: Chowdhury, Prosanta
Sent: Wednesday, February 28, 2018 3:33 PM
To: 'RAI@nuscalepower.com'
Cc: Lee, Samuel; Cranston, Gregory; Dias, Antonio; Li, Chang; Baval, Bruce; NuScaleDCRaisPEm Resource
Subject: Request for Additional Information No. 375 eRAI No. 9201 (05.02.05)
Attachments: Request for Additional Information No. 375 (eRAI No. 9201).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.

Prosanta Chowdhury, Project Manager
Licensing Branch 1 (NuScale)
Division of New Reactor Licensing
Office of New Reactors
U.S. Nuclear Regulatory Commission
301-415-1647

Hearing Identifier: NuScale_SMR_DC_RAI_Public
Email Number: 403

Mail Envelope Properties (DM5PR0901MB218286BBA7C3C0471E6E15429EC70)

Subject: Request for Additional Information No. 375 eRAI No. 9201 (05.02.05)
Sent Date: 2/28/2018 3:33:09 PM
Received Date: 2/28/2018 3:33:15 PM
From: Chowdhury, Prosanta

Created By: Prosanta.Chowdhury@nrc.gov

Recipients:

"Lee, Samuel" <Samuel.Lee@nrc.gov>
Tracking Status: None
"Cranston, Gregory" <Gregory.Cranston@nrc.gov>
Tracking Status: None
"Dias, Antonio" <Antonio.Dias@nrc.gov>
Tracking Status: None
"Li, Chang" <Chang.Li@nrc.gov>
Tracking Status: None
"Bavol, Bruce" <Bruce.Bavol@nrc.gov>
Tracking Status: None
"NuScaleDCRaisPEm Resource" <NuScaleDCRaisPEm.Resource@nrc.gov>
Tracking Status: None
"RAI@nuscalepower.com" <RAI@nuscalepower.com>
Tracking Status: None

Post Office: DM5PR0901MB2182.namprd09.prod.outlook.com

Files	Size	Date & Time
MESSAGE	561	2/28/2018 3:33:15 PM
Request for Additional Information No. 375 (eRAI No. 9201).pdf		91384

Options

Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Request for Additional Information No. 375 (eRAI 9201)

Issue Date: 02/28/2018

Application Title: NuScale Standard Design Certification - 52-048

Operating Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 05.02.05 - Reactor Coolant Pressure Boundary Leakage Detection

Application Section:

QUESTIONS

05.02.05-7

If an item meets any of the criteria specified in 10 CFR 50.36(c)(2)(ii), then a technical specification (TS) limiting condition for operation (LCO) must be established for that item.

In its response to RAI 8843, NuScale stated that the leak-before-break (LBB) leakage limit on leakage from the main steam (MSS) or feedwater (FWS) lines does not satisfy 10 CFR 50.36(c)(2)(ii) Criterion (2) for TS LCO because these lines are not part of the reactor coolant pressure boundary and the limit is not a “process variable, design feature, or operating restriction” for an initial condition of the analyses. NuScale further stated that the LBB leakage limit is solely an indicator for the need to take further action to investigate the source of leakage and evaluate the potential consequences of that leakage. Therefore, NuScale did not propose a TS LCO for the LBB leakage limit.

If a DC applicant asserts that no LCO is needed, it must show that none of the four criteria of 10 CFR 50.36(C)(2)(ii) are satisfied for that item. NuScale has not addressed whether Criterion 4 is satisfied for LBB leakage limit in its RAI response. Therefore, NuScale’s RAI response is insufficient to support its position that no LCO is needed.

After reviewing the applicant’s RAI response, the staff view is that NuScale’s characterization of the LBB leakage limit as solely an indicator for the need to take further action is not fully correct. It should be noted that the LBB leakage limit is related to the critical crack size in the LBB analyses described in FSAR Section 3.6.3. Beyond the critical crack size, the crack growth becomes unstable, and the success of LBB to prevent gross pipe failures (i.e., high-energy pipe breaks) cannot be assured with the technical information currently available to the staff in the DC application. Accordingly, the dynamic effects resulting from the potential pipe breaks should be evaluated to meet the GDC 4 requirement such that nearby SSCs important to safety are protected from the dynamic effects resulting from the postulated high-energy pipe breaks. The NuScale FSAR Tier 2, Section 3.6.2 states that the dynamic effects of MSS or FWS pipe breaks are not analyzed based on the success of LBB to prevent such high energy line breaks. As discussed above, the staff view is that the SSCs important to safety inside the NuScale containment are not protected from the dynamic effects of jet impingement and pipe whip from possible MSS and FWS high energy line breaks when the LBB leakage limit is exceeded.

In its response to RAI 8843, NuScale proposed to use the procedures being used in RG 1.45 for prolonged low-level RCS leakage to also monitor the LBB leakage. However, leakage with no upper limit, as proposed by the applicant, is not related to or determined by the LBB critical crack size. As discussed above, the consequences of exceeding the LBB limit compounded with the design of unprotected instrumentation and unprotected SSCs to mitigate a design basis accident are serious. Even though MSS and FWS lines are not part of the reactor coolant

pressure boundary, the failure of LBB could result in the break of these high energy lines, and the dynamical effects could lead to:

- the failure of the instrumentation used to detect/indicate a significant abnormal degradation of the reactor coolant pressure boundary (as indicated in Criterion 1 of 10 CFR 50.36(c)(2)(ii), or
- the failure of or a challenge to the integrity of a fission product barrier due to jet impingement and pipe whip and an initial condition (critical crack size) for the LBB analyses (as indicated in Criterion 2 of 10 CFR 50.36(c)(2)(ii).

In addition, the risks associated with the failure of LBB compounded with unprotected SSCs inside containment have not been analyzed by the applicant in the RAI response. In the past, all design certifications (such as AP1000 and USEPR) that proposed to credit LBB for RCS, and MSS lines have TS LCOs for the LBB leakage limit. AP1000 TS LCO 3.7.8 for the main steam line is a good example.

Therefore, the NRC staff determined that 10 CFR 50.36(c)(2)(ii) Criteria 1, 2, and possibly Criterion 4 apply to the LBB leakage limit of any high energy line break including MSS and FWL. The applicant is requested to propose such a TS LCO.