

July 7, 2017

Docket No. 52-048

U.S. Nuclear Regulatory Commission  
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**SUBJECT:** NuScale Power, LLC Response to NRC Request for Additional Information No. 40 (eRAI No. 8839) on the NuScale Design Certification Application

**REFERENCE:** U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 40 (eRAI No. 8839)," dated May 26, 2017

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) response to the referenced NRC Request for Additional Information (RAI).

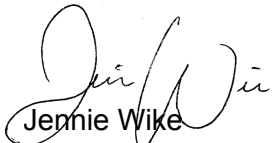
The Enclosure to this letter contains NuScale's response to the following RAI Questions from NRC eRAI No. 8839:

- 08.02-8
- 08.02-9
- 08.02-10

This letter and the enclosed response make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Darrell Gardner at 980-349-4829 or at [dgardner@nuscalepower.com](mailto:dgardner@nuscalepower.com).

Sincerely,



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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 8839

**Enclosure 1:**

NuScale Response to NRC Request for Additional Information eRAI No. 8839

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## **Response to Request for Additional Information Docket No. 52-048**

**eRAI No.:** 8839

**Date of RAI Issue:** 05/26/2017

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**NRC Question No.:** 08.02-8

FSAR Tier 2 Table 8.1-1, "Acceptance Criteria and Guidelines for Electric Power Systems" states that 10 CFR 50.65(a)(4) is guidance (G) for Section 8.2 on offsite power systems. FSAR Tier 2 Section 8.2.3.2, "Analysis of Offsite Power System Conformance with Regulatory Framework," states that the development and implementation of the maintenance rule (10 CFR 50.65) including the identification of SSCs that require assessment in accordance with 10 CFR 50.65(a)(4), is described in FSAR Tier 2 Section 17.6, "Maintenance Rule." FSAR Tier 2 Section 17.6 includes COL item 17.6-1 that a COL applicant that references the NuScale Power Plant design certification will describe the program for monitoring the effectiveness of maintenance required by 10 CFR 50.65.

Also for the offsite power system, FSAR Tier 2 Table 8.1-1 states the maintenance rule is guidance whereas FSAR Tier 2 Section 8.2.3.2 indicates that the maintenance rule is applicable per COL item 17.6-1.

QUESTION: Please explain whether the maintenance rule should be listed as A (applicable) in FSAR Tier 2 Table 8.1-1 for the offsite power system.

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**NuScale Response:**

FSAR Table 8.1-1 has been revised to include the 10 CFR 50.65(a)(4) criteria as A (acceptance criteria) for FSAR Section 8.2, Offsite Power System.

**Impact on DCA:**

Table 8.1-1 has been revised as described in the response above and as shown in the markup provided in this response.

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RAI 08.02-2, RAI 08.02-4, RAI 08.02-8

**Table 8.1-1: Acceptance Criteria and Guidelines for Electric Power Systems**

Criteria	Title	Applicable Section (Note 1)				Remarks
		8.2 Offsite Power System	8.3.1 Onsite AC Power System	8.3.2 Onsite DC Power System	8.4 Station Blackout	
1. 10 CFR 50, Appendix A, General Design Criteria for Nuclear Plants						
a. GDC 2	Design bases for protection against natural phenomena		A	A		§8.2 - ADAMS Accession No. ML090260039
b. GDC 4	Environmental and dynamic effects design bases		A	A		§8.2 - ADAMS Accession No. ML090260039
c. GDC 5	Sharing of structures, systems, and components		A	A		§8.2 - ADAMS Accession Nos. ML11133A334 and ML090260039
d. GDC 17	Electric power systems					The NuScale design supports an exemption from GDC 17.
e. GDC 18	Inspection and testing of electric power systems					The NuScale design supports an exemption from GDC 18.
f. GDC 33	Reactor coolant makeup					The NuScale design supports an exemption from GDC 33.
g. GDCs 34, 35, 38, 41, 44	Residual heat removal, emergency core cooling, containment heat removal, containment atmosphere cleanup, cooling water					The plant design complies with a set of principal design in lieu of these GDC, as described in Section 3.1.4.
h. GDC 50	Containment design basis					Containment vessel penetration assemblies are not included in the scope of the onsite electrical power system. Penetration assemblies are part of the containment design.
2. Regulations (10 CFR 50 and 10 CFR 52)						
a. 10 CFR 50.34	Contents of applications; technical information					
i. 10 CFR 50.34(f)(2)(v)	Additional Three Mile Island (TMI)-related requirements (Item I.D.3)		A	A		
ii. 10 CFR 50.34(f)(2)(xiii)	Additional TMI-related requirements (Item II.E.3.1)					The NuScale design supports an exemption from 10CFR50.34(f)(2)(xiii).

Table 8.1-1: Acceptance Criteria and Guidelines for Electric Power Systems (Continued)

Criteria	Title	Applicable Section (Note 1)				Remarks
		8.2 Offsite Power System	8.3.1 Onsite AC Power System	8.3.2 Onsite DC Power System	8.4 Station Blackout	
iii. 10 CFR 50.34(f)(2)(xx)	Additional TMI-related requirements (Item II.G.1)					The NuScale design does not include pressurizer relief valves or block valves, and the the design supports an exemption from the pressurizer level indicator portion of 10CFR50.34(f)(2)(xx).
b. 10 CFR 50.55a(h)	Codes and standards		A	A		
c. 10 CFR 50.63	Loss of all alternating current power		G		A	
d. 10 CFR 50.65(a)(4)	Requirements for monitoring the effectiveness of maintenance at nuclear power plants	GA	A	A		Development and implementation of the Maintenance Rule program is discussed in Section 17.6.
e. 10 CFR 52.47(b)(1)	Contents of applications; technical information	A	A	A	A	Paragraph (b)(1), as it relates to ITAAC (for design certification) sufficient to assure that the SSCs in this area of review will operate in accordance with the certification.
f. 10 CFR 52.80(a)	Contents of applications; additional technical information					N/A for NuScale, this rule pertains to applications referencing an early site permit or a standard design certification.
<b>3. Regulatory Guides (RGs)</b>						
a. Regulatory Guide 1.6 - March 1971	Safety Guide 6 - Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems		G	G		
b. Regulatory Guide 1.32 - Revision 3, March 2004	Criteria for Power Systems for Nuclear Power Plants	G	G	G		As it relates to the EDSS; see Section 8.3.2
c. Regulatory Guide 1.47 - Revision 1, February 2010	Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems		G	G		As it relates to the EDSS; see Section 8.3.2
d. Regulatory Guide 1.53 - Revision 2, November 2003	Application of the Single-Failure Criterion to Safety Systems		G	G		As it relates to the EDSS; see Section 8.3.2

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## **Response to Request for Additional Information Docket No. 52-048**

**eRAI No.:** 8839

**Date of RAI Issue:** 05/26/2017

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**NRC Question No.:** 08.02-9

DSRS Table 8.1-1, "Acceptance Criteria and Guidelines for Electric Power Systems" states that SECY 94-084, "Policy and Technical Issues Associated with RTNSS in Passive Plant Designs, 1994" and SECY 95-132, "Policy and Technical Issues Associated with RTNSS in Passive Plant Designs, 1995" are guidance (G) as it relates to the inclusion of an alternate power source to non-safety loads at evolutionary plant designs. DSRS Section 8.2.III.3.A states that for SECY 94-084 and SECY 95-132, the NuScale design review should identify any offsite power requirements to support non-safety-related, risk-significant active systems identified through the Regulatory Treatment of Non-safety Systems (RTNSS) process.

FSAR Tier 2 Section 8.1.4.3, "Regulatory Requirements and Guidance" states that the design of NuScale electrical systems conforms to the Commission-approved positions in Sections F, "Station Blackout" and G, "Electrical Distribution" of SECY-94-084 related to passive plant electrical systems. Also, FSAR Tier 2 Table 8.1-1, "Acceptance Criteria and Guidelines for Electric Power Systems" states that SECY 94-084, and SECY 95-132 are guidance (G) for the offsite power system. However, FSAR Tier 2 Section 8.2 does not provide any discussions on the above Commission papers.

QUESTION: Please provide a discussion regarding how the NuScale design conforms to SECY 94-084 and SECY 95-132 for the offsite power system and include a discussion in FSAR Tier 2 Section 8.2.

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**NuScale Response:**

The design of the offsite power system considered the guidance of SECY 94-084 Parts F and G, which were confirmed in SECY 95-132. The applicable portions of these SECY documents on the electrical systems are described in FSAR Section 8.1.4.3. These SECY documents also establish expectations for a RNTSS process for nonsafety-related plant systems. FSAR Section 17.4.3 describes the NuScale methodology to establish risk significance of SSC. FSAR Section 19.3 describes the process for identifying nonsafety-related SSC that perform risk-significant functions in accordance with RTNSS criteria. These processes did not identify any safety-

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related or risk-significant loads for the offsite or onsite AC power systems. The NuScale RTNSS evaluation process supports a demonstration of conformance with SECY 94-084 Parts F and G as described below.

According to SECY 94-084 Parts F and G, an evaluation of the offsite power system against the RTNSS criteria supports a conclusion that passive plants do not require an alternate AC power source to support safe shutdown in the event of a loss of the normal AC power source or to reduce risk from a Station Blackout (SBO) event. FSAR Section 8.2.3.2 indicates there are no safety-related or risk-significant loads for the offsite power system. The SBO coping capability for the 72-hour duration included in SECY 94-084 Part F is described in FSAR Section 8.4. The lack of safety-related and risk-significant loads and the SBO coping capability of the passive NuScale design obviate the need for an alternate AC power source. See also the NuScale response to RAI 08.02-10, which addresses the need for an alternate AC power source as discussed in SECY 91-078.

NuScale has revised FSAR Section 8.2, Offsite Power System, to reflect the above discussion. Consistent with Section III.5.A of NuScale DSRs 8.3.1, AC Power Systems (Onsite), FSAR Section 8.3.1.2.7 was revised to more directly address conformance with the RTNSS process and the subject SECY documents as they apply to the onsite AC power systems. Similarly, FSAR Section 8.3.2.2.2 was revised to address the DC systems' conformance with the SECY documents. Conforming revisions to FSAR Table 1.9-7, Conformance with Advanced and Evolutionary Light Water Reactor Design Issues (SECYs and Associated SRMs), were also made.

**Impact on DCA:**

FSAR Sections 8.2, 8.3.1.2, 8.3.2.2 and FSAR Table 1.9-7 have been revised as described in the response above and as shown in the markup provided in this response.

RAI 08.02-9

**Table 1.9-7: Conformance with Advanced and Evolutionary Light Water Reactor Design Issues (SECYs and Associated SRMs)**

Doc ID	Title	Conformance Status	COL Applicability	Comments	Section
SECY-89-013	Design Requirements Related to the Evolutionary Advanced Light Water Reactors	Conforms	Applicable	Addressed through SECY-90-016 and SECY-93-087. See Table 1.9-8 for further information.	-
SECY-90-016	Evolutionary Light-Water Reactor (LWR) Certification Issues and Their Relationship to Current Regulatory Requirements	Partially Conforms	Applicable	This SECY was directed towards evolutionary ALWR designs. The applicability of certain SECY-90-016 issues to passive plants was later established in SECY-93-087 and/or SECY-94-084. As a passive ALWR design, the NuScale design conforms to the passive plant guidance of SECY-93-087 and SECY-94-084, rather than that of SECY-90-016. See Table 1.9-8 for further information.	19.1 19.2
SECY-90-241	Level of Detail Required for Design Certification under Part 52	Conforms	Applicable	Incorporated into 10 CFR 52 and implementing NRC guidance documents.	-
SECY-90-377	Requirements for Design Certification under 10 CFR Part 52	Conforms	Applicable	Incorporated into 10 CFR 52 and implementing NRC guidance documents.	-
SECY-91-074	Prototype Decisions for Advanced Reactor Designs	Conforms	Applicable	Incorporated into 10 CFR 52 and implementing NRC guidance documents.	-
SECY-91-078	Chapter 11 of the Electric Power Research Institute's (EPRI's) Requirements Document and Additional Evolutionary Light Water Reactor (LWR) Certification Issues	Not Applicable	Not Applicable	SECY-91-078 pertains to evolutionary ALWR designs and is not directly applicable to passive plant designs.	8.1.4
SECY-91-178	ITAAC for Design Certifications and Combined Licenses	Conforms	Applicable	Incorporated into 10 CFR 52 and implementing NRC guidance documents.	14.3.2
SECY-91-210	ITAAC Requirements for Design Review and Issuance of FDA	Conforms	Applicable	Incorporated into 10 CFR 52 and implementing NRC guidance documents.	-
SECY-91-229	Severe Accident Mitigation Design Alternatives for Certified Standard Designs	Conforms	Not Applicable	Incorporated into NRC Orders, regulatory guidance, and pending rulemaking.	19.2.6
SECY-91-262	Resolution of Selected Technical and Severe Accident Issues for Evolutionary Light-Water Reactor (LWR) Designs	Conforms	Applicable	Incorporated into NRC Orders, regulatory guidance, and pending rulemaking.	-
SECY-92-053	Use of Design Acceptance Criteria During the 10 CFR Part 52 Design Certification Reviews	Conforms	Applicable	Incorporated into NRC Orders, regulatory guidance, and pending rulemaking.	14.3.6



**Table 1.9-7: Conformance with Advanced and Evolutionary Light Water Reactor Design Issues (SECYs and Associated SRMs) (Continued)**

Doc ID	Title	Conformance Status	COL Applicability	Comments	Section
SECY-92-092	The Containment Performance Goal, External Events Sequences, and the Definition of Containment Failure for Advanced LWRs	Conforms	Applicable	Incorporated into NRC Orders, regulatory guidance, and pending rulemaking.	-
SECY-93-087	Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs	See Table 1.9-8.	See Table 1.9-8.	None.	-
SECY-94-084	Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Design (RTNSS)	Partially Conforms	Applicable	Incorporated into 10 CFR 52 and implementing NRC guidance documents. The NuScale Fire Protection System does not contain any RTNSS equipment. However, Section C, Safe Shutdown Requirements, of the SECY discusses the stable shutdown condition for passive ALWR which is applicable to the NuScale Power Plant.	5.4 <del>8.1.4</del> <u>8.1</u> <del>8.3.1</del> <u>8.2</u> <del>8.3.2</del> <u>8.3</u> 8.4 9.2.5 Appendix 9A 15.0.4 19.3
SECY-94-302	Source-Term-Related Technical and Licensing Issues Relating to Evolutionary and Passive Light-Water-Reactor Designs	Conforms	Applicable	Incorporated into 10 CFR 52 and implementing NRC guidance documents.	-
SECY-95-132	Policy and Technical Issues Associated with Regulatory Treatment of Non-Safety Systems in Passive Plant Designs	Conforms	Applicable	Incorporated into 10 CFR 52 and implementing NRC guidance documents.	<del>8.1.1</del> <del>8.1.4</del> <u>8.1</u> <del>8.3.1</del> <u>8.2</u> <del>8.3.2</del> <u>8.3</u> 8.4 19.3
SECY-14-038	Performance-Based Framework for Nuclear Power Plant Emergency Preparedness Oversight	Conforms	Applicable	None.	13.3
SECY-14-088	Proposed Options to Address Lessons-Learned Review of the U.S. Nuclear Regulatory Commissions Force-On-Force Inspection Program in Response to Staff Requirements Memorandum - COMGEA/COMWCO-14-0001	Not Applicable	Applicable	Site-specific requirements.	Not Applicable

**Branch Technical Position 8-3 Revision 3**

The performance of grid stability studies is site-specific and is addressed in Section 8.2.3.1.

**Branch Technical Position 8-6 Revision 3**

Branch Technical Position (BTP) 8-6 addresses the adequacy of offsite system voltages to Class 1E (safety-related) loads. The offsite power system does not supply power to Class 1E loads and does not support safety-related functions. Accordingly, BTP 8-6 is not applicable to the offsite power system.

**Branch Technical Position 8-9 Revision 0**

The BTP 8-9 addresses the effects of transmission grid open-phase conditions as identified in NRC Information Notice 2012-03 and NRC Bulletin 2012-01. This guidance involves protection from a common cause AC power failure due to open phase conditions in the offsite power sources that are credited for GDC 17 and the effect on onsite safety-related buses and safety-related loads. The offsite power system does not support safety-related functions. In addition, 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.

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 Section 7.1.2, ensures that the open phase conditions described in BTP 8-9 would not prevent the performance of safety-related functions.

**Regulatory Guide 1.32 Revision 3**

Regulatory Guide 1.32 addresses design criteria for safety-related power systems. The NuScale Power Plant does not rely on an offsite power system to support or perform safety functions. Accordingly, Regulatory Guide 1.32 is not applicable to the offsite power system.

**Regulatory Guide 1.68 Revision 3**

COL Item 8.2-3: A COL applicant that references the NuScale Power Plant design certification will describe the testing of the switchyard and the connections to an offsite power system, if provided, consistent with Regulatory Guide 1.68, Revision 3.

**SECY 94-084 and SECY 95-132**

FSAR Section 17.4.3 describes the NuScale methodology to establish risk significance of SSC. The NuScale process for evaluating SSC against the RTNSS criteria is described in FSAR Section 19.3. This process did not identify any safety-related or risk-significant loads for the offsite power system.

RAI 08.02-9

The lack of safety-related and risk-significant AC loads and the 72-hour SBO coping capability of the passive NuScale design as described in Section 8.4 obviate the need for an alternate AC power source or a safety-related emergency diesel generator, consistent with SECY 94-084 Parts F and G which were confirmed in SECY 95-132.

**Branch Technical Position 8-2, Rev. 3**

The intent of Branch Technical Position (BTP) 8-2 is to ensure that the provision of GDC 17 is met with respect to minimizing the probability of concurrent loss of electrical power sources. This guidance precludes the use of onsite standby AC power sources for purposes other than supplying standby power when needed. With the NuScale Power Plant non-reliance on AC power for the performance of safety-related functions, the concurrent loss of onsite and offsite AC power sources would have no significant adverse effect on plant safety. Notwithstanding this conclusion, for operational, commercial, and plant investment protection purposes, the BDGs are used only to supply standby power to designated loads when needed, and are not interconnected with other AC power sources, except for short periods to perform load testing.

As described in Section 8.3.1.1, there are certain operating conditions during which the AAPS may be interconnected with other AC power sources (e.g., one or more NPM turbine generators or offsite power sources, if available). The NuScale design does not rely on AC power sources for the performance of safety-related functions, and the guidance of BTP 8-2 need not be applied to the AAPS.

**Branch Technical Position 8-4, Rev. 3**

Branch Technical Position 8-4 establishes the acceptability of disconnecting power to electrical components of a fluid system as one means of designing against a single failure that might cause an undesirable component action. Removal of electric power from safety-related valves is not used in the NuScale Power Plant design as a means of satisfying the single failure criterion. Therefore, this BTP is not applicable to the NuScale design.

**Branch Technical Position 8-5, Rev. 3**

Branch Technical Position 8-5 provides supplemental guidance for implementing RG 1.47 in the onsite AC power system. The conformance to RG 1.47 is described above.

**Branch Technical Position 8-6, Rev. 3**

The undervoltage provisions contained in BTP 8-6 are not relevant to the NuScale Power Plant design because a loss of voltage or a degraded voltage condition on the offsite power system would have no reasonable likelihood of adversely affecting the performance of plant safety-related functions.

**Branch Technical Position 8-9, Rev. 0**

The criteria specified in BTP 8-9 relevant to passive plant designs are considered as described in Section 8.2.

**[SECY 94-084 and SECY 95-132](#)**

FSAR Section 17.4.3 describes the NuScale methodology to establish risk significance of SSC. The NuScale process for evaluating SSC against the RTNSS criteria is described in FSAR Section 19.3. This process did not identify any safety-related or risk-significant loads for the onsite AC power systems.

The lack of safety-related and risk-significant AC loads and the 72-hour SBO coping capability of the passive NuScale design as described in Section 8.4 obviate the need for an alternate AC power source or a safety-related emergency diesel generator, consistent with SECY 94-084 Parts F and G, which were confirmed in SECY 95-132.

RAI 08.02-9

#### **8.3.1.2.8 Electrical Power System Calculations and Distribution System Studies for Alternating Current Systems**

Load-flow studies, short-circuit studies, and motor-starting studies for the AC power system are performed using the Electrical Transient Analyzer Program (ETAP) (Reference 8.3-11).

##### **Load-Flow Studies and Undervoltage or Overvoltage Protection**

Load-flow studies are performed to evaluate whether an acceptable voltage range is maintained at equipment terminals under worst case loading conditions. Voltage drop at equipment terminals is also calculated for the largest motor starting condition. The studies confirm that terminal voltage of equipment meets the acceptable voltage ranges.

##### **Short-Circuit Studies**

Analyses are performed to evaluate worst-case, bolted, three-phase short-circuit fault currents in the onsite AC power system. The analyses are performed to evaluate acceptable ratings for equipment, such as circuit breakers and switchgear bus work.

The short-circuit current results are compared with and must be less than the acceptance criteria (including at least five percent margin), which are the applicable circuit breaker interrupting and close and latch ratings and maximum bus bracing current capabilities. Table 8.3-1 provides nominal equipment ratings for the AC power system.

Containment electrical penetration assembly overload and short-circuit over-current protection is described in Section 8.3.1.2.5.

##### **Equipment Sizing Studies**

Equipment sizing was developed from a load list and subsequently verified using the ETAP load flow, voltage regulation, and short-circuit analysis results. Worst case loading was determined and equipment was selected that enveloped the load requirements. Major AC distribution equipment ratings are listed in Table 8.3-1.

The EDSS conforms to 10 CFR 50.55a(h) and IEEE Standard 603-1991 (and hence RG 1.153) to the extent described in Reference 8.3-1.

**Regulatory Guide 1.155 (August 1998)**

Regulatory Guide 1.155 provides guidance for implementing the station blackout requirements of 10 CFR 50.63. The extent to which the NuScale Power Plant design conforms to RG 1.155 is described in Section 8.4.

**Regulatory Guide 1.160, Rev. 3**

Regulatory Guide 1.160 provides guidance for monitoring the effectiveness of maintenance at nuclear power plants. The development and implementation of the maintenance rule (10 CFR 50.65) program, including the identification of SSC that require assessment per 10 CFR 50.65(a)(4), is stated in Section 17.6.

**Regulatory Guide 1.212**

The EDSS and EDNS batteries are sized per IEEE Standard 485-1997 as endorsed by Regulatory Guide 1.212 (November 2008).

**Regulatory Guide 1.218 (April 2012)**

Regulatory Guide 1.218 provides guidance for monitoring the condition of cables that have been determined to fall within the scope of the maintenance rule (10 CFR 50.65). The development and implementation of the maintenance rule program, including the identification of SSC that require assessment per 10 CFR 50.65(a)(4), is stated in Section 17.6.

**Branch Technical Position 8-4, Rev. 3**

Branch Technical Position 8-4 establishes the acceptability of disconnecting power to electrical components of a fluid system as one means of designing against a single failure that might cause an undesirable component action. Removal of electric power from safety-related valves is not used in the NuScale Power Plant design as a means of satisfying the single failure criterion. Therefore, this BTP is not applicable to the NuScale design.

**Branch Technical Position 8-5, Rev. 3**

The onsite DC power systems conform to BTP 8-5 to the extent described in the discussion of conformance with 10 CFR 50.34(f)(2)(v) above.

**SECY 94-084 and SECY 95-132**

FSAR Section 17.4.3 describes the NuScale methodology to establish risk significance of SSC. The NuScale process for evaluating SSC against the RTNSS.

criteria is described in FSAR Section 19.3. This process did not identify any safety-related or risk-significant functions for the onsite DC power systems.

#### **8.3.2.2.3 Electrical Power System Calculations and Distribution System Studies for Direct Current Systems**

The following subsections describe the calculations and studies that were developed for the DC power systems. The calculations were performed using the ETAP computer software (Reference 8.3-11).

##### **Load-Flow and Voltage-Regulation Studies, and Undervoltage and Overvoltage Protection**

The DC load-flow analyses were performed for both the EDNS and EDSS to confirm equipment assumptions and select equipment ratings. The margins for load growth were included in the analyses.

The operating voltage range for the EDSS and EDNS was determined by calculation and accommodates equalize charging the batteries at a specified low temperature. The operating voltage range for the EDSS-MS and the EDSS-C 125 Vdc batteries is 105 Vdc to 140 Vdc. The operating voltage range for the EDNS 250 Vdc batteries is 200 Vdc to 280 Vdc, and the operating range for the EDNS 125 Vdc batteries is 100 Vdc to 140 Vdc.

##### **Short-Circuit Studies**

Short-circuit analyses are performed for the EDSS-MS, EDSS-C, and the EDNS DC subsystems. These analyses are performed in accordance with IEEE Standard 946-2004 (Reference 8.3-13) methodology and the available short-circuit currents from each battery and connected charger are determined under a worst case short circuit at the battery terminals.

The short-circuit current results are compared to short-circuit current acceptance criteria. Containment electrical penetration assembly overload, short-circuit current capability, and associated overcurrent protection is described in Section 8.3.1.2.5.

##### **Equipment Sizing Studies**

The DC equipment sizing was developed from a load list and was verified using the ETAP load-flow and short-circuit analysis results. Worst-case loading was determined and the power supply equipment was selected that enveloped the loading requirements. The ratings for the major DC equipment are listed in Table 8.3-3 and Table 8.3-8.

The acceptance criteria for the major DC system components are that the equipment ratings are not exceeded when load-flow, voltage-drop, and short-circuit analyses are performed. The equipment sizing includes additional design margin for future load growth.

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## **Response to Request for Additional Information Docket No. 52-048**

**eRAI No.:** 8839

**Date of RAI Issue:** 05/26/2017

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**NRC Question No.:** 08.02-10

DSRS Table 8.1-1, "Acceptance Criteria and Guidelines for Electric Power Systems" states that SECY 91-078, "Electric Power Research Institute Requirements Document and Additional Evolutionary Light Water Reactor Certification Issues, 1991" is guidance for offsite power systems as it relates to the inclusion of an alternate power source to non-safety loads at evolutionary plant designs. However, FSAR Tier 2 Table 8.1-1, "Acceptance Criteria and Guidelines for Electric Power Systems" states that SECY 91- 078 is not applicable for the offsite power system. In addition, FSAR Tier 2 Section 8.1.4.3, "Regulatory Requirements and Guidance" states that SECY 91-078 is not directly applicable to passive plant designs.

QUESTION: Please clarify the applicability of SECY 91-078 to the offsite power system.

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**NuScale Response:**

SECY 91-078 is not applicable to the NuScale offsite power system. As described in FSAR Section 8.1.4.3, SECY 91-078 pertains to evolutionary advanced light water reactors and is not applicable to passive plant designs. The NuScale design does not rely on active systems for safe shutdown and consequently the plant design does not need to meet SECY-91-078. This is consistent with the conclusion in Section 8.5.2.2 of NUREG-1793, Final Safety Evaluation Report Related to Certification of the the AP1000 Standard Design.

Notwithstanding the above, the NuScale design includes features that mitigate the effects of grid events discussed in SECY-91-078. The offsite power system, if included as part of a site-specific COL application, does not connect to safety-related buses and is not required to provide AC power to safety-related or risk-significant loads. In addition, the island mode feature maintains uninterrupted power to the nonsafety-related AC loads in the event of a loss of grid event as described in FSAR Section 8.3.1.1.1.

**Impact on DCA:**

There are no impacts to the DCA as a result of this response.

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