From:	Carolyn Lauron
To:	Justin Hawkins
Cc:	Greg Cranston; Andrew Brenner; Jordan Glisan; Michael Dudek
Subject:	NRC Staff Response to Question regarding Water Source for Fire Protection
Date:	Wednesday, December 28, 2022 7:47:00 AM
Attachments:	image001.png image002.png image003.png

Hi Justin –

Below is the NRC staff response to the question regarding water source for fire protection.
If you have questions or need more information, please let us know.

Thanks,
Carolyn Lauron
US NRC

Background:

Regulatory Guide (RG) 1.189, Section 3.2.1, Paragraph (j) states, in part:[1]

> j. Provisions should be made to supply water to at least two standpipes and hose connections for manual firefighting in areas containing equipment required for safe plant shutdown in the event of a safe-shutdown earthquake. The piping system serving such hose stations should be analyzed for safe-shutdown earthquake loading and should be provided with supports to ensure system pressure integrity. The piping and valves for the portion of the hose standpipe system affected by this functional requirement should satisfy ASME B31.1, "Power Piping" (Ref. 76). The water supply for this condition may be obtained by manual operator actuation of valves in a connection to the hose standpipe header from a normal seismic Category I water system, such as the essential service water system. The cross-connection should be (1) capable of providing flow to at least two hose stations (approximately 284 L/min (75 gal/min) per hose station), and (2) designed to the same standards as the seismic Category I water system (i.e., it should not degrade the performance of the seismic Category I water system).

However, the NuScale design appears to use a non-Seismic Category I (SC-I) water source, the fire water storage tanks (part of the Fire Protection System of which NuScale states all components are SC-III) as the water supply for the safe-shutdown earthquake. NuScale cites "alternate conformance" to RG 1.189, Paragraph 3.2.1(j) in their Final Safety Analysis Report (FSAR) Chapter 9, but discussion of this "alternate conformance" is not discussed in the Final Safety Evaluation Report (FSER).

3.2.1, j[3]	Provisions should be made to supply water to at least two standpipes and hose connections for manual firefighting in areas containing equipment required for safe plant shutdown in the event of a safe-shutdown earthquake. The piping system serving such hose stations should be analyzed for safe-shutdown earthquake loading and should be provided with supports to ensure system pressure integrity. The piping and valves for the portion of the hose standpipe system affected by this functional requirement should, at a minimum, satisfy ASME B31.1, "Power Piping". The water supply for this condition may be obtained by manual operator actuation of valves in a connection to the hose standpipe header from a normal seismic Category I water system, such as the essential service water system. The cross-connection should be (1) capable of providing flow to at least two hose stations (approximately 284 L/min (75 gal/min) per hose station), and (2) designed to the same standards as the seismic Category I water system (i.e., it should not degrade the performance of the seismic Category I water system).	Alternate Conformance	The fire water storage tanks are designed in accordance with AWWA D100-205, as referenced by NFPA-22. The fire water yard piping is designed in accordance with ASME B31.1.

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 1.29 or RG 1.143) (Note 5)
SAS, Service Air System							
All components	CUB, ANB, RXB, TGB, RWB	B2	None	None	None	N/A	III
IAS, Instrument and Control Air System							
All components	CUB, RWB, RXB, TGB, SCB, DGB, ANB	B2	None	None	None	N/A	III
TBVS, Turbine Building HVAC System							
All components	TGB	B2	None	None	None	N/A	III
SBVS, Security Building HVAC System							
All components	SCB	B2	None	None	None	N/A	III
DGBVS, Diesel Generator HVAC System							
All components	DGB	B2	None	None	None	N/A	III
ABVS, Annex Building HVAC System							
All components	ANB, RWB	B2	None	None	None	N/A	III
FPS, Fire Protection System							
All components	CRB, RXB, TGB, RWB, SCB, ANB, DGB, ATB, FWB, WHB, CUB	B2	None	AQ	RG 1.189	N/A	III

QUESTIONS:

1. **Is a SC-I water source for fire protection required to conform with RG 1.189, Paragraph 3.2.1(j)?**

NRC Staff Response:

No. The licensee/applicant would need to demonstrate that in areas containing equipment required for safe plant shutdown that at least two standpipe and hose connections and their water supply are capable of withstanding the maximum potential earthquake stresses for the particular region where the plant is sited and can be supplied with water for manual firefighting efforts after being subjected to the maximum potential earthquake stresses. If an analysis shows that the designed/installed fire protection systems (water supply, main piping, standpipe system, etc.), are capable of this, then RG 1.189, Paragraph 3.2.1(j) would be satisfied. The NuScale "alternate conformance" provided fire water storage tanks that are designed in accordance with American Water Works Association (AWWA) standard, AWWA-D100-205, as referenced by National Fire Protection Association (NFPA) standard, NFPA 22, and the fire water yard piping designed in accordance with American Society of Mechanical Engineers (ASME) standard, ASME B31.1, all of which are not sufficient to satisfy RG 1.189, Paragraph 3.2.1(j).[2], [3], [4]

RG 1.189 discusses an alternate method to supply water to the two standpipe and hose connections through a cross connection with another plant system that is already classified as Seismic Category 1. If the licensee/applicant choose this route and the other plant system was not already classified as Seismic Category 1, then an analysis would have to be conducted that demonstrates the other plant system is capable of withstanding the maximum potential earthquake stresses for the particular region where the plant is sited (same as discussed above).

2. **Are there additional considerations not documented in the FSER that provide clarification on the acceptance of NuScale's alternate conformance with to RG 1.189, Paragraph 3.2.1(j)?**

NRC Staff Response:

Any clarification would be similar to the above. A search of applicable RAIs and responses related to the NuScale review could provide additional clarification regarding this item.[5]

References:

1. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.189, “Fire Protection for Nuclear Power Plants,” Revision 4, dated May 2021, Agencywide Documents Access and Management System (ADAMS) Accession No. ML21048A441.
2. American Water Works Association, AWWA D100-05, “Welded Carbon Steel Tanks for Water Storage,” Denver, CO.
3. National Fire Protection Association, NFPA 22, “Standard for Water Tanks for Private Fire Protection,” Quincy, MA.
4. American Society of Mechanical Engineers, ASME Standard B31.1, “Power Piping,” New York, NY.
5. US NRC, Electronic Requests for Additional Information related to the NuScale Design Certification review may be found here: https://www.nrc.gov/reactors/new-reactors/smr/licensing-activities/nuscale/rai.html