

## NuScaleDCRaisPEm Resource

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**From:** Cranston, Gregory  
**Sent:** Tuesday, November 14, 2017 3:54 PM  
**To:** RAI@nuscalepower.com  
**Cc:** NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Martinez Navedo, Tania; Ray, Sheila; Murray, Demetrius  
**Subject:** RE: Request for Additional Information No. 223, RAI 8978 (14.2)  
**Attachments:** Request for Additional Information No. 223 (eRAI No. 8978).pdf

RESENT WITH CORRECT SUBJECT LINE. THE CORRECT RAI WAS PREVIOUSLY SENT WITH THE CORRECT NUMBERS, BUT THE SUBJECT LINE LISTED No. 219 INSTEAD OF No. 223. THE RAI NUMBER IS No. 223 FOR 8978.

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**From:** Cranston, Gregory  
**Sent:** Tuesday, September 12, 2017 10:55 AM  
**To:** 'RAI@nuscalepower.com' <RAI@nuscalepower.com>  
**Cc:** NuScaleDCRaisPEm Resource <NuScaleDCRaisPEm.Resource@nrc.gov>; Lee, Samuel <Samuel.Lee@nrc.gov>; Chowdhury, Prosanta <Prosanta.Chowdhury@nrc.gov>; Martinez Navedo, Tania <Tania.MartinezNavedo@nrc.gov>; Ray, Sheila <Sheila.Ray@nrc.gov>; Murray, Demetrius <Demetrius.Murray@nrc.gov>  
**Subject:** Request for Additional Information No. 219, RAI 8978 (14.2)

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

**Hearing Identifier:** NuScale\_SMR\_DC\_RAI\_Public  
**Email Number:** 307

**Mail Envelope Properties** (MWHPR09MB120019B2B5DBE09971E501A690280)

**Subject:** RE: Request for Additional Information No. 223, RAI 8978 (14.2)  
**Sent Date:** 11/14/2017 3:53:41 PM  
**Received Date:** 11/14/2017 3:53:48 PM  
**From:** Cranston, Gregory

**Created By:** Gregory.Cranston@nrc.gov

**Recipients:**

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Tracking Status: None

**Post Office:** MWHPR09MB1200.namprd09.prod.outlook.com

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MESSAGE	1243	11/14/2017 3:53:48 PM
Request for Additional Information No. 223 (eRAI No. 8978).pdf		174187

**Options**

**Priority:** Standard

**Return Notification:** No

**Reply Requested:** No

**Sensitivity:** Normal

**Expiration Date:**

**Recipients Received:**

## Request for Additional Information No. 223 (eRAI No. 8978)

Issue Date: 09/11/2017

Application Title: NuScale Standard Design Certification - 52-048

Operating Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 14.02 - Initial Plant Test Program - Design Certification and New License Applicants

Application Section: 14.02

### QUESTIONS

14.02-2

Regulatory Guide (RG) 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," in Appendix A, "Initial Test Program," Section A-1.g discusses pre-operational testing of electrical systems. Specifically, Section A-1.g states, "Tests should demonstrate that the integrated system will perform as designed in response to simulated partial and full losses of offsite power sources. Tests also should demonstrate degraded protection systems designed to transfer from offsite to onsite power sources during degraded voltage conditions." FSAR Tier 2, Section 14.2.7, "Test Programs Conformance with Regulatory Guides," states that the initial test program conforms to RG 1.68, Revision 4 except for aspects that address specific SSC design features not in the design."

FSAR Tier 2, Section 14.2.1.2, "Preoperational Test Phase Objectives," states that objectives of the preoperational test phase include to 1) demonstrate that SSC will perform their functions in accordance with their design during the preoperational test phase, 2) verify and demonstrate expected operation following a loss of power sources and in degraded modes for which the systems are designed to remain operational, and 3) test the proper functioning of controls, permissives, interlocks, and equipment protective devices for which malfunction or premature actuation may shut down or defeat the operation of systems or equipment.

FSAR Tier 2, Table 14.2-54, "13.8kV and Switchyard System Test," FSAR Tier 2, Table 14.2-55, "Medium Voltage AC Electrical Distribution System Test," FSAR Tier 2, Table 14.2-56, "Low Voltage AC Electrical Distribution System Test," provides the preoperational tests for the AC electrical systems.

FSAR Tier 2, Table 14.2-57, "Highly Reliable DC Power System Test," and FSAR Tier 2, Table 14.2-58, "Normal DC Power System Test" provides the preoperational tests for DC systems.

QUESTION: Considering the preoperational test objective to verify and demonstrate expected operation following a loss of power sources and in degraded modes for which the systems are designed to remain operational, please describe how the above mentioned preoperational tests for the AC and DC systems verify and demonstrate expected operation in degraded modes. In addition, please explain how the preoperational test in Table 14.2-54 verifies and demonstrates operation during degraded offsite power conditions, including open phase conditions.

14.02-3

Regulatory Guide (RG) 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," in Appendix A, "Initial Test Program," Section A-1.g discusses pre-operational testing of electrical systems. Specifically, Section A-1.g states, "Tests should demonstrate that the integrated system will perform as designed in response to simulated partial and full losses of offsite power sources. Tests also should demonstrate degraded protection systems designed to transfer from offsite to onsite power sources during degraded voltage conditions." FSAR Tier 2, Section 14.2.7, "Test Programs Conformance with Regulatory Guides," states that the initial test program conforms to RG 1.68, Revision 4 except for aspects that address specific SSC design features not in the design."

FSAR Tier 2, Table 14.2-105, "Island Mode Test for NuScale Power Module #1 (Test #105)" and FSAR Tier 2, Table 14.2-106, "Island Mode Test for Multiple NuScale Power Modules (Test #106)" are the the initial plant tests for island mode operation.

In addition, FSAR Tier 2, Section 8.3.1.1.1, page 8.3-4, states Island Mode is a capability that allows operation of all NPMs without a connection to a transmission grid that could provide an offsite AC power supply. The staff understands the uniqueness of the 600MW 12-module, two division, design, that allows 100% external load rejection and island mode operation.

#### QUESTIONS:

- a) FSAR Tier 2 Section 8.3.1.1.1, page 8.3-4, states that "for the latter plants, island mode also includes an automatic control function to transition to island mode and maintain power to onsite AC loads in the event the grid is lost or becomes unstable." Please clarify what is meant by "latter plants".
- b) FSAR Tier 2, Table 14.2-106, "Island Mode Test for Multiple NuScale Power Modules (Test #106)," Acceptance Criterion i.a states that the service unit turbine generator transitions to island mode by changing from droop mode control to isochronous mode control to control the load on the 13.8kV bus it is supplying. FSAR Tier 2 Section 8.3.1.1.1, states that "the generator for a previously-selected unit designated as the service units are tripped and steam is diverted from droop to isochronous control." When module 1 is pre-selected for isochronous mode, what are the status of the other modules (11 of them) with respect to runback load capabilities?
- c) FSAR Tier 2, Table 14.2-105, "Island Mode Test for NuScale Power Module #1 (Test #105)," Acceptance Criterion i.c and FSAR Tier 2, Table 14.2-106, "Island Mode Test for Multiple NuScale Power Modules (Test #106)," Acceptance Criterion i.e state that electrical power to the plant loads is uninterrupted without loss of voltage or automatic bus transfer. During the island mode operation, how does the automatic control function keep the voltage and frequency within limits?
- d) FSAR Tier 2, Table 14.2-105, "Island Mode Test for NuScale Power Module #1 (Test #105)," Acceptance Criterion i.d and FSAR Tier 2, Table 14.2-106, "Island Mode Test for Multiple NuScale Power Modules (Test #106)," Acceptance Criterion i.d states that the auxiliary AC Power source (AAPS) starts automatically started but does not automatically load its associated bus. Please clarify why the AAPS starts automatically.