RAIO-1017-56963

October 31, 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. 208 (eRAI No. 9074) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 208 (eRAI No. 9074)," dated September 01, 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 Question from NRC eRAI No. 9074:

- 09.02.04-1

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 Carrie Fosaaen at 541-452-7126 or at cfosaaen@nuscalepower.com.

Sincerely,

Zackary W. Rad
Director, Regulatory Affairs
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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9074

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9074

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

eRAI No.: 9074
Date of RAI Issue: 09/01/2017

NRC Question No.: 09.02.04-1

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

GDC 2 establishes requirements with respect to the potable water system (PWS) design regarding protection against the effects of natural phenomena such as earthquakes, tornados, hurricanes and floods GDC 2 requires that SSCs important to safety be designed to withstand the effects of natural phenomena without loss of capability to perform their safety functions. The application of GDC 2 to the PWS design ensures that SSCs important to safety will not be adversely affected by PWS failure.

FSAR Tier 2, Table 3.2-1 indicates that all components of the PWS are nonsafety-related, nonrisk-significant, and seismic classification III. However, FSAR Tier 2, Section 9.2.4.1 states that portions of the PWS that are in proximity to Seismic Category I SSCs are designed to Seismic Category II standards. Also, in FSAR Tier 2 Section 9.2.4.3, “Safety Evaluation,” it is stated that potable water is supplied to the Control Building and that the PWS piping penetrating the control room (CR) envelope and habitability boundary is provided with isolations to control the potential for flooding the CR in the event of a line break and loss of system pressure.

Based on the description in the FSAR, it appears to the staff that the portion of the PWS, up to and including the SSCs used for isolation, is part of the control room envelope pressure boundary and should, therefore, be designed to the same standards as the rest of the CR habitability pressure boundary. It also appears that there are portions of the PWS that are located near Seismic Category I SSCs and, yet, the FSAR does not provide sufficient detail to determine if the PSW design is acceptable in these plant areas.

Therefore, the applicant is requested to:

- Clarify the safety and seismic classification for the portion of the PWS that penetrates the control room envelope and habitability boundary. If they differ from those for SSCs that are

part of the boundary, provide justification for applying different standards.
- Discuss how the PWS design protects against in-leakage into the control room and ensures control room envelope integrity under a seismic event.
- Identify the portions of the PWS that are near Seismic Category I SSCs which are to be classified as seismic category II.

The FSAR should be modified accordingly.

NuScale Response:

First bullet response:

The first bullet in this RAI question is concerned with control room envelope (CRE) and habitability boundary and the safety and seismic classification for the portion of the potable water system (PWS) that penetrates the control room envelope and habitability boundary.

FSAR Section 9.2.4 and Table 3.2-1 have been revised to indicate that for each supply and return line that penetrates the CRE, the PWS isolation device inside the CRE, and the piping between the isolation device and the CRE outer wall, are Seismic Category II.

Second bullet response:

The PWS supply and return lines from the outer wall of the CRE up to and including the PWS isolation device inside the CRE, are part of the CRE pressure boundary. The Seismic Category II classification of this portion of the PWS protects against in-leakage of radioactively contaminated air into the control room and ensures CRE integrity under a seismic event. FSAR Section 9.2.4 and FSAR Table 3.2-1 have been revised to indicate that these portions of the PWS are designated Seismic Category II.

Third bullet response:

In the response to RAI No. 8866, Question 09.02.02-1, transmitted by letter RAIO-0817-55425 on August 14, 2017 (ADAMS Accession No. ML17226A370), NuScale provided an update to FSAR Tier 2 Table 3.2-1, "Classification of Structures, Systems and Components." The update to Table 3.2-1 provided Note 5 which applies to the Seismic Classification of SSCs, including the potable water system (PWS). Note 5 states, "*Where SSC (or portions thereof) as determined in the as-built plant which are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.*"

The sentence in FSAR Tier 2, Section 9.2.4.1, “Design Bases,” which reads, “Portions of the system that are in proximity to Seismic Category I SSC are designed to Seismic Category II

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standards.” is meant to be consistent with FSAR Tier 2, Table 3.2-1, Note 5. This note addresses the third bullet of the NRC RAI question, since PWS components that could affect Seismic Category I SSCs will be designed to Seismic Category II standards.

Also, the ITAAC in FSAR Tier 1 Table 3.13-1, item 5, will verify the appropriate seismic classification of components in the Control Building.

Impact on DCA:

FSAR Section 9.2.4 and Table 3.2-1 have been revised as described in the response above and as shown in the markup provided in this response.

RAI 03.02.01-2, RAI 03.02.01-3, RAI 03.02.02-2, RAI 03.02.02-6, RAI 06.02.04-2, RAI 09.02.02-1, RAI 09.02.04-1, RAI 09.02.05-1, RAI 09.02.06-1, RAI 09.02.09-2, RAI 11.02-1, RAI 19-14

Table 3.2-1: Classification of Structures, Systems, and Components

SSC (Note 1)	Location	SSC Classification (A1, A2, B1, B2)	RTNSS Category (A,B,C,D,E)	QA Program Applicability (Note 2)	Augmented Design Requirements (Note 3)	Quality Group / Safety Classification (Ref RG 1.26 or RG 1.143) (Note 4)	Seismic Classification (Ref. ~~RG 1.189 or~~ RG 1.29 or RG 1.143) (Note 5)
CNTS, Containment System							
All components (except as listed below)	RXB	A1	N/A	Q	None	A	I
• RXM Lifting Lugs • Top Auxiliary Mechanical Access Structure • Top Auxiliary Mechanical Access Structure Diagonal Lifting Braces	RXB	B1	None	AQ-S	• ANSI/ANS 57.1-1992 • ASME NOG-1 • NUREG-0554	N/A	I
CFDS Piping in containment	RXB	B2	None	AQ-S	None	B	II
Piping from (CES, CFDS, CVCS, FWS, MSS, and RCCWS) CIVs to disconnect flange (outside containment)	RXB	B2	None	AQ-S	None	D	I
~~Hydraulic Skid for valve reset~~	~~RXB~~	~~B2~~	~~None~~	~~None~~	~~None~~	~~D~~	~~III~~
CIV Close and Open Position Sensors: • CES, Inboard and Outboard • CFDS, Inboard and Outboard • CVCS, Inboard and Outboard PZR Spray Line • CVCS, Inboard and Outboard RCS Discharge • CVCS, Inboard and Outboard RCS Injection • CVCS, Inboard and Outboard RPV High-Point Degasification • FWS, Supply to SGs and DHR HXs FWIV • RCCWS, Inboard and Outboard Return and Supply • SGS, Steam Supply CIV/MSIVs and CIV/MSIV Bypasses	RXB	B2	None	AQ-S	IEEE 497-2002 with CORR 1	N/A	I
Containment Pressure Transducer (Wide Range)	RXB	B2	None	AQ-S	IEEE 497-2002 with CORR 1	N/A	II
• Containment Air Temperature (RTDs) • FW Temperature Transducers	RXB	B2	None	AQ-S	None	N/A	II
SGS, Steam Generator System							
• SG tubes • Feedwater plenums • Steam plenums • ~~SG tube supports~~	RXB	A1	N/A	Q	None	A	I
• SG tube supports	RXB	A1	N/A	Q	None	N/A	I
• Steam piping inside containment • Feedwater piping inside containment • Feedwater supply nozzles • Main steam supply nozzles • Thermal relief valves	RXB	A2	N/A	Q	None	B	I
Flow restrictors	RXB	A2	N/A	Q	None	N/A	I
RXC, Reactor Core System							
Fuel assembly (RXF)	RXB	A1	N/A	Q	None	N/A	I
Fuel Assembly Guide Tube	RXB	A2	N/A	Q	None	N/A	I
Incore Instrument Tube	RXB	B2	None	AQ-S	None	N/A	I
CRDS, Control Rod Drive System							
• Control Rod Drive Shafts • Control Rod Drive Latch Mechanism	RXB	A1	N/A	Q	None	N/A	I
CRDM Pressure Boundary (Latch Housing, Rod Travel Housing, Rod Travel Housing Plug)	RXB	A2	N/A	Q	None	A	I
CRDS Cooling Water Piping and Pressure Relief Valve	RXB	B2	None	AQ-S	None	B	II
Rod Position Indication (RPI) Coils	RXB	B2	None	AQ-S	None	N/A	I
• Control Rod Drive Coils • CRDM power cables from EDN breaker to MPS breaker • CRDM power cables from MPS breaker to CRDM Cabinets	RXB	B2	None	AQ-S	None	N/A	II

Table 3.2-1: Classification of Structures, Systems, and Components (Continued)

SSC (Note 1)	Location	SSC Classification (A1, A2, B1, B2)	RTNSS Category (A,B,C,D,E)	QA Program Applicability (Note 2)	Augmented Design Requirements (Note 3)	Quality Group / Safety Classification (Ref RG 1.26 or RG 1.143) (Note 4)	Seismic Classification (Ref. ~~RG 1.189 or~~ RG 1.29 or RG 1.143) (Note 5)
All components	TGB	B2	None	None	• NEI 97-06 • EPRI PWR Secondary Water Chemistry Guidelines, Rev 7	D	III
HVDS, (Feedwater) Heater Vents and Drains System							
All components	TGB	B2	None	None	None	D	III
CHWS, Chilled Water System							
All components	Various	B2	None	None	None	N/A	III
ABS, Auxiliary Boiler System							
High Pressure and Low Pressure Aux Boiler skids	TGB	B2	None	None	No	D	III
Radioactivity Instruments	Various	B2	None	AQ	ANSI N42.18-2004	N/A	III
CARS, Condenser Air Removal System							
All components (except as listed below)	TGB	B2	None	None	None	D	III
• Effluent Radiation Element • Effluent Radiation Transmitter • Discharge Flow Transmitter	TGB	B2	None	AQ	IEEE 497-2002 with CORR 1	N/A	III
TGS, Turbine Generator System							
All components (except as listed below)	TGB	B2	None	None	None	N/A	III
TG Gland Seal Exhauster Radiation Monitor	TGB	B2	None	AQ	ANSI N42.18-2004	N/A	III
TLOSS, Turbine Lube Oil Storage System							
All components	TGB	B2	None	None	None	N/A	III
CPS, Cathodic Protection System							
Cathodic Protection System	Various	B2	None	None	None	N/A	III
CWS, Circulating Water System							
All components	TGB, Yard	B2	None	None	None	D	III
SCWS, Site Cooling Water System							
All components (except as listed below)	Yard	B2	None	None	None	D	III
Letdown line rad monitor	Yard	B2	None	AQ	ANSI N42.18-2004	N/A	III
PWS, Potable Water System							
All components (except as listed below)	Various	B2	None	None	None	N/A	III
Supply and return piping from the CRE penetration (includes only the isolation devices and the piping between the isolation devices and the outer wall of the CRE)	CRB	B2	None	None	None	N/A	II
UWS, Utility Water System							
All components (except as listed below)	Various	B2	None	None	None	N/A	III
Wastewater effluent discharge portion of UWS	Various	B2	None	None	None	D	III
Letdown Line Rad Monitor	RWB	B2	None	AQ	ANSI N42.18-2004	N/A	III
DWS, Demineralized Water System							
All components (except as listed below)	Various	B2	None	None	None	D	III
• DWS potentially radioactive loop • Grab sample isolation valves • Grab sample ports • DWS headers - radiation indication instruments	Various	B2	None	AQ	None	D	III
NDS, Nitrogen Distribution System							
All components	Yard, RWB	B2	None	None	None	N/A	III
SAS, Service Air System							
All components	Various	B2	None	None	None	N/A	III
IAS, Instrument and Control Air System							
All components	Various	B2	None	None	None	N/A	III
TBVS, Turbine Building HVAC System							
All components	TGB	B2	None	None	None	N/A	III

9.2.4 Potable and Sanitary Water Systems

The potable water system (PWS) provides potable water for human use and sanitary water collection throughout the plant for treatment and discharge. Potable water is supplied for usage via the potable water supply distribution system. Sanitary water is water discharged from restrooms, showers, or sinks.

9.2.4.1 Design Bases

This section identifies the PWS required or credited functions, the regulatory requirements that govern the performance of those functions, and the controlling parameters and associated values that ensure that the functions are fulfilled. Together, this information represents the design bases, defined in 10 CFR 50.2, as required by 10 CFR 52.47(a) and (a)(3)(ii).

RAI 09.02.04-1

The PWS serves no safety-related functions, is not credited for mitigation of design basis accidents, and has no safe shutdown functions. General Design Criteria (GDC) 2, 4, and 5 were considered in the design of the PWS. The PWS is not required to function during or after a natural phenomenon event or other events that result in the generation of missiles, pipe whipping, or discharging fluids. Portions of the system that are in proximity to Seismic Category I SSC are designed to Seismic Category II standards. The PWS has no function in the orderly shutdown of an NPM or the ability to maintain the NPM shut down. There are no safety-related, risk-significant or safe shutdown functions in the PWS that are shared between NuScale Power Modules. See Section 9.2.4.3 for the safety evaluation. The PWS is designed to protect the integrity of the control room envelope (CRE).

GDC 60 was considered in the design of the PWS. The PWS has no interconnections to systems having the potential for containing radioactive material.

9.2.4.2 System Description

The PWS provides potable water for human use and consumption and provides for the collection and treatment of sanitary water.

The PWS provides piping, valves, and other control components to distribute potable water to final use locations. Potable water usage includes drinking fountains, kitchen/breakroom facilities, sinks, showers, water closets, and emergency eyewash/shower stations. Water heaters are installed, as appropriate, to provide hot water to end users. Potable water system component materials are compatible with Federal safe drinking water regulations. During normal operation, the PWS distribution network maintains a minimum system pressure to preclude leakage into the system. Any connection to or from other water systems is accomplished using isolation devices, such as backflow preventers or air gaps, between the PWS and interfacing systems to prevent any system cross-contamination. Overall, potable water capacity is based on the anticipated number of on-site personnel for a 24-hour period during normal operations.

COL Item 9.2-2: A COL applicant that references the NuScale Power Plant design certification will describe the source and pre-treatment methods of potable water for the site, including the use of associated pumps and storage tanks.

Piping, valves, and other components are provided to collect sanitary waste from sanitary waste drains and distribute it to collection and treatment facilities. Overall, sanitary waste capacity is based on the anticipated number of on-site personnel for a 24-hour period during normal operations.

RAI 09.02.04-1

The PWS provides water to, and accepts waste water from, the CRE. Each PWS supply and return line to or from the CRE includes an isolation device located inside the CRE. If a line is damaged by a seismic event, it can be isolated to protect the control room from inleakage of atmospheric radioactive contaminants. Each applicable line is designated Seismic Category II from the outer wall of the CRE up to and including the isolation device.

COL Item 9.2-3: A COL applicant that references the NuScale Power Plant design certification will describe the method for sanitary waste storage and disposal, including associated treatment facilities.

9.2.4.3 Safety Evaluation

The PWS serves no safety-related functions or cooling function, is not credited for mitigation of design basis accidents, and has no safe shutdown functions.

RAI 09.02.04-1

~~Consistent with GDC 2, portions of the PWS routed through the Control Building in proximity to safety-related equipment are seismically mounted (Seismic Category II), consistent with Regulatory Guide 1.29, to prevent failures from affecting safety-related equipment.~~Consistent with GDC 2 and Regulatory Guide 1.29, the following portions of the PWS are designated Seismic Category II:

RAI 09.02.04-1

- portions of the PWS in proximity to safety-related SSCs that could render the safety-related SSCs inoperable

RAI 09.02.04-1

- for each supply and return line that penetrates the control room envelope (CRE), the PWS isolation device inside the CRE and the piping between the isolation device and the CRE outer wall.

The remainder of the PWS is Seismic Category III. Seismic, quality and other design classifications for the components in the PWS are identified in Section 3.2.

The PWS does not provide service directly to the Reactor Building or the radwaste building. Since the PWS is not routed in these buildings, any leakage from the PWS will