RAIO-0418-59552

April 16, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 370 (eRAI No. 9404) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 370 (eRAI No. 9404)," dated February 21, 2018

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. 9404:

- 10.03.06-5
- 10.03.06-6
- 10.03.06-7

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
NuScale Power, LLC

Distribution: Samuel Lee, NRC, OWFN-8G9A
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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9404

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NuScale Response to NRC Request for Additional Information eRAI No. 9404

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

eRAI No.: 9404
Date of RAI Issue: 02/21/2018

NRC Question No.: 10.03.06-5

Regulatory Basis

Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix A, General Design Criterion (GDC) 1 requires that structures, systems, and components (SSCs) important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed.

GDC 4 requires that SSCs important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents.

10 CFR 52.47(a)(9) requires an applicant for a standard design certification to "[identify and describe] all differences in design features, analytical techniques, and procedural measures proposed for the design and those corresponding features, techniques, and measures given in the SRP acceptance criteria."

Follow-up to RAI 9066, Question 10.3.6-1

Below is a follow-up RAI to NuScale's letter, "NuScale Power, LLC Response to NRC Request for Additional Information No. 243 (eRAI No. 9066) on the NuScale Design Certification Application," Question 10.03.06-1 (ADAMS Accession No. ML17326B393). This topic was discussed, and a follow-up RAI was requested by NuScale, during a public meeting on February 7, 2018 (Meeting Notice, ADAMS Accession No. ML18003A665).

The staff agrees with NuScale's statement that DCD Tier 2, FSAR, Sections 3.6.3.1.1 and 5.4.1.2 describe the material composition of the safety-related portion of the steam and feedwater piping that are part of the steam generator system (SGS), decay heat removal system (DHRS), and containment system (CNTS). However, the staff's understanding is that since these portions of steam and feedwater piping are part of the SGS, DHRS, and CNTS, they are also discussed in DCD Tier 2, FSAR, Sections 5.4.1.5 and 6.1.1.

NuScale's response cites Section I of SRP 10.3.6, which states:

The materials selection, fabrication, and fracture toughness of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (hereafter "the Code"), Section III, Class 2 and 3 pressure boundary components of the steam and feedwater systems are reviewed to verify they meet the relevant requirements of the Commission's regulations.

NuScale's response cites NSAC-202L-R2, which is used to justify the removal of the flow accelerated corrosion (FAC) program for the safety-related portions of the MSS and CFWS. NuScale's response then uses the combination of SRP 10.3.6 Section I and NSAC-202L-R2 to remove the discussion of the FAC program from DCD Tier 2, FSAR, Section 10.3.6.3. Furthermore, NuScale's response states, "With the susceptibility for an increased rate of FAC removed, the necessity to identify and control the material specifications of the upstream, non- safety-related components to the same degree as the safety-related components is considered unnecessary."

The staff disagrees with NuScale's revisions and statement as the FAC program should also consider non-safety systems. The staff further disagrees with removing a system from consideration without screening it using the guidance of Generic Letter 89-08 and NSAC-202L-R3 (the revision cited in the FSAR). The staff cannot make a safety finding on removal of these systems as not every component material is listed.

The FAC program is related to the Maintenance Rule, 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," which states, in part:

(a)(1) Each holder of an operating license for a nuclear power plant under this part and each holder of a combined license under part 52 of this chapter after the Commission makes the finding under § 52.103(g) of this chapter, shall monitor the performance or condition of structures, systems, or components, against licensee-established goals, in a manner sufficient to provide reasonable assurance that these structures, systems, and components, as defined in paragraph (b) of this section, are capable of fulfilling their intended functions. These goals shall be established commensurate with safety and, where practical, take into account industrywide operating experience. When the performance or condition of a structure, system, or component does not meet established goals, appropriate corrective action shall be taken. For a nuclear power plant for which the licensee has submitted the certifications specified in § 50.82(a)(1) or 52.110(a)(1) of this chapter, as applicable, this section shall only apply to the extent that the licensee shall monitor the performance or condition of all structures, systems, or components associated with the storage, control, and maintenance of spent fuel in a safe condition, in a manner sufficient to provide reasonable assurance that these structures, systems, and components are capable of fulfilling their intended functions.

(b) The scope of the monitoring program specified in paragraph (a)(1) of this section shall include safety related and nonsafety related structures, systems, and components, as follows:

(2) Nonsafety related structures, systems, or components:

(i) That are relied upon to mitigate accidents or transients or are used in plant emergency operating procedures (EOPs); or

(ii) Whose failure could prevent safety-related structures, systems, and components from fulfilling their safety-related function; or

(iii) Whose failure could cause a reactor scram or actuation of a safety-related system.

Failure of the safety or non-safety related portions of the steam and power conversion systems would cause a reactor trip and actuate the ESF systems. Therefore, the staff disagrees with NuScale's basis for removing the FAC program from the DCD.

Revise the DCD to re-include the text related to the FAC program in Section 10.3.6.3, including COL Item 10.3-2, as revised in in letter dated June 26, 2017 [ADAMS Accession No. ML17177A686].

NuScale Response:

NuScale has revised the DCD to re-insert text related to the FAC program in Section 10.3.6.3, including COL Item 10.3-2.

Impact on DCA:

Section 10.3.6.3 and Table 1.8-2 have been revised as described in the response above and as shown in the markup provided in this response.

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 03.09.03-12, 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 03.13-3, 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 10.03.06-1, 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

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, as applicable.	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 10.3-1:	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:	~~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.	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
COL Item 11.2-1:	A COL applicant that references the NuScale Power Plant design certification will ensure mobile equipment used and connected to plant systems is in accordance with ANSI/ANS-40.37, Regulatory Guide (RG) 1.143, 10 CFR 20.1406, NRC IE Bulletin 80-10 and 10 CFR 50.34a.	11.2
COL Item 11.2-2:	A COL applicant that references the NuScale Power Plant design certification will calculate doses to members of the public using the site-specific parameters, compare those liquid effluent doses to the numerical design objectives of 10 CFR 50, Appendix I, and comply with the requirements of 10 CFR 20.1302 and 40 CFR 190.	11.2
COL Item 11.2-3:	A COL applicant that references the NuScale Power Plant design certification will perform a site-specific evaluation of the consequences of an accidental release of radioactive liquid from the pool surge control system storage tank in accordance with NRC Branch Technical Position 11-6.	11.2
COL Item 11.2-4:	A COL applicant that references the NuScale Power Plant design certification will perform a site-specific evaluation using the site-specific dilution flow.	11.2
COL Item 11.2-5:	A COL applicant that references the NuScale Power Plant design certification will perform a cost-benefit analysis as required by 10 CFR 50.34a and 10 CFR 50, Appendix I, to demonstrate conformance with regulatory requirements. This cost-benefit analysis is to be performed using the guidance of Regulatory Guide 1.110.	11.2
COL Item 11.3-1:	A COL applicant that references the NuScale Power Plant design certification will perform a site-specific cost-benefit analysis.	11.3
COL Item 11.3-2:	A COL applicant that references the NuScale Power Plant design certification will calculate doses to members of the public using the site-specific parameters, compare those gaseous effluent doses to the numerical design objectives of 10 CFR 50, Appendix I, and comply with the requirements of 10 CFR 20.1302 and 40 CFR 190.	11.3
COL Item 11.3-3:	A COL applicant that references the NuScale Power Plant design certification will perform an analysis in accordance with Branch Technical Position 11-5 using the site-specific parameters.	11.3
COL Item 11.4-1:	A COL applicant that references the NuScale Power Plant design certification will describe mobile equipment used and connected to plant systems in accordance with ANSI/ANS 40.37, Regulatory Guide 1.143, 10 CFR 20.1406, NRC IE Bulletin 80-10, and 10 CFR 50.34a.	11.4
COL Item 11.4-2:	A COL applicant that references the NuScale Power Plant design certification will develop a site-specific process control program following the guidance of Nuclear Energy Institute (NEI) 07-10A (Reference 11.4-3).	11.4
COL Item 11.5-1:	A COL applicant that references the NuScale Power Plant design certification will describe site-specific process and effluent monitoring and sampling system components and address the guidance provided in ANSI N13.1-2011, ANSI N42.18-2004 and Regulatory Guides 1.21, 1.33 and 4.15.	11.5

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 MSS and the CFWS 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 MSS and CFWS 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.

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.

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Docket No. 52-048

eRAI No.: 9404
Date of RAI Issue: 02/21/2018

NRC Question No.: 10.03.06-6

Follow-up to RAI 9066, Question 10.3.6-2

Below is a follow-up RAI to NuScale's letter, "NuScale Power, LLC Response to NRC Request for Additional Information No. 243 (eRAI No. 9066) on the NuScale Design Certification Application," Question 10.03.06-2 (ADAMS Accession No. ML17326B393). This topic was discussed, and a follow-up RAI was requested by NuScale, during a public meeting on February 7, 2018 (Meeting Notice, ADAMS Accession No. ML18003A665).

The staff agrees with NuScale's statement that DCD Tier 2, FSAR, Sections 3.6.3.1.1 and 5.4.1.2 describe the material composition of the safety-related portion of the steam and feedwater piping that are part of the steam generator system (SGS), decay heat removal system (DHRS), and containment system (CNTS). However, the staff's understanding is that since these portions of steam and feedwater piping are part of the SGS, DHRS, and CNTS, they are also discussed in DCD Tier 2, FSAR, Sections 5.4.1.5 and 6.1.1.

DCD, Tier 2, Section 10.3.6 states that Section 10.3.6 discusses the non-safety related portions of the steam and power conversion systems and cites DCD Tier 2, Table 10.3-5. As written, the last paragraph in DCD Tier 2, FSAR, Section 10.3.6.2, discusses stainless steel or nickel based alloy in the non-safety related portions of the steam and power conversion systems. Per NuScale's RAI response and Table 10.3-5, these systems do not contain stainless steel or nickel based alloys, so the last paragraph in Section 10.3.6.2 is unclear. NuScale's reply did not respond to the staff's question.

Revise Section 10.3.6 to only discuss the non-safety related portions of the steam and power conversion systems since other DCD sections discuss the safety related portions (SGS, DHRS, CNTS) and clarify 10.3.6.2 in regards to stainless steel or nickel-based alloy materials in these non-safety related portions. Differentiating the DCD in this manner would be in accordance with the guidance in SRP 10.3.6 to evaluate materials for systems that perform the same function as steam and feedwater systems.

NuScale Response:

FSAR Tier 2, Section 10.3.6 has been revised to only discuss the non-safety related portions of the steam and power conversion systems as requested by the Staff.

Some of the materials used in the design and fabrication of the systems described in Section 10.3.6 may or may not be comprised of or contain stainless steel or nickel-based materials. Because none of the systems and components described in Section 10.3.6 are Class 2 or 3, details regarding their use and their susceptibility to stress corrosion cracking is beyond the scope of SRP 10.3.6. As such, FSAR Tier 2, Section 10.3.6.2 has been revised to remove the reference to intergranular stress corrosion cracking.

To improve clarity, NuScale removed the last two columns of FSAR Tier 2, Table 10.3-5, “Material Specifications and Corrosion Allowances” and renamed the table to “Power Conversion System Flow-Accelerated Corrosion Program Piping.” The first sentence in Section 10.3.6.2 that referred to the table was revised to improve clarity and intent. The sentence was then moved to Section 10.3.6.3 as it more appropriately aligned with that section’s topic.

Impact on DCA:

FSAR Sections 10.3.6, 10.3.6.2, 10.3.6.3 and Table 10.3-5 have been revised as described in the response above and as shown in the markup provided in this response.

also assist in minimizing iron transport to the steam generators. Additional information on the condensate polishing system is provided in Section 10.4.6.

10.3.5.3 Primary-to-Secondary Leakage

Leakage of primary water into the SG tubes from through-wall tube defects would represent a source of radioactive iodine to the secondary system. The volatility of radioactive iodine is increased by acidic and oxidizing solutions. The secondary side chemicals added (Section 10.3.5.1.2) make the secondary side chemistry both basic and reducing. These conditions suppress the volatility of radioactive iodine species, thus minimizing release through the main condenser evacuation system.

The implications of detecting radioactivity in the secondary side are addressed by the requirements identified in Section 11.5.

10.3.5.4 Chemical Addition System

Equipment is provided to inject controlled quantities of treatment chemicals as part of the secondary water chemistry program. These treatment chemicals are injected into the condensate pump discharge header. See details for the feedwater treatment system in Section 10.4.11.

RAI 10.03.06-1

10.3.6 Steam and Feedwater System Materials

The portion of the steam and power conversion system discussed under this section includes the turbine generator system (including the turbine bypass system and the turbine gland sealing system), the MSS (including extraction steam), the CFWS (including the condensate polishing system), and the auxiliary boiler system. This portion of the steam and power conversion system is outside containment, is non-safety-related and is not relied upon to perform a nuclear safety function.

~~RAI 10.03.06-1~~RAI 10.03.06-6

~~As described in Section 3.6.1, the main steam and feedwater lines inside containment are part of the steam generator system in the NuScale system designation scheme. The MSIVs and FWIVs are inside containment, are part of the containment system, and are safety-related.~~

10.3.6.1 Fracture Toughness

RAI 10.03.06-6

~~The portions of the steam and power conversion system noted under Section 10.3.6 above are nonsafety-related and are not relied upon to perform a nuclear safety function.~~ The quality group for the portions of the steam and power conversion system noted in Section 10.3.6 above is quality group D, thus the piping is non-nuclear safety ASME B31.1 piping. The piping materials for the portions of the steam and power conversion system noted in Section 10.3.6 above meet ASME B31.1 requirements.

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 MSS and the CFWS 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 MSS and CFWS 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.

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.

RAI 10.03.06-6

Table 10.3-5: Power Conversion System Flow-Accelerated Corrosion Program Piping~~Material Specifications and Corrosion Allowances~~

System	Piping segment	~~Corrosion Allowance mils/yr~~	~~Material Specification~~
Condensate and Feedwater System	Condenser to condensate pumps	~~1.0~~	~~SA-335 Grade P11~~
	Condensate pumps to feedwater pumps	~~1.0~~	~~SA-335 Grade P11~~
	Feedwater pumps to the connection on the module platform	~~1.0~~	~~SA-335 Grade P11~~
Main Steam System	Secondary isolation valve to turbine	~~0.4~~	~~SA-335 Grade P11~~
	Turbine extraction lines to feedwater heaters	~~0.4~~	~~SA-335 Grade P11~~
Turbine Generator, Turbine Gland Sealing, and Turbine Bypass Systems	Auxiliary steam to gland seals	~~0.4~~	~~SA-335 Grade P11~~
	Feedwater to gland steam desuperheater	~~1.0~~	~~SA-335 Grade P11~~
	Turbine bypass to condenser	~~0.4~~	~~SA-335 Grade P11~~
	Feedwater to turbine bypass desuperheater	~~1.0~~	~~SA-335 Grade P11~~
Auxiliary Boiler System	Low pressure boiler to turbine building users	~~0.4~~	~~SA-335 Grade P11~~
	High pressure boiler to module heatup system heat exchangers	~~0.4~~	~~SA-335 Grade P11~~
	Auxiliary boiler to condenser deaerator	~~0.4~~	~~SA-335 Grade P11~~

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

eRAI No.: 9404
Date of RAI Issue: 02/21/2018

NRC Question No.: 10.03.06-7

Follow-up to RAI 9066, Question 10.3.6-3

Below is a follow-up RAI to NuScale's letter, "NuScale Power, LLC Response to NRC Request for Additional Information No. 243 (eRAI No. 9066) on the NuScale Design Certification Application," Question 10.03.06-3 (ADAMS Accession No. ML17326B393). This topic was discussed, and a follow-up RAI was requested by NuScale, during a public meeting on February 7, 2018 (Meeting Notice, ADAMS Accession No. ML18003A665).

The staff agrees with NuScale's statement that DCD Tier 2, FSAR, Sections 3.6.3.1.1 and 5.4.1.2 describe the material composition of the safety-related portion of the steam and feedwater piping that are part of the steam generator system (SGS), decay heat removal system (DHRS), and containment system (CNTS). However, the staff's understanding is that since these portions of steam and feedwater piping are part of the SGS, DHRS, and CNTS, they are also discussed in DCD Tier 2, FSAR, Sections 5.4.1.5 and 6.1.1.

NuScale's response states that the portion of the steam and power conversion system discussed in DCD Tier 2, FSAR, Section 10.3.6 is non-safety related. Therefore, NuScale states, "the nonsafety related portions of steam and power conversion systems are beyond the scope of the cleanliness requirements described in Subparts 2.1 and 2.2 of ASME NQA-1."

However, NuScale's response acknowledges that, "the cleanliness of the non-safety-related portions of steam and power conversion systems described in DCD Tier 2, FSAR, Section 10.3.6 could impact the downstream, safety-related portions of the CNTS or DHRS." To justify the above statement, NuScale states:

> NuScale considers the materials of the safety-related portions of the CNTS and DHRS in conjunction with the secondary water chemistry control program to be adequate protection from contamination originating in the non-safety steam and power conversion systems from impacting safety-related portions of the CNTS or DHRS.

In order for the staff to make a safety finding that the CNTS and DHRS can perform their safety-related function, the staff requests that NuScale revise the DCD to include the justification from

their letter.

The staff notes that NuScale's response does not specifically address the SGS. Therefore, in order for the staff to make a safety finding regarding the integrity of the SGS, the staff requests that NuScale revise the DCD to include the justification from their letter. The justification should include how this meets the NuScale SG Program using NEI 97-06 and EPRI Steam Generator Management Program guidance.

NuScale Response:

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.

NuScale has added the above justification to FSAR Section 10.3.6.2 as requested by the Staff.

Impact on DCA:

FSAR Section 10.3.6.2 has been revised as described in the response above and as shown in the markup provided in this response.

10.3.6.2 Materials Selection and Fabrication

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~~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.~~

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~~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.

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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.

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~~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 MSS and the CFWS 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.~~

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The MSS and CFWS 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.

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