RAIO-0518-59927

May 09, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
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11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Supplemental Response to NRC Request for Additional Information No. 196 (eRAI No. 9050) on the NuScale Design Certification Application

REFERENCES:
1. U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 196 (eRAI No. 9050)," dated August 25, 2017
2. NuScale Power, LLC Response to NRC "Request for Additional Information No. 196 (eRAI No. 9050)," dated October 18, 2017

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. 9050:

- 16-18

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 Steven Mirsky at 240-833-3001 or at smirsky@nuscalepower.com.

Sincerely,

Zackary W. Rad
Director, Regulatory Affairs
NuScale Power, LLC

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Enclosure 1: NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9050

Enclosure 1:

NuScale Supplemental Response to NRC Request for Additional Information eRAI No. 9050

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

eRAI No.: 9050
Date of RAI Issue: 08/25/2017

NRC Question No.: 16-18

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.

In the ASA-LCO-A section of Bases Subsection B 3.3.1, the 5th, 6th, and 7th paragraphs below the heading “Design Basis Definition” state:

Permissive and interlock setpoints automatically provide, or allow manual or automatic blocking of trips during MODULE evolutions. They are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the initial conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative initial conditions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

Operational bypasses are addressed in the footnotes to Table 3.3.1-1. They are not otherwise addressed as specific Table entries.

The automatic bypass removal features must function as a backup to manual actions for all safety related trips to ensure the trip Functions are not operationally bypassed when the safety analysis assumes the Functions are OPERABLE.

The applicant is requested to

a. Clarify in Subsections B 3.3.1, B 3.3.2, and B 3.3.3 that the interlocks and permissives associated with each MODULE Protection System (MPS) Instrumentation Function channel, each Reactor Trip System (RTS) Logic and Actuation Function division, and each Engineered Safety Features Actuation System (ESFAS) Logic and Actuation Function division, respectively, must be OPERABLE for the associated Function channel or Function division to be OPERABLE.

b. Clarify in Subsection B 3.3.1 that the required interlocks and permissives are verified to be OPERABLE by the CHANNEL CALIBRATION specified by SR 3.3.1.4 for each associated MPS Instrument Function channel.

c. Clarify in Subsection B 3.3.2 that the required interlocks and permissives are verified to be OPERABLE by the ACTUATION LOGIC TEST specified by SR 3.3.2.1 for each associated RTS Logic and Actuation division.

d. Clarify in Subsection B 3.3.3 that the required interlocks and permissives are verified to be OPERABLE by the ACTUATION LOGIC TEST specified by SR 3.3.3.1 for each associated ESFAS Logic and Actuation Function division.

NuScale Response:

This supplemental response is provided in response to information requested during the March 14, 2018 public meeting addressing issues identified by the staff on February 14, 2018. This information supplements the response provided in RAI 196-9050, Question 16-18, sub-question d, as provided in NuScale letter RAIO-1017-56656, dated October 18, 2017 (ML17291A482).

A description of the O-1 override is added to the Bases of LCO 3.3.1. The override applies to

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portions of the MPS and actuations described in LCO 3.3.3, however no additional changes are proposed because those Bases refer to the description provided in the Bases for LCO 3.3.1. Additionally, some changes were made to Chapter 7, "Instrumentation and Controls," Table 7.1-5, “Module Protection System Interlocks / Permissives / Overrides,“ and Figure 7.1-1k, “ESFAS - Containment System Isolation, Chemical and Volume Control System Interlocks,“ of the FSAR to describe the design and function of the O-1 override.

Impact on DCA:

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

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Table 7.1-5: Module Protection System Interlocks / Permissives / Overrides

Interlock/ Permissive/ Override	Condition for Interlock/Permissive/ Override	Function
N-1 Permissive	Intermediate Range Log Power Permissive: Permissive established when at least 3 of 4 Intermediate Range Log Power channels > approximately 1 decade above the channel lower range limit.	Allows the operator to manually establish an operating bypass of the following: • Reactor Trip on High Source Range Count Rate • Reactor Trip on High Source Range Log Power Rate • Demineralized Water System Isolation actuation on High Source Range Count Rate • Demineralized Water System Isolation actuation on High Source Range Log Power Rate Operating bypasses are automatically removed when permissive condition is no longer satisfied.
N-1 Interlock	Intermediate Range Log Power Interlock: Interlock established when at least 3 of 4 Intermediate Range Log Power channels > approximately 1 decade above the channel lower range limit.	Automatically establishes an operating bypass of the Demineralized Water System Isolation on High Subcritical Multiplication. Operating bypass is automatically removed when Interlock condition is no longer satisfied.
N-2L Permissive	Power Range Linear Power Permissive: Permissive established when at least 3 of 4 Power Range Linear Power Channels > 15% RTP	Allows the operator to manually establish an operating bypass of the following: • Reactor Trip on High-1 Power Range Linear Power. This increases the High Power Range High Linear Power trip to the High-2 trip setpoint) • Demineralized Water System Isolation actuation on High-1 Power Range Linear Power Operating bypasses are automatically removed when permissive condition is no longer satisfied.
N-2L Interlock	Power Range Linear Power Interlock: Interlock established when at least 3 of 4 Power Range Linear Power Channels > 15% RTP	Automatically establishes an operating bypass of the following: • Reactor Trip on High Intermediate Range Log Power Rate • Demineralized Water System Isolation actuation on High Intermediate Range Log Power Rate Operating bypasses are automatically removed when interlock condition is no longer satisfied.

Table 7.1-5: Module Protection System Interlocks / Permissives / Overrides (Continued)

Interlock/ Permissive/ Override	Condition for Interlock/Permissive/ Override	Function
T-4 Interlock	Narrow Range RCS Hot Temperature Interlock: Interlock established when at least 3 of 4 RCS Narrow Range RCS Hot Temperature channels <600° F	Automatically establishes an operating bypass of the following: • Reactor Trip on Low Pressurizer Pressure • CVCS Isolation actuation on Low Pressurizer Pressure • DHRS actuation on Low Pressurizer Pressure • Demineralized Water System Isolation of Low Pressurizer Pressure Operating bypasses are automatically removed when interlock condition is no longer satisfied.
L-1 Interlock	Containment Water Level Interlock: Interlock established when at least 3 of 4 Containment Level Channels > 45′ AND RT-1 is active	Automatically establishes operating bypass of the following trip signals for DHRS actuation: • High Pressurizer Pressure • Low Low Pressurizer Pressure • Low Low Pressurizer Level • High Narrow Range RCS Hot Temperature • Low Low Main Steam Pressure • High Main Steam Pressure • Low Steam Superheat • High Steam Superheat • High Narrow Range Containment Pressure Operating bypasses are automatically removed when interlock condition is no longer satisfied.
F-1 Interlock	RCS Flow Interlock: Interlock established after a set time delay when at least 3 of 4 RCS Flow Channels ≤ 0.0 ft^3/sec and RT-1 has been established	Automatically establishes operating bypass of CVCS isolation on Low Low RCS Flow. Operating bypasses are automatically removed when interlock condition is no longer satisfied.
O-1 Override	Containment System Isolation Override Function: Override established when manual override switch is active and RT-1 permissive is established	Override will allow manual control of the containment flood and drain and CVCS isolation valves from the module control system with an active automatic containment system isolation OR automatic CVCS isolation signal. The override does not affect the CVCS containment isolation valves closure signal when generated on High Pressurizer Level. The Override switch must be manually taken out of Override when the Override, O-1, is no longer needed.

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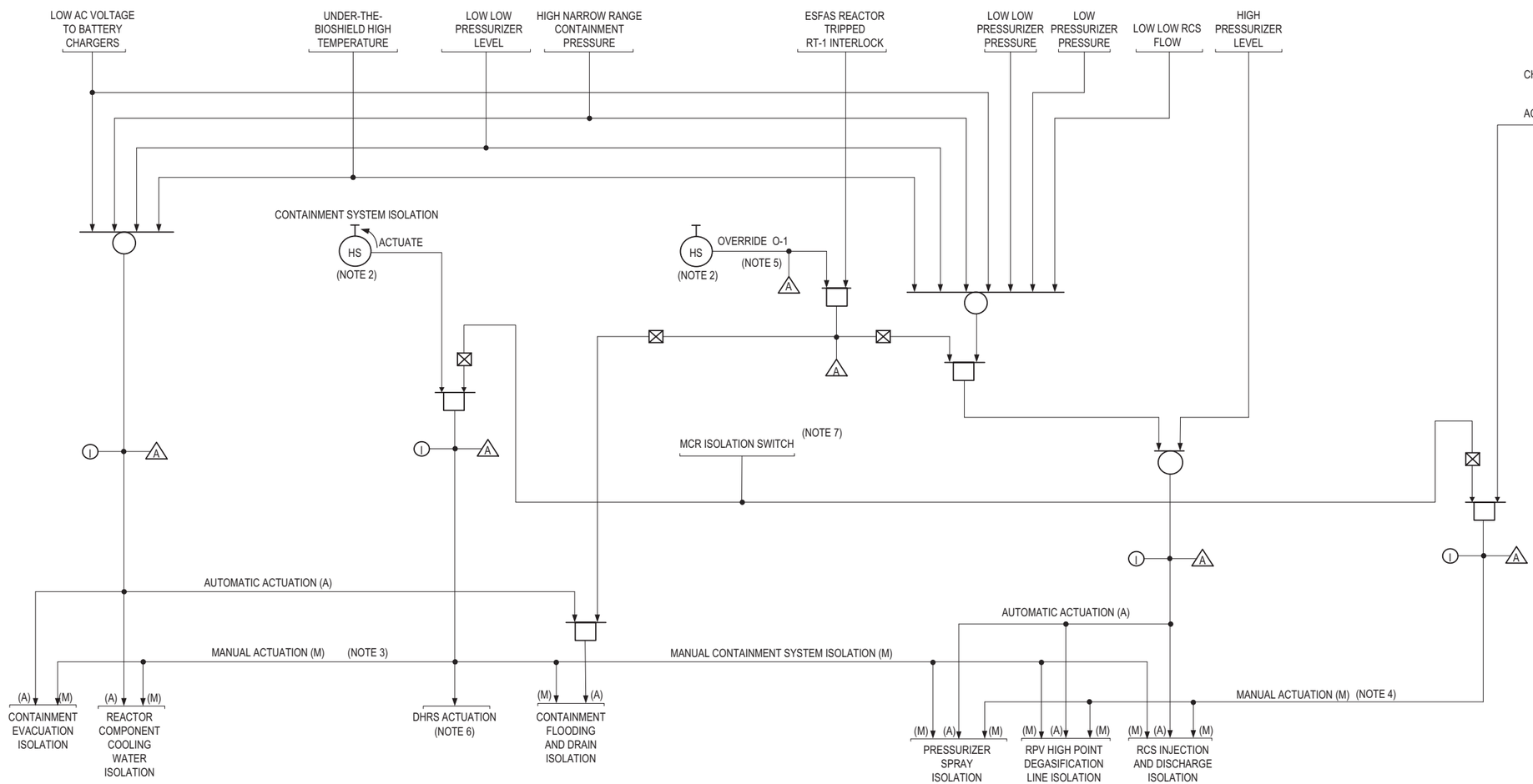
Figure 7.1-1k: ESFAS - Containment System Isolation, Chemical and Volume Control System Interlocks



NOTE 1: LOGIC IS SHOWN FOR DIVISION I ONLY. LOGIC FOR DIVISION II IS THE SAME AS DIVISION I.

NOTE 2: TWO SWITCHES, ONE PER ESFAS DIVISION.

NOTE 3: MANUAL ACTUATION INITIATES CONTAINMENT ISOLATION AT THE DIVISION LEVEL THROUGH THE EIM APL LOGIC.

NOTE 4: MANUAL ACTUATION INITIATES CHEMICAL AND VOLUME CONTROL SYSTEM ISOLATION AT THE DIVISION LEVEL THROUGH THE EIM APL LOGIC.

NOTE 5: OVERRIDE TO ALLOW OPERATORS ADD WATER TO CONTAINMENT DURING CONTAINMENT ISOLATION.

NOTE 6: DECAY HEAT REMOVAL SYSTEM ACTUATION IS DEFINED AS THE SIMULTANEOUS CLOSURE OF THE FWIV, FWRV, MSIV, SECONDARY MSIV AND THE OPENING OF THE DHRS ACTUATION VALVES FOR A GIVEN TRAIN OF DHRS.

NOTE 7: TWO MANUAL ACTUATION ISOLATION SIGNALS, ONE PER RTS/ESFAS DIVISION.

protective function within its associated division. Actuation of either divisional switch is sufficient to complete the safety function. The manual actuation switches are shown in the MPS functional logic diagrams as shown in Figure 7.1-1j through Figure 7.1-1n:

- reactor trip
- ECCS actuation
- decay heat removal actuation
- containment isolation
- demineralized water system isolation
- chemical and volume control system isolation
- pressurizer heater trip
- low temperature over pressure protection

Because the hard-wired manual actuation switch input is downstream of digital components within the MPS, failure of the MPS automatic function does not prevent the manual initiation of the required protective action.

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If enabled by the operator using the safety-related enable nonsafety control switch, the capability for manual component level control of ESF equipment is possible using nonsafety discrete hard-wired inputs from the MCS to the HWM. These signals are then input to the actuation priority logic circuit on the EIM. Any automatic or manual safety-related signal will override the nonsafety signal and is prioritized within the actuation priority logic. For beyond DBEs and for a limited number of actuated equipment, a safety-related override switch can be used to prioritize a nonsafety signal over ~~an~~certain automatic signals. Override switches are provided for the following function.

Override - two switches / one per division

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- The manual override switches override the containment flooding and drain system and chemical and volume control system containment isolation valves.
- The manual override switches will generate an alarm when activated.

See the MPS functional logic diagrams (Figure 7.1-1j through Figure 7.1-1ao). The manual controls are controlled administratively through approved plant procedures.

No manually controlled actions are assumed in the NuScale Power Plant safety analyses in order to accomplish required safety-related functions. No Type A post-accident monitoring variables have been identified as defined in IEEE Std 497-2002 "IEEE Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations," (Reference 7.2-31). The MPS provides outputs of monitored variables to two redundant divisions of the MCR SDIS displays for accident monitoring and to aid in manual operations. MCS human system interface displays in the MCR are also used to support manual controls.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

isolation valves, using the Enable NS Control switch and MCS, with RCS flow below the Low Low RCS Flow setpoint as long as the reactor trip breakers are open.

1. When two or more RCS flow channels are less than or equal to the Low Low RCS Flow setpoint, a reactor trip and CVCSI actuation are generated. When more than two RCS flow channels are less than or equal to the Low Low RCS Flow setpoint for more than a short time delay AND RT-1 is active (both divisional reactor trip breakers open), F-1 is active and an automatic operating bypass is established for the Low Low RCS Flow CVCSI actuation.

2. When RT-1 is not active, or two or more RCS flow channels are greater than the Low Low RCS Flow setpoint for more than a short time delay, the F-1 interlock is not active and the operating bypass is automatically removed.

Containment System Isolation Override, O-1

The containment system isolation override, O-1, is established when the manual override switch (one for each division) in the main control room is in the override position for the respective ESFAS division and the RT-1 permissive is established. The O-1 override allows for manual control of the CVCS containment isolation valves and the containment flood and drain containment isolation valves, from the module control system with an active automatic containment system isolation or automatic CVCS isolation signal present. The override does not affect the CVCS containment isolation valves closure signal when the isolation signal is generated on High Pressurizer Level. The O-1 override switch must be manually taken out of override when the override O-1 is no longer needed. The override is automatically removed if the RT-1 permissive is removed.

Reactor Trip System and ESFAS Functions

The specific safety analyses applicable to each protective function are identified below: