

July 3, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission  
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**SUBJECT:** NuScale Power, LLC Submittal of Changes to Final Safety Analysis Report, Section 10.3.6, "Steam and Feedwater System Materials"

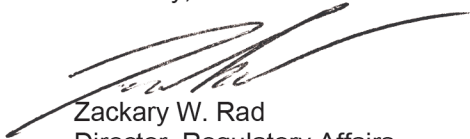
**REFERENCES:** Letter from NuScale Power, LLC to Nuclear Regulatory Commission, "NuScale Power, LLC Response to NRC Request for Additional Information No. 370 (eRAI No. 9404)," dated April 16, 2018 (ML18106A139)

During a June 20, 2018, closed teleconference with Omid Tabatabai-Yazdi, NRC Project Manager, and Nicholas McMurray, NRC reviewer of the NRC staff, NuScale Power, LLC (NuScale) discussed potential updates to Final Safety Analysis Report (FSAR), Section 10.3.6, "Steam and Feedwater System Materials." As a result of this discussion, NuScale changed Section 10.3.6 and Section 1.8, "Interfaces with Certified Design." The Enclosure to this letter provides a mark-up of the FSAR pages incorporating the revisions in redline/strikeout format. NuScale will include this change as part of a future revision to the NuScale Design Certification Application.

This letter makes no regulatory commitments or revisions to any existing regulatory commitments.

Please feel free to contact Carrie Fosaaen, Licensing Project Manager at 541-542-7126 or [cfosaaen@nuscalepower.com](mailto:cfosaaen@nuscalepower.com) if you have any questions.

Sincerely,



Zackary W. Rad  
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NuScale Power, LLC

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Enclosure: "Changes to NuScale Final Safety Analysis Report Sections 1.8, "Interfaces with Certified Design," and 10.3.6, "Steam and Feedwater System Materials"

**Enclosure:**

“Changes to NuScale Final Safety Analysis Report Sections 1.8, “Interfaces with Certified Design,” and 10.3.6, “Steam and Feedwater System Materials”

RAI 01-61, RAI 02.04.13-1, RAI 03.04.02-1, RAI 03.04.02-2, RAI 03.04.02-3, RAI 03.05.01.04-1, RAI 03.05.02-2, RAI 03.06.02-15, RAI 03.06.03-11, RAI 03.07.01-2, RAI 03.07.01-3, RAI 03.07.02-8, RAI 03.07.02-12, RAI 03.08.04-23S1, RAI 03.08.05-14S1, RAI 03.09.02-15, RAI 03.09.02-48, RAI 03.09.02-67, RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-6, RAI 03.09.06-16, RAI 03.09.06-16S1, RAI 03.09.06-27, RAI 03.11-8, RAI 03.11-14, RAI 03.11-14S1, RAI 03.11-18, RAI 03.13-3, RAI 04.02-152, RAI 05.02.05-8, RAI 05.04.02.01-13, RAI 05.04.02.01-14, RAI 06.04-1, RAI 09.01.02-4, RAI 09.01.05-3, RAI 09.01.05-6, RAI 09.03.02-3, RAI 09.03.02-4, RAI 09.03.02-5, RAI 09.03.02-6, RAI 09.03.02-8, RAI 10.02-1, RAI 10.02-2, RAI 10.02-3, RAI 10.02.03-1, RAI 10.02.03-2, RAI 10.03.06-1, RAI 10.03.06-5, RAI 10.04.06-1, RAI 10.04.06-2, RAI 10.04.06-3, RAI 10.04.10-2, RAI 13.01.01-1, RAI 13.01.01-1S1, RAI 13.02.02-1, RAI 13.03-4, RAI 13.05.02.01-2, RAI 13.05.02.01-2S1, RAI 13.05.02.01-3, RAI 13.05.02.01-3S1, RAI 13.05.02.01-4, RAI 13.05.02.01-4S1, RAI 14.02-7, RAI 19-31, RAI 19-31S1, RAI 19-38, RAI 20.01-13

**Table 1.8-2: Combined License Information Items**

Item No.	Description of COL Information Item	Section
COL Item 1.1-1:	A COL applicant that references the NuScale Power Plant design certification will identify the site-specific plant location.	1.1
COL Item 1.1-2:	A COL applicant that references the NuScale Power Plant design certification will provide the schedules for completion of construction and commercial operation of each power module.	1.1
COL Item 1.4-1:	A COL applicant that references the NuScale Power Plant design certification will identify the prime agents or contractors for the construction and operation of the nuclear power plant.	1.4
COL Item 1.7-1:	A COL applicant that references the NuScale Power Plant design certification will provide site-specific diagrams and legends, as applicable.	1.7
COL Item 1.7-2:	A COL applicant that references the NuScale Power Plant design certification will list additional site-specific piping and instrumentation diagrams and legends as applicable.	1.7
COL Item 1.8-1:	A COL applicant that references the NuScale Power Plant design certification will provide a list of departures from the certified design.	1.8
COL Item 1.9-1:	A COL applicant that references the NuScale Power Plant design certification will review and address the conformance with regulatory criteria in effect six months before the docket date of the COL application for the site-specific portions and operational aspects of the facility design.	1.9
COL Item 1.10-1:	A COL applicant that references the NuScale Power Plant design certification will evaluate the potential hazards resulting from construction activities of the new NuScale facility to the safety-related and risk significant structures, systems, and components of existing operating unit(s) and newly constructed operating unit(s) at the co-located site per 10 CFR 52.79(a)(31). The evaluation will include identification of management and administrative controls necessary to eliminate or mitigate the consequences of potential hazards and demonstration that the limiting conditions for operation of an operating unit would not be exceeded. This COL item is not applicable for construction activities (build-out of the facility) at an individual NuScale Power Plant with operating NuScale Power Modules.	1.10
COL Item 2.0-1:	A COL applicant that references the NuScale Power Plant design certification will demonstrate that site-specific characteristics are bounded by the design parameters specified in Table 2.0-1. If site-specific values are not bounded by the values in Table 2.0-1, the COL applicant will demonstrate the acceptability of the site-specific values in the appropriate sections of its combined license application.	2.0
COL Item 2.1-1:	A COL applicant that references the NuScale Power Plant design certification will describe the site geographic and demographic characteristics.	2.1
COL Item 2.2-1:	A COL applicant that references the NuScale Power Plant design certification will describe nearby industrial, transportation, and military facilities. The COL applicant will demonstrate that the design is acceptable for each potential accident, or provide site-specific design alternatives.	2.2
COL Item 2.3-1:	A COL applicant that references the NuScale Power Plant design certification will describe the site-specific meteorological characteristics for Section 2.3.1 through Section 2.3.5, as applicable.	2.3
COL Item 2.4-1:	A COL applicant that references the NuScale Power Plant design certification will investigate and describe the site-specific hydrologic characteristics for Section 2.4.1 through Section 2.4.14, <del>as applicable</del> <u>except Section 2.4.8 and Section 2.4.10.</u>	2.4
COL Item 2.5-1:	A COL applicant that references the NuScale Power Plant design certification will describe the site-specific geology, seismology, and geotechnical characteristics for Section 2.5.1 through Section 2.5.5, below.	2.5
COL Item 3.2-1:	A COL applicant that references the NuScale Power Plant design certification will update Table 3.2-1 to identify the classification of site-specific structures, systems, and components.	3.2

**Table 1.8-2: Combined License Information Items (Continued)**

Item No.	Description of COL Information Item	Section
COL Item 10.2-3:	<p><del>Not Used. A COL applicant that references the NuScale Power Plant design certification will perform an evaluation of the probability of turbine missile generation. The report provides a calculation of the probability of turbine missile generation using established methods and industry guidance applicable to the fabrication technology employed. The analysis is a comprehensive report containing a description of turbine fabrication methods, material quality and properties, and required maintenance and inspections that addresses:</del></p> <ul style="list-style-type: none"> <li><del>a) the calculated probability of turbine missile generation from material and overspeed-related failures based on as-built rotor and blade designs and as-built material properties (as determined in certified testing and nondestructive examination);</del></li> <li><del>b) maximum anticipated speed resulting from a loss of load, assuming normal control system function without trip.</del></li> <li><del>c) overspeed basis and overspeed protection trip setpoints.</del></li> <li><del>d) discussion of the design and structural integrity of turbine rotors.</del></li> <li><del>e) an analysis of potential degradation mechanisms (e.g., stress corrosion cracking, pitting, low cycle fatigue, corrosion fatigue, erosion and erosion/corrosion), and maintenance or operating requirements necessary for mitigation.</del></li> <li><del>f) material properties (e.g., yield strength, stress-rupture properties, fracture toughness, minimum operating temperature of the high pressure turbine rotor) and the method of determining those properties.</del></li> <li><del>g) required preservice test and inspection procedures and acceptance criteria to support calculated turbine missile probability.</del></li> <li><del>h) actual maximum tangential and radial stresses and their locations in the turbine rotor.</del></li> <li><del>i) rotor and blade design analyses, including loading combinations, assumptions and warmup time, that demonstrate sufficient safety margin to withstand loadings from postulated overspeed events up to 120 percent of rated speed.</del></li> <li><del>j) description of the required inservice inspection and testing program for valves essential to overspeed protection and inservice tests, inspections, and maintenance activities for the turbine and valve assemblies that are required to support the calculated missile probability, including inspection and test frequencies with technical bases, type of inspection, techniques, areas to be inspected, acceptance criteria, disposition of reportable indications, and corrective actions.</del></li> </ul>	10.2
COL Item 10.3-1:	A COL applicant that references the NuScale Power Plant design certification will provide a site-specific chemistry control program based on the latest revision of the Electric Power Research Institute Pressurized Water Reactor Secondary Water Chemistry Guidelines and Nuclear Energy Institute (NEI) 97-06 at the time of the COL application.	10.3
COL Item 10.3-2:	<del>Not used. A COL Applicant that references the NuScale Power Plant design certification will provide a description of the flow-accelerated corrosion monitoring program for carbon steel portions of the steam and power conversion systems that contain water or wet steam and are susceptible to flow-accelerated corrosion based on Generic Letter 89-08 and the latest revision of the Electric Power Research Institute NSAC-202L at the time of the COL application.</del>	10.3
COL Item 10.4-1:	A COL applicant that references the NuScale Power Plant design certification will determine the size and number of new and spent resin tanks in the condensate polishing system.	10.4
COL Item 10.4-2:	A COL applicant that references the NuScale Power Plant design certification will describe the type of fuel supply for the auxiliary boilers.	10.4
COL Item 10.4-3:	A COL applicant that references the NuScale Power Plant design certification will provide a secondary water chemistry analysis. This analysis will show that the size, materials, and capacity of the feedwater treatment system equipment and components satisfies the water quality requirements of the secondary water chemistry program described in Section 10.3.5, and that it is compatible with the chemicals used.	10.4

### 10.3.6.2 Materials Selection and Fabrication

RAI 10.03.06-6

~~Table 10.3-5 provides the piping material specifications and corrosion allowances for the portions of the steam and power conversion system noted in Section 10.3.6 above.~~

RAI 10.03.06-6

~~Specifically, m~~Material selection and fabrication requirements for ~~the portions of~~ the steam and power conversion system ~~noted in Section 10.3.6 above~~ conform to ASME B31.1 and are consistent with the quality group and seismic design classifications provided in Table 3.2-1.

RAI 10.03.06-7

The materials of the safety-related portions of the CNTS, SGS and DHRS in conjunction with the secondary water chemistry control program described in Section 10.3.5 provide protection from contamination originating in the non-safety steam and power conversion systems from impacting safety-related portions of the CNTS, SGS or DHRS.

RAI 10.03.06-6

~~The design, materials selection, fabrication, and operation of components mitigate susceptibility to intergranular stress corrosion cracking of the stainless steel and nickel-based materials used. See additional stress corrosion cracking information in Section 3.6.3.~~

### 10.3.6.3 Flow-Accelerated Corrosion

RAI 10.03.06-1, RAI 10.03.06-5, RAI 10.03.06-6

The design of the piping in the steam and power conversion systems incorporates considerations to prevent the occurrence of erosion and corrosion. These considerations include material selection, limits on flow velocity, inspection programs, and limits on water chemistry to reduce FAC. The design meets the guidance contained in Generic Letter 89-08 and NSAC-202L-R3 (Reference 10.3-1) governing design considerations to minimize FAC including FAC monitoring programs.~~FSAR Section 3.6.3 and Section 5.4.1 describe the material composition of the safety-related portion of the steam and feedwater piping, which for the NuScale design, are part of the containment and steam generator systems. The material composition of this portion of the steam and feedwater piping is not susceptible to FAC. Section 3.6.3 contains additional FAC-related information.~~

RAI 10.03.06-5

The steam and power conversion systems design and layout incorporate appropriate provisions to minimize FAC. These provisions are applied to the high-energy, nonsafety-related portions that could adversely impact safety-related systems susceptible to FAC and other flow-induced degradation mechanisms.

RAI 10.03.06-6

Table 10.3-5 provides a list of power conversion system piping which is within the scope of the flow-accelerated corrosion monitoring program.

RAI 10.03.06-5

In addition to design and layout provisions, flow-accelerated corrosion is minimized by the implementation of a secondary water chemistry control program as described in Section 10.3.5.

RAI 10.03.06-1, RAI 10.03.06-5

COL Item 10.3-2: ~~Not used.~~ A COL Applicant that references the NuScale Power Plant design certification will provide a description of the flow-accelerated corrosion monitoring program for carbon steel portions of the steam and power conversion systems that contain water or wet steam and are susceptible to flow-accelerated corrosion based on Generic Letter 89-08 and the latest revision of the Electric Power Research Institute NSAC-202L at the time of the COL application.

### 10.3.7 Instrumentation

The main steam temperature, pressure, radiation, and flow instrumentation is designed to permit automatic plant operation, remote control, and continuous indication of system parameters. The remote instrumentation readouts required for monitoring the system are provided in the main control room. The ability to manually initiate MSS control actions is available in the main control room.

Table 10.3-4 shows the MSS instrumentation. A list of the instrumentation associated with DHRS actuation and operation (including MSIV and secondary MSIV closure) is provided in Section 7.1.

The instrumentation and controls associated with turbine bypass are described in Section 10.4.4.

### 10.3.8 References

- 10.3-1 Electric Power Research Institute, "Recommendations for an Effective Flow-Accelerated Corrosion Program (NSAC-202L-R3) Non-Proprietary Version," EPRI Report No.1015425, Final Report, August 2007.
- 10.3-2 Electric Power Research Institute, "Pressurized Water Reactor Secondary Water Chemistry Guidelines", Rev 7, February 17, 2009, Palo Alto, CA.
- 10.3-3 Nuclear Energy Institute, "Steam Generator Program Guidelines," Rev 3, Washington, DC, January 2011.