

Public Teleconference Between NuScale Power, LLC, and  
Office of Nuclear Reactor Regulation,  
Technical Specifications Branch (STSB), and  
Electrical and Instrumentation and Controls Branch A (EICA)

Wednesday June 12, 2019

1:30 PM --- 3:30 PM

**SELECTED OPEN ITEMS**

1. RESPONSE TIME

- a. Unresolved RAI questions
  - RAI 506-9614, Question 16-50
  - RAI 512-9634, Question 16-60, Subquestion 38 {16-60-44}
  - RAI 520-9642, Question 16-65
- b. Defined Terms and Definitions
  - RTS RESPONSE TIME
  - ESF RESPONSE TIME
  - CHANNEL RESPONSE TIME
  - ACTUATION RESPONSE TIME
  - TOTAL RESPONSE TIME = CHANNEL RESPONSE TIME + MPS maximum digital time response + ACTUATION RESPONSE TIME
- c. COL Item 16.1-3
  - Channel sensor response time allocation - bracketed sentence in Bases for SR 3.3.1.3
  - Is value of each maximum digital time response allocation for each RPS and ESFAS Function approved in DCA review or COL application review?
  - The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured.
  - **In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.**
- d. Affected Surveillances
  - SR 3.3.1.3
  - SR 3.3.2.2
  - SR 3.3.3.2
  - SR 3.4.6.2
  - SR 3.4.10.2
  - SR 3.5.1.2
  - SR 3.5.2.5
  - SR 3.6.2.3
  - SR 3.7.1.2
  - SR 3.7.2.2

2. EXCEPTIONS TO SRS FOR BREAKERS AND VALVES WHEN IN ACTUATED POSITIONS

- a. Closed/open to comply with ACTIONS but open/closed under administrative controls
- b. Can't meet SR, placed in actuated position, but placed in normal position under administrative controls
- c. RAI 197-9051, Question 16-28
- d. Reliance on operator manual action when in non-actuated position under administrative controls for multiple valves, breakers
- e. Class 1E isolation devices

3. In response (ML18347A619) to RAI 506-9614 (ML18289A751), Question 16-52, the markup of Subsections 3.7.1 and B 3.7.1 needs the following corrections (also see RAI 512-9634 (ML18333A021), Question 16-60, Subquestion 34); the staff will verify implementation of these corrections to close the confirmatory item under Question 16-52:

3.7.1

- Condition A NOTE: remove “inoperable” so the Note says: “Separate Condition entry is allowed for each valve.”
- Condition A: remove “required” so the Condition says: “One or more valves inoperable.”
- Required Action A.2 NOTE 1: Insert “devices” so the Note says: “Isolation devices in high radiation areas may be verified by use of administrative means.”

B 3.7.1 Actions section, Action A:

- First paragraph, first sentence: change “this conditions is” to “Condition A is”;
- Second paragraph, second sentence: change “effected” to “affected”
- Third paragraph, first sentence: change “exit the LCO” to “exit the Condition”
- Fourth paragraph: change “The time is reasonable” to “The 72 hour Completion Time is reasonable”
- In general, use title case for Condition, Required Action, and Completion Time throughout the Bases.
- The staff recommends that a technical editor review the entire Bases to improve grammar, style, and readability. The technical editor should keep in mind STS writer’s guide conventions on capitalization, no use of hyphens in multiple word adjectives, and use of hard spaces to keep technical phrases on same line.

B 3.7.1 Actions section, Action B:

- Third paragraph, second sentence: change “the inoperable isolation valve only affect the capability” to “the inoperable isolation **valves** only affect the capability”
- Fourth paragraph: change “The time is reasonable” to “The 8 hour Completion Time is reasonable”
- In general: instead of saying: “a closed or otherwise isolated inoperable isolation valve’s safety function is being performed” say this: “a closed or otherwise isolated inoperable isolation valve’s safety function is **accomplished**”
- Fifth paragraph, first sentence: change “its safety function is being performed” to “the inoperable isolation valves’ safety functions are accomplished”

B 3.7.1 Actions section, Action C:

- First paragraph, third sentence: Remove unnecessary phrase “using Required Action C.1 and C.2”
- Second paragraph: replace “must be placed” with “to be”
- Fourth paragraph, first sentence: replace “based operating” with “based on operational”

4. The proposed surveillance column Note of SR 3.3.3.2 (“Verify pressurizer heater breaker ACTUATION RESPONSE TIME is within limits. | 24 months”), says “Not required to be met for pressurizer heater breakers that are open or closed under administrative control.” The Bases for this Note says:

A Note provides an allowance for the SR so that it does not need to be met for pressurizer heater breakers that are open in their actuated position. This allowance permits continued operation when a pressurizer heater breaker is open because it has performed it’s the breaker’s safety function is accomplished. The note also allows intermittent closure of the breakers under administrative control when the SR is not met *because the slowly occurring nature of the phenomena the automatic opening of the heater breakers mitigate.*

Discuss the last phrase denoted by italics. Table 3.3.1-1 lists many MPS instrument Functions that initiate the pressurizer heater trip ESF Function. Are all of the associated postulated events and AOOs slowly occurring?

<p>o In the Bases phrase, "channel actuation response time," the word "actuation" is unnecessary and inconsistent with SR 3.3.1.3, which uses the phrase "channel response time."</p>	<p>The response to Question 16-65 removed the word "actuation" from the first paragraph of the Bases for SR 3.3.1.3, as suggested by the staff. So, the first two sentences state (Quoted sentences with underlined and lined-through shaded text indicate additional staff recommended editorial changes):</p> <p style="padding-left: 40px;">This SR <del>3.3.1.3</del> verifies that the individual channel <del>actuation</del> response times are less than or equal to the maximum values assumed in the <u>safety accident</u> analysis. The channel <del>actuation</del> response time is the time from when the process variable exceeds its setpoint until the output from the channel analog logic reaches the input of the MPS digital logic.</p> <p>The response justified these changes with the following explanation:</p> <p style="padding-left: 40px;"><i>The channel response time verified by SR 3.3.1.3 spans from the process sensor to the output of the analog to digital converter. If a channel's design performs a digital comparison to evaluate a trip setpoint then that evaluation is within the scope of the digital response time described in FSAR Section 7.1.4 and Section 7.0 of TR-1015-18653-P-A. If a channel includes analog processing or comparison before the analog to digital converter, then the analog processing and comparison would be within the scope of the channel response time. Practically, there may be no difference if procedures use a channel response time measured from the sensor conservatively through a digital comparison device - however the channel response time is as described from the sensor to the output of the channel's analog to digital converter.</i></p> <p>In view of this explanation, and because the meaning of the phrase "analog logic" is unclear, the staff suggests revising the second sentence (as quoted above) of the first paragraph, as shown by shading in the following markup. (In a separate letter, which is taken by the staff as supeseding the RAI question response, the applicant moved this sentence from the Bases to GTS Section 1.1 to be the definition of a new defined term, CHANNEL RESPONSE TIME.):</p> <p style="padding-left: 40px;">The channel <del>actuation</del> response time is the time from when the process variable exceeds its setpoint until the <u>channel analog signal</u> output <del>from the channel analog logic</del> reaches the input of the MPS digital logic.</p> <p>The Question 16-65 response also stated:</p> <p style="padding-left: 40px;"><i>The phrase "response time" is used in different contexts. Editorial clarifications were made to the Bases of SR 3.3.1.3 to differentiate between channel response times, actuation response times, and response times in general.</i></p> <p>The Question 16-65 response accordingly inserted "actuation" in the last sentence of the second paragraph, and inserted "channel" in the first sentence of the third paragraph, respectively, as follows:</p> <p style="padding-left: 40px;">The <u>actuation</u> response time testing of the RTS and ESFAS divisions are tested in accordance with LCO 3.3.2 and <u>LCO 3.3.3, respectively</u>.</p> <p style="padding-left: 40px;">SR 3.3.1.3 is modified by a Note indicating that neutron detectors are excluded from <u>channel</u> response time testing.</p> <p>The staff observes that NuScale's May 16<sup>th</sup> letter includes proposed changes to response time SRs and associated Bases that appear to supersede many of the changes proposed by the response to Question 16-65.</p> <p>In particular, NuScale's letter further revised SR 3.3.1.3 and the Bases for SR 3.3.1.3, as follows:</p> <ul style="list-style-type: none"> <li>• SR 3.3.1.3 <div style="margin-left: 100px;"> <p>-----NOTE-----</p> <p>Neutron detectors are excluded from <del>response time</del> <u>CHANNEL RESPONSE TIME</u> testing.</p> <p>-----</p> <p>Verify <del>channel required response time</del> <u>CHANNEL RESPONSE TIME</u> is within limits.   In accordance with the Surveillance Frequency Control Program</p> </div> </li> </ul>
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(Note that the above staff-suggested edit of the Note is for consistency with the below proposed change to the first sentence of the third paragraph of the Bases for SR 3.3.1.3.)

- SR 3.3.1.3 Bases first paragraph, first two sentences:

This SR ~~3.3.1.3~~ verifies that the individual ~~channel actuation response times~~ CHANNEL RESPONSE TIMES are less than or equal to the maximum values assumed in the safety ~~accident~~ analysis. ~~The channel actuation response time is the time from when the process variable exceeds its setpoint until the output from the channel analog logic reaches the input of the MPS digital logic.~~

(Note that the above staff-suggested edit is an editorial correction.)

- SR 3.3.1.3 Bases second paragraph:

~~Response time~~ CHANNEL RESPONSE TIME may be verified by any series of sequential, overlapping or total channel measurements, including allocated sensor response time, such that the ~~response time~~ CHANNEL RESPONSE TIME is verified. [Allocations for sensor response times may be obtained from records of test results, vendor test data, or vendor engineering specifications.] The ~~response time~~ verification of ACTUATION RESPONSE TIMES ~~testing~~ of the RTS and ESFAS divisions ~~and verification of the TOTAL RESPONSE TIMES are tested performed~~ in accordance with LCO 3.3.2, "Reactor Trip System Logic and Actuation," and LCO 3.3.3, "Engineered Safety Features Actuation System Logic and Actuation," LCO 3.4.6, "Chemical and Volume Control System Isolation Valves," LCO 3.4.10, "Low Temperature Overpressure Protection (LTOP) Valves," LCO 3.5.1, "Emergency Core Cooling System (ECCS)," LCO 3.5.2, "Decay Heat Removal System (DHR)," LCO 3.6.2, "Containment Isolation Valves," LCO 3.7.1, "Main Steam Isolation Valves (MSIVs)," and LCO 3.7.2, "Feedwater Isolation."

(Note that the above staff-suggested edits are editorial for consistency and improved grammar, and technical for inclusion of the staff proposed definition of TOTAL RESPONSE TIME.)

- SR 3.3.1.3 Bases third paragraph, first sentence:

SR 3.3.1.3 is modified by a Note indicating that neutron detectors are excluded from ~~response time~~ CHANNEL RESPONSE TIME testing.

In its May 16<sup>th</sup> letter, NuScale also proposed a new defined term and definition in GTS Section 1.1 based on a mark up of the second sentence of the first paragraph of the DCA Part 4, Revision 2, Bases for SR 3.3.1.3, as follows; the shaded text in the following mark up denotes the above staff-suggested edit of the second Bases sentence.):

CHANNEL RESPONSE  
TIME

The ~~channel actuation response time~~ is ~~the time from when the process variable exceeds its setpoint until the~~ channel analog signal ~~output from the channel analog logic reaches the input of the digital portion of the MPS~~ Module Protection System digital logic.

Similarly, NuScale also proposed to use the language of the SR 3.3.2.3 Bases first paragraph, third sentence, and SR 3.3.3.2 Bases first paragraph, third sentence, to create a new defined term and definition in GTS Section 1.1, as follows:

ACTUATION RESPONSE  
TIME

The time from when the Module Protection System equipment interface module output initiates an analog actuation signal until the actuated valves or breakers reach their final actuated position.

In the response to Question 16-65, the applicant also revised the SR 3.3.1.3 Bases second paragraph by placing the "allowance" to allocate sensor response times in

square brackets (this was also reflected in the May 16<sup>th</sup> letter's mark up of the SR 3.3.1.3 Bases):

[Allocations for sensor response times may be obtained from records of test results, vendor test data, or vendor engineering specifications.]

A COL applicant may, or may not, choose to seek NRC approval of sensor response time allocations. Accordingly, NuScale proposed a new COL action item, COL Item 16.1-3, specifically for this Bases statement, in DCA Part 2, Tier 2, FSAR Section 16.1.1, which states:

A COL applicant that references the NuScale Power Plant design certification, and uses allocations for sensor response times based on records of tests, vendor test data, or vendor engineering specifications as described in the Bases for Surveillance Requirement 3.3.1.3, will do so for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.

If no sensor response time allocations are approved by the NRC as part of a COL application review, the staff understands that the COL applicant would omit the bracketed sentence in the Bases for SR 3.3.1.3. The response to Question 16-65 also added COL Item 16.1-3 and corresponding changes to DCA Part 2, Tier 2, FSAR Table 1.8-2, "Combined License Information Items."

The staff is concerned that the applicant's proposed CHANNEL RESPONSE TIME definition does not include the applicable content of the W-STs definitions of ESF RESPONSE TIME and RTS RESPONSE TIME; the following quotations denote that content by italics. The following quotations also lineout portions of the definitions which do not apply to the NuScale design:

Westinghouse STS Section 1.1 response time definitions:

ESF RESPONSE TIME	The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, <del>pump discharge pressures reach their required values, etc.</del> ). <del>Times shall include diesel generator starting and sequence loading delays, where applicable.</del> <i>The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.</i>
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RTS RESPONSE TIME	The RTS RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its RTS trip setpoint at the channel sensor until <del>loss of stationary gripper coil voltage</del> <u>the reactor trip breakers are open</u> . <i>The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.</i>
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The staff understands that NuScale is seeking NRC approval of the MPS maximum digital time response value as a part of the NuScale design certification; this value would be considered Tier 2 information in Part 2 of the DCA and would

accordingly be subject to the change controls specified in Section VIII of the NuScale design certification Appendix to 10 CFR Part 52.

The staff suggests adding the following defined term and definition to GTS Section 1.1, to be used in combination with the proposed defined terms of CHANNEL RESPONSE TIME and ACTUATION RESPONSE TIME:

**TOTAL RESPONSE TIME**

The TOTAL RESPONSE TIME shall be the sum of CHANNEL RESPONSE TIME, MPS maximum digital time response, and ACTUATION RESPONSE TIME. *The TOTAL RESPONSE TIME may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.*

By including the last two sentences, which are based on the W-STs RTS RESPONSE TIME and ESF RESPONSE TIME definitions, in this TOTAL RESPONSE TIME definition, the staff concludes that the applicant's proposed COL Item 16.1-3 would not be needed for a COL applicant to seek NRC approval of sensor response time allocations.

This proposed definition would then be used in the statement of SR 3.3.1.3, SR 3.3.2.2 and SR 3.3.3.2, as follows:

• SR 3.3.1.3

-----NOTE-----  
Neutron detectors are excluded from ~~response time~~  
CHANNEL RESPONSE TIME testing.

Verify CHANNEL RESPONSE TIME of each MPS instrumentation Function channel is within limits. | In accordance with the Surveillance Frequency Control Program

• SR 3.3.2.2

Verify ACTUATION RESPONSE TIME of each reactor trip breaker and TOTAL RESPONSE TIME of each reactor trip Function division are ~~is~~ within limits. | In accordance with the Surveillance Frequency Control Program

• SR 3.3.3.2

-----NOTE-----  
Not required to be met for pressurizer heater breakers that are open or closed under administrative controls.

Verify ~~pressurizer heater breaker~~ ACTUATION RESPONSE TIME of each pressurizer heater breaker and TOTAL RESPONSE TIME of each pressurizer heater trip Function division are ~~is~~ within limits. | In accordance with the Surveillance Frequency Control Program

Since the May 16<sup>th</sup> letter also proposed to use the defined term ACTUATION RESPONSE TIME in the statements of SRs that verify valve actuation times, the staff proposes that such SRs also require verifying the ESF TOTAL RESPONSE TIME of each division of each associated ESFAS Logic and Actuation Function is within limits, as follows:

• SR 3.4.6.2

-----NOTE-----  
Not required to be met for valves that are closed or open under administrative controls.

Verify ~~the~~ isolation ACTUATION RESPONSE TIME of each automatic power operated CVCS valve and TOTAL RESPONSE TIME of each CVCS isolation Function division

	<p><del>are is</del> within limits.   In accordance with the INSERVICE TESTING PROGRAM</p>
• SR 3.4.10.2	<p>Verify <del>the</del> open ACTUATION RESPONSE TIME of each RVV and TOTAL RESPONSE TIME of each LTOP Function division <del>are is</del> within limits.   In accordance with the INSERVICE TESTING PROGRAM</p>
• SR 3.5.1.2	<p>-----NOTE----- Not required to be met for valves that are open. -----</p> <p>Verify <del>the</del> open ACTUATION RESPONSE TIME of each RVV and RRV and TOTAL RESPONSE TIME of each ECCS Function division <del>are is</del> within limits.   In accordance with the INSERVICE TESTING PROGRAM</p>
• SR 3.5.2.5	<p>Verify <del>the</del> open ACTUATION RESPONSE TIME of each DHRS actuation valve and the TOTAL RESPONSE TIME of each DHRS Function division <del>are is</del> within limits.   In accordance with the INSERVICE TESTING PROGRAM</p>
• SR 3.6.2.3	<p>-----NOTE----- Not required to be met for automatic containment isolation valves that are closed to comply with ACTIONS, that are open under administrative controls. -----</p> <p>Verify <del>the</del> isolation ACTUATION RESPONSE TIME of each automatic containment isolation valve and TOTAL RESPONSE TIME of each containment isolation Function division <del>are is</del> within limits.   In accordance with the INSERVICE TESTING PROGRAM</p>
• SR 3.7.1.2	<p>Verify isolation ACTUATION RESPONSE TIME of each MSIV and MSIV bypass valve and TOTAL RESPONSE TIME of each secondary system isolation Function division <del>are is</del> within limits.   In accordance with the INSERVICE TESTING PROGRAM</p>
• SR 3.7.2.2	<p>Verify isolation ACTUATION RESPONSE TIME of each FWIV and FWRV and TOTAL RESPONSE TIME of each secondary system isolation Function division <del>are is</del> within limits.   In accordance with the INSERVICE TESTING PROGRAM</p>
	<p>Alternatively, verification of TOTAL RESPONSE TIME of each ESF Function for each associated ESFAS Logic and Actuation Function division could be specified in GTS Subsection 3.3.3 as a new separate SR, as follows:</p>
• SR 3.3.3.5	<p>Verify TOTAL RESPONSE TIME of each ESF Function associated with each ESFAS Logic and Actuation Function division is within limits.   In accordance with the Surveillance Frequency Control Program and the INSERVICE TESTING PROGRAM</p>
	<p>Pending achieving alignment with NuScale about response time testing definitions and surveillances, and associated Bases, this subject remains open under Question 16-50.</p>