

NuScaleDCRaisPEm Resource

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Sent: Friday, May 26, 2017 3:49 PM
To: RAI@nuscalepower.com
Cc: NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Zimmerman, Jacob; Ray, Sheila
Subject: Request for Additional Information No. 32, RAI 8823
Attachments: Request for Additional Information No. 32 (eRAI No. 8823).pdf

Attached please find NRC staff's request for additional information concerning review of the NuScale Design Certification Application.

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. 32 (eRAI No. 8823)

Issue Date: 05/26/2017

Application Title: NuScale Standard Design Certification - 52-048

Operating Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 08.02 - Offsite Power System

Application Section: 8.2

QUESTIONS

08.02-4

RG 1.32 "Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants," is related to the criteria for power systems and endorses IEEE Std. 308, "Criteria for Class 1E Power Systems for Nuclear Power Generating Stations."

FSAR Tier 2 Table 8.1-1, "Acceptance Criteria and Guidelines for Electric Power Systems," states that RG 1.32 is guidance for FSAR Tier 2 Section 8.2, "Offsite Power System" and is noted with a "G" (i.e. Guidance) in the column for FSAR Tier 2 Section 8.1, Table 8.1-1.

FSAR Tier 2 Section 8.2.3.2, "Analysis of Offsite Power System Conformance with Regulatory Framework," states that RG 1.32 is not applicable to the offsite power system.

The staff requests NuScale to clarify the inconsistency between FSAR Tier 2 Table 8.1-1 and FSAR Tier 2 Section 8.2.3.2.

08.02-5

DSRS Section 8.2 states that acceptable guidelines for the design, installation, testing, and performance of station grounding systems and surge and lightning protection systems are found in: 1) RG 1.204, "Guidelines for Lightning Protection of Nuclear Power Plants"; 2) IEEE Std. 665-1995, "IEEE Guide for Generating Station Grounding"; 3) IEEE Std. 666-1991, "IEEE Design Guide for Electric Power Service Systems for Generating Stations"; 4) IEEE Std. 1050-1996, "IEEE Guide for Instrumentation and Control Equipment Grounding in Generating Stations"; and 5) IEEE Std. C62.23-1995, "IEEE Application Guide for Surge Protection of Electric Generating Plants." DSRS Table 8-1, "Acceptance Criteria and Guidelines for Electric Power Systems," states that RG 1.204 is used as guidance for Section 8.2 on offsite power systems.

FSAR Tier 2 Table 8.1-1, "Acceptance Criteria and Guidelines for Electric Power Systems" states that RG 1.204 does not apply for FSAR Tier 2 Section 8.2 on offsite power systems. However, FSAR Tier 2, Table 1.9-2, "Conformance with Regulatory Guides," states that "The grounding and lightning protection systems are designed, installed, tested, and maintained in conformance with RG 1.204, with the exception that where IEEE Std. 666-1991 (Reaffirmed 1996) and IEEE Std. 1050-1996 are specified, IEEE Std. 666-2007 and IEEE Std. 1050-2004 instead are applied. Reconciliation of the two versions of each standard demonstrates the acceptability of the use of the later versions."

FSAR Tier 2 Section 8.2.2, "Switchyard," includes in COL Item 8.2-1 that a COL applicant that references the NuScale Power Plant design certification will describe the site-specific switchyard and design, including lightning and grounding equipment.

The staff requests NuScale to please explain why the grounding and lightning protection of the switchyard and connections to an offsite and onsite power system does not meet the guidance in RG 1.204 and the applicable standards listed in the above paragraph, as discussed in DSRS Section 8.2. If the grounding and lightning protection of the switchyard and connections to an offsite and onsite power system does meet the guidance in RG 1.204, please clarify FSAR Tier 2 Section 8.2 to state conformance to RG 1.204.

08.02-6

Generic (GL) Letter 2007-01, "Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients," (ADAMS Accession No. ML070360665) and the associated Summary Report (ADAMS Accession No. ML082760385) discuss cable failures, and finds that: 1) the predominant factor contributing to cable failures at nuclear power plants appears to be the presence of water/moisture or exposed to submerged conditions, and 2) licensees should have a program for using available diagnostic cable testing methods to assess cable condition.

DSRS Section 8.2 states that operating experience has shown that undetected degradation of underground electric cables due to protracted exposure to wetted environments or submergence in water could result in multiple equipment failures and cables from independent power sources or different divisions could be affected by the same condition.

The staff requests NuScale to;

1. Please explain how the NuScale design addresses the operating experience in GL 2007-01, and
2. Identify if there are any inaccessible or underground cables, and if there are any inaccessible or underground cables, describe the inspection, testing and monitoring programs, if applicable, to detect the degradation of inaccessible or underground cables. If condition monitoring programs are used, discuss the applicability of RG 1.218, "Condition Monitoring Techniques for Electric Cables Used in Nuclear Power Plants" for the offsite power system.

08.02-7

Recognizing that the NuScale design has the flexibility to be connected to a transmission grid, micro-grid or dedicated service load, staff is addressing connections to offsite power sources.

FSAR Tier 2 Table 8.1-1, "Acceptance Criteria and Guidelines for Electric Power Systems" states that SRP BTP 8-9 and BL 2012-01 are guidance for Section 8.2 regarding open phase conditions in the grid. FSAR Tier 2 Section 8.2 states that there are no failures of the offsite power system, including open phase conditions or a station blackout that will prevent the operation of safety-related functions. Furthermore, FSAR Tier 2 Section 8.2 states that "If the offsite power system is supplying power to the onsite AC power system, the electrical isolation between the "highly reliable" DC power system and equipment with safety-related functions, which is described in [FSAR Tier 2] Section 7.1.2, ensures that the open phase conditions described in BTP 8-9 would not prevent the performance of safety-related functions."

DSRS Section 8.2 states that: 1) no single event, including a single protective relay, interlock, or switchgear failure, in the event of loss of all standby power sources, will prevent the separation of the offsite power system from the onsite distribution system and 2) the offsite power system and standby power supplies should not have common mode failures. In general, a failure modes and effects analysis

(FMEA) for the offsite system evaluates the effects of failures including loss of a relay or switchgear and open phase event.

The staff requests additional detail and discussion or an FMEA regarding the offsite power system to clearly show that no failures of the offsite power system, including open phase conditions, will prevent the operation of safety-related functions. Operating experience described in Bulletin 2012-01 shows that open-phase conditions, if unattended/detected, can initiate electrical transient and/or sustained degraded voltage condition, which could potentially impact the electrical power system. Otherwise, provide features for detection of open phase conditions and alarm in the main control room, as specified in BTP 8-9, Position B.3 for designs with passive safety features.