



May 17, 2019

Docket No. 52-048

U.S. Nuclear Regulatory Commission  
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**SUBJECT:** NuScale Power, LLC Supplemental Response to NRC Request for Additional Information No. 156 (eRAI No. 9031) on the NuScale Design Certification Application

**REFERENCES:** 1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 156 (eRAI No. 9031)," dated August 08, 2017  
2. NuScale Power, LLC Response to NRC "Request for Additional Information No. 156 (eRAI No.9031)," dated May 16, 2019  
3. NuScale Power, LLC Supplemental Response to "NRC Request for Additional Information No. 156 (eRAI No. 9031)" dated April 22, 2019

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

The Enclosure to this letter contains NuScale's supplemental response to the following RAI Question from NRC eRAI No. 9031:

- 16-2

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](mailto:cfosaaen@nuscalepower.com).

Sincerely,

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Enclosure 1: NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9031



**Enclosure 1:**

NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9031

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

**eRAI No.:** 9031

**Date of RAI Issue:** 08/08/2017

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**NRC Question No.:** 16-2

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose technical specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for TS to be included as part of the operating license for a nuclear power facility. The model standard technical specifications (STS) in the following documents provide NRC guidance on format and content of TS as acceptable means to meet 10 CFR 50.36 requirements. These documents may be accessed using the Agencywide Documents Access and Management Systems (ADAMS) by their accession numbers.

- NUREG-1431, “STS Westinghouse Plants,” Revision 4 (ADAMS Accession Nos. ML12100A222 and ML12100A228)
- NUREG-1432, “STS Combustion Engineering Plants,” Revision 4 (ADAMS Accession Nos. ML12102A165 and ML12102A169)
- NUREG-2194, “STS Westinghouse Advanced Passive 1000 (AP1000) Plants,” Revision 0 (ADAMS Accession No. ML16111A132)

The NRC staff needs to evaluate technical differences in the proposed generic TS (GTS) from applicable provisions in these documents, which are referenced by the DC applicant in Design Control Document (DCD) Tier 2, Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the GTS to ensure adequate protection of public health and safety, and the completeness and accuracy of the GTS Bases.

The NRC staff reviewed the technical report (TR) titled Technical Specifications Regulatory Conformance and Development (TSRCD), TR-1116-52011-NP, dated December 16, 2016 (ADAMS Accession No. ML17005A136), and concludes that it does not fully discuss the



differences in presentation and content of GTS Section 1.1, “Definitions,” compared to equivalent definitions in Section 1.1 in Revision 4 of the STS for Westinghouse plants (NUREG-1431) and CE plants (NUREG-1432), or Revision 0 of the STS for Westinghouse AP1000 plants (NUREG-2194). In the following cases, the staff needs such discussions to complete the review of the NuScale definitions. Accordingly, the staff requests that the applicant revise the TSRCD to justify the noted defined term differences between the NuScale GTS and whichever STS is most appropriate (AP1000 STS, Westinghouse STS, CE STS, or other STS). If a proposed difference is derived from Section 1.1 of the General Electric (GE) economic simplified boiling water reactor (ESBWR) GTS (ADAMS Accession Nos. ML14100A550 and ML14100A552), or the General Electric-Hitachi (GEH) advanced boiling water reactor (ABWR) plant-specific TS for South Texas Project, Unit 3 (STP-3) or Unit 4 (STP-4), the justification should say so.

The STP-4 plant-specific TS may be found in Revision 12 of the combined license (COL) application (COLA), dated April 21, 2015 (ADAMS Accession No. ML15124A421), and in Appendix A of the STP-4 COL (License No. NPF-098; Docket No. 52-013) made effective on February 12, 2016 (ADAMS Accession Nos. ML16033A047 and ML16032A420). Also, see

- COLA Part 2, “FSAR” (ADAMS Accession Nos. ML15124A321 - ML15124A325)
- COLA Part 4, “Technical Specifications” (ADAMS Accession No ML15316A454)
- Design Certification Application (DCA) Revision 4, Part 4, “Technical Specifications,” dated May 12, 1997 (ADAMS Accession No. ML11126A173)

a. ACTUATION LOGIC TEST

Paragraphs (a) and (b) are new and need to be discussed. In particular paragraph (a) states that a purpose of this test is “to test digital computer hardware.” Why is this test limited to hardware? Why not include testing of software?

b. CHANNEL CHECK

Differences are neither identified nor discussed. Also request clarification of Channel Check surveillance description in FSAR Tier 2, Section 7.2.10, pages 7.2-47 & 7.2-48.

c. CHANNEL OPERATIONAL TEST (COT)

Paragraphs (a) and (b) are new and need to be discussed. In particular, paragraph (a) states that a purpose of this test is “to test digital computer hardware.” Why is the COT

limited to hardware? Why not include testing of software? Also, the NuScale definition omits the STS definition's phrase "injection of a simulated or actual signal into the channel as close to the sensor practicable"; explain why this test performance condition is omitted. Finally, explain why only GTS Subsection 3.4.7 specifies a COT surveillance requirement (for the RCS LEAKAGE detection instrumentation gaseous radioactivity monitor on the containment evacuation system gas discharge line). In the May 17-18, 2017, meeting with the staff, NuScale said that self-testing and diagnostics, which is designed into the Highly Integrated Protection System (HIPS) platform, negates a need for manually checking the functioning of the instrument loop between CHANNEL CALIBRATION surveillances. NuScale suggested its position is consistent with digital instrumentation upgrades at Oconee, Wolf Creek, and Diablo Canyon. Hence no COT for reactor trip and SFAS instrument function channels.

However, DCA Part 2, FSAR Tier 2, Section 7.2.15.2, "I&C system testing," states:

*Periodic surveillance testing also verifies the continual self-testing functions. Performance of periodic surveillance testing does not involve disconnecting wires or installation of jumpers for at-power testing. The self-test features maintain separation group and division independence by being performed at within the separation group or within the division.*

The applicant is requested to specify a COT for RTS and ESFAS instrumentation Function channels that is consistent with the above statement and with a Frequency consistent with the COT for RTS and ESFAS instrumentation Functions in the W-AP1000-STC (92 days).

d. DOSE EQUIVALENT XE-133

There is a mistake in the definition – the dose quantity should be effective dose equivalent (EDE), not committed effective dose equivalent (CEDE). The referenced Federal Guidance Report table is correct, but there is no such thing as CEDE for the external dose:

DOSE EQUIVALENT XE-133 shall be that concentration of Xe-133 (microcuries per gram) that alone would produce the same **committed** effective dose equivalent as the

quantity and isotopic mixture of noble gases (Kr-85m, Kr-85, Kr-87, Kr-88, Xe-131m, Xe-133m, Xe-133,

Xe-135m, Xe-135, and Xe-138) actually present. The dose conversion factors used for this calculation shall be those listed in Table III.1 of EPA Federal Guidance Report No. 12, "External Exposure to Radionuclides in Air, Water, and Soil," EPA 402-R- 93-081, September 1993.

The applicant is requested to correct this error.

e. LEAKAGE

Paragraph (a) regarding Identified **LEAKAGE** does not address "LEAKAGE, such as that from seals or valve packing, that is captured and conducted to collection systems or a sump or collecting tank." Explain why these leakage pathways, which are included in the STS definition as stated, are omitted. Also, change "Identified Leakage" to "Identified LEAKAGE" in the title of paragraph (a).

f. LEAKAGE

The definition of LEAKAGE in Section 1.1 of the NuScale generic technical specifications (GTS), paragraph (c) regarding Pressure Boundary LEAKAGE includes a statement, which is not found in the Westinghouse standard TS (W-STTS): "A fault in an RCS component body, pipe wall, or vessel wall is isolated if LEAKAGE through the isolation device is  $\leq 0.5$  gpm per nominal inch of valve size up to a maximum limit of 5 gpm."

The staff questions the need and appropriateness of this deviation from the W-STTS LEAKAGE definition because no Pressure Boundary LEAKAGE should be allowed. The staff notes that the above deviation was included in withdrawn traveler TSTF-534, "Clarify Application of Pressure Boundary Leakage Definition," Revision 0. In its response letter, dated September 4, 2012 (MLxxxcccvvv), to a staff request for supplemental information on TSTF-534, the industry (the Owners Groups' TSTF) provided the requested supplemental information but also chose to withdraw the traveler.

The applicant is requested to withdraw from the GTS and Bases all corresponding changes to W-STTS Section 1.1 and W-STTS Bases Subsection B 3.4.13, proposed in TSTF-534.

Alternatively, the applicant may seek approval of the changes in this traveler, as applied to the NuScale design, taking into consideration the supplemental information in the industry's response letter, by providing justification for the changes that is acceptable to the Mechanical Engineering Branch staff in the Office of New Reactors.

f. OPERABLE-OPERABILITY

The definition for OPERABLE-OPERABILITY includes a reference to "seal water." Explain how this feature is applicable to the NuScale design. Also, should the phrase "separation group" be considered for inclusion in the definition? Lastly, since NuScale includes no Class 1E "emergency electrical power" source or distribution system, discuss how the control room operator should interpret the phrase "when all necessary attendant ... normal or emergency electrical power that [is] required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s)"; especially if the preferred (normal) electrical power source or distribution is unavailable.

g. STAGGERED TEST BASIS

Response time testing in the STS usually has a Frequency "on a STAGGERED TEST BASIS." Even though all such surveillance frequencies are specified by referencing the Surveillance Frequency Control Program (SFCP), this omitted definition is still necessary. See related question about including a value for the base surveillance frequency in all of the surveillance requirements (other than frequencies based on another program, such as "In accordance with the INSERVICE TEST PROGRAM").

In addition, as indicated in the markup of Section 1.1 of the Westinghouse STS (NUREG-1431, Revision 3.1) in TSTF-425, Revision 3, the definition of STAGGERED TEST BASIS should be bracketed, as follows:

[STAGGERED TEST BASIS

A STAGGERED TEST BASIS shall consist of the testing of one of the systems, subsystems, channels, or other designated components during the interval specified by the Surveillance Frequency, so that all systems, subsystems, channels, or other designated

components are tested during n Surveillance Frequency intervals, where n is the total number of systems, subsystems, channels, or other designated components in the associated function.]

h. TRIP ACTUATING DEVICE OPERATIONAL TEST (TADOT)

The applicant is requested to explain why the TADOT definition is not included in the GTS. Note that the AP1000 STS specifies a TADOT for the reactor trip on passive residual heat removal actuation function, manual reactor trip function, the reactor trip breakers (RTBs), all of the ESFAS manual initiation functions, the ESFAS initiation on reactor trip (P-4) function, and the remote shutdown workstation RTB open/closed indication. The staff observes that SR 3.3.4.1, “Perform actuation device operational test,” is the only specified surveillance that appears equivalent to the TADOT of the AP1000 STS. Also, the Bases for SR 3.3.4.1 does not include the statement found in the AP1000 STS Bases for SR 3.3.7.1, “This test shall verify OPERABILITY by actuation of the end devices.” for the reactor trip breakers. The applicant is requested to clarify the SR 3.3.4.1 Bases by indicating how the end device is actuated to demonstrate OPERABILITY of each of the Manual Actuation Functions (1 through 8) listed in Table 3.3.4-1.

i. MODE

The applicant is requested to correct the words behind the acronym “CVCS” from “Chemical Volume and Control System” to “Chemical and Volume Control System” in accordance with Table 1-1, “Acronyms,” in Section 1.3, “Abbreviations,” of TR-1116-52011-NP, “Technical Specifications Regulatory Conformance and Development,” Revision 0.

j. MODULE

The applicant is requested to consider clarifying the definition’s first sentence by replacing “a single modular unit” with “a single nuclear steam supply system” to avoid using the word ‘modular’ because it is similar to the defined term “MODULE.” The applicant is also requested to consider making the following editorial changes in the Specifications and Bases:

- (1) Replace all occurrences of the words “unit” and “units” with the defined terms “MODULE” and “MODULES,” respectfully, throughout the Specifications and Bases. This request does not apply in cases where the term unit(s) appears in quotations, document titles, or when the term refers to a structure, system, or component other than a reactor and its associated containment vessel.
- (2) Replace all occurrences of the words “plant” and “plants” with the defined terms “MODULE” and “MODULES,” respectfully, throughout the Specifications and Bases. This request does not apply in cases where the term plant(s) appears in quotations, document titles, or in relation to title of GTS Section 3.7. This request does not apply in cases where “plant” does not mean a single “MODULE”, but refers to the entire set of MODULES and associated SSCs within a NuScale facility; however, the intended meaning of “plant” in such cases must be clear.

In Part 7 of the DCA, the applicant proposed the following exemption to 10 CFR 50.54(m) by replacing these minimum licensed operator staffing requirements with NuScale-specific requirements. In the following quoted material, the terms “facility,” “unit,” “site,” “module,” and “plant,” are highlighted in blue colored font.

*...NuScale proposes the following provisions be included in Section V, Applicable Regulations, of the NuScale **Power Plant** design certification rule.*

V. *Applicable Regulations*

*\*.\*.\**

C. *A licensee referencing this appendix is exempt from portions of the following regulations:*

1. *Paragraph (m) of 10 CFR 50.54—Conditions of licenses—codified as of [date of NuScale **Power Plant** design certification]. In place,*

*the following requirements shall be conditions of such licenses:*

a. *A senior operator licensed pursuant to part 55 of this chapter shall be present at **the facility** or readily available on call at all times during its operation, and shall be present at **the facility** during initial start-up and approach to power, recovery from an unplanned or unscheduled shutdown or significant reduction in power, and refueling, or as otherwise prescribed in the **facility license**.*

b. *Licensees shall meet the following requirements:*

(1) *Each licensee shall meet the minimum licensed operator staffing requirements in the following table:*

**Minimum Requirements<sup>1</sup> Per Shift for On-Site Staffing of NuScale Power Plants by Operators and Senior Operators Licensed Under 10 CFR Part 55**

Number of nuclear power units operating <sup>2</sup>	Position	One to twelve units
		One control room
None	Senior Operator	1
	Operator	2
One to twelve	Senior Operator	2
	Operator	3

<sup>1</sup>Temporary deviations from the numbers required by this table shall be in accordance with criteria established in the **unit's** technical specifications.

<sup>2</sup>For the purpose of this table, a **nuclear power unit** is considered to be operating when it is fueled, in an operating bay, and has the ability to communicate with a support system as defined by **the unit's** technical specifications.

(2) *Each licensee shall have at **its site** a person holding a senior operator license for **all fueled units** at **the site** who is assigned responsibility for **overall plant operation** at all times there is fuel in **any unit**.*

- (3) *When a nuclear power unit is fueled, in an operating bay, and has the ability to communicate with a support system, as defined by the unit's technical specifications, each licensee shall have a person holding a senior operator license for the nuclear power unit in the control room at all times. In addition to this senior operator a licensed operator or senior operator shall be present at the controls at all times. In addition to the senior operator and licensed operator or senior operator present at the controls, a licensed operator or senior licensed operator shall be in the control room envelope at all times.*
- (4) *Each licensee shall have present, during alteration or movement of the core of a nuclear power unit (including fuel loading, fuel transfer, or movement of a module that contains fuel), a person holding a senior operator license or a senior operator license limited to fuel handling to directly supervise the activity and, during this time, the licensee shall not assign other duties to this person.*

The staff notes that GTS Subsection 5.2.2 is consistent with this exemption request. The applicant is requested to reconcile the need for the definition of MODULE in light of the contextual meanings of the highlighted terms. Also, it seems that including the word “envelope” in *item (3)* is unnecessary; the applicant is requested to consider removing it.

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#### **NuScale Response:**

This supplement addresses two additional items identified and described by the staff in April, 2019.

The definition of OPERABLE - OPERABILITY was modified to more completely reflect its usage in the Technical Specifications and Bases. Additionally, a typographical omission was corrected in the definition of LEAKAGE.



**Impact on DCA:**

The Technical Specifications have been revised as described in the response above and as shown in the markup provided in this response.

1.1 Definitions

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LEAKAGE

LEAKAGE shall be:

a. Identified LEAKAGE

1. LEAKAGE from sources that are both specifically located and known either not to interfere with the operation of leakage detection systems or not to be pressure boundary LEAKAGE, or
2. Reactor Coolant System (RCS) LEAKAGE through a steam generator (SG) to the Secondary System (primary to secondary LEAKAGE),

b. Unidentified LEAKAGE

All LEAKAGE that is not identified LEAKAGE, and

c. Pressure Boundary LEAKAGE

LEAKAGE (except primary to secondary SG LEAKAGE) through a nonisolable fault in an RCS component body, pipe wall, or vessel wall. ~~A fault in an RCS component body, pipe wall, or vessel wall is isolated if LEAKAGE through the isolation device is  $\leq$  0.5 gpm per nominal inch of valve size up to a maximum limit of 5 gpm.~~

MODE

A MODE shall correspond to any one inclusive combination of ~~R~~ reactivity, ~~C~~ condition, ~~R~~ reactor ~~C~~ coolant ~~T~~ temperature, control rod assembly (CRA) withdrawal capability, Chemical and Volume Control System (CVCS) and Containment Flood and Drain System (CFDS) configuration, reactor vent valve electrical isolation, and reactor vessel flange bolt tensioning specified in Table 1.1-1 with fuel in the reactor vessel.

OPERABLE-OPERABILITY

A system, subsystem, separation group, channel, division, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, electrical power, cooling water, lubrication, and other auxiliary equipment that are required for the system, subsystem, separation group, channel, division, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).