NuScaleDCRaisPEm Resource

From:	Cranston, Gregory
Sent:	Thursday, November 29, 2018 8:36 AM
To:	Request for Additional Information
Cc:	Lee, Samuel; Cusumano, Victor; Harbuck, Craig; Tesfaye, Getachew; Chowdhury, Prosanta; NuScaleDCRaisPEm Resource
Subject:	Request for Additional Information No. 512 eRAI No. 9634 (16)
Attachments:	Request for Additional Information No. 512 (eRAI No. 9634).pdf

Attached please find NRC staff's request for additional information (RAI) concerning review of the NuScale Design Certification Application.

Please submit your technically correct and complete response by January 21, 2019, RAI to the NRC Document Control Desk.

If you have any questions, please contact me.

Thank you.

Hearing Identifier: NuScale_SMR_DC_RAI_Public
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Request for Additional Information No. 512 (eRAI No. 9634)

Issue Date: 11/29/2018
Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 16 - Technical Specifications
Application Section: Part 2 FSAR Chapter 16; Part 4 Technical Specifications and Bases

QUESTIONS

16-60

The NRC staff identified issues in Revision 1 of the DCA, mostly in Part 4 which contains the generic TS and Bases, regarding grammar, spelling, typographical errors, and conformance with improved TS writer's guide conventions concerning style, format, and content; such items are considered editorial or administrative in nature. Satisfactory disposition of editorial comments will result in high quality generic TS and Bases that are technically accurate, clear, and internally consistent, and therefore easily useable for controlling operation of NuScale units in a safe manner.

Subsequent to the initial draft of the following sub-questions, the staff discussed the draft sub-questions with the applicant in a public meeting conference call on November 6, 2018 (ML183ddAnnn). Also, some draft sub-questions were resolved in Revision 2 of the generic TS and Bases. The results of the meeting and the comparison with Revision 2 are indicated before each affected sub-question.

1. In Revision 2 of DCA part 2, FSAR Section 16.1, on Page 16.1-8: Table 16.1-1: "Surveillance Frequency Control Program Base Frequencies," is missing rows for SR 3.4.10.1 and SR 3.4.10.3.

2. A response is not required because this item is already included in and will be addressed in the response to RAI 506-9614, Question 16-59. In Revision 2 of DCA part 2, FSAR Section 15.1.1.2 says "In a decrease in feedwater temperature event that results in a reactor trip, the subsequent actuation of the decay heat removal system (DHRS) is credited with maintaining reactor cooling. The MPS signals credited for DHRS actuation are low PZR pressure, high steam superheat, low PZR level, high steam pressure, or high hot leg temperature." The listing of Low PZR level is a typo, because low low PZR level initiates DHRS.

3. A response is not required because this item is being referred to the NRO technical branch responsible for reviewing FSAR Section 6.4. Markup of Page 6.4-1 of FSAR Section 6.4 in Letter dated June 1, 2018, follow-up to NRC-NuScale public meetings held on 2/26/2018 and 4/3/2018. (Also see response to RAI 01-1.) NuScale is requested to explain why it proposed adding the sentence, "No operator actions are required or credited to mitigate the consequences of design basis events, before or after 72 hours." This sentence is included in Revision 2 of DCA part 2, FSAR Section 6.4.

4. A response is not required because this item is being referred to the NRO technical branch responsible for reviewing FSAR Section 6.4. Markup of Pages 6.4-9 and 6.4-14 of FSAR Section 6.4 in Letter dated June 1, 2018, follow-up to NRC-NuScale public meetings held on 2/26/2018 and 4/3/2018. (Also see response to RAI 5.2.5-7, RAI 6.4-3.) Regarding COL Item 6.4-5 and Table 6.4-4, "CRHS Testing"; in the next to last row, the "Parameter" field says "CRHS supply actuation valves and CRE pressure relief valves operation" and the "Acceptance Criteria" field says "Stroke open on CRHS actuation signal." This information is unchanged in Revision 2 of DCA part 2, FSAR Table 6.4-4. NuScale is requested to provide a more suitable acceptance criterion for the "CRE pressure relief valves operation" parameter.

5. Revision 2 of DCA part 4, GTS page 1.1-4, definition of MODE: The applicant is requested to clarify the definition of MODE, as indicated by markup:

> A MODE shall correspond to any one inclusive combination of ~~Reactivity Condition~~ reactivity condition, ~~Reactor Coolant Temperature~~ reactor coolant 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.

6. In Revision 2 of DCA part 4, the GTS definition of Mode 3 in Table 1.1-1 also includes meeting one or more of three conditions, as specified by table footnote (a):

> (a) Any CRA capable of withdrawal, any CVCS or CFDS connection to the module not isolated.

The staff understands that this footnote means the unit is in Mode 4 when (i) no CRA is capable of being withdrawn, and (ii) all CVCS and CFDS module connections are isolated. The applicant is requested to point to or provide a clear description of how each module connection must be isolated for the unit to enter Mode 4.

7. Please coordinate the response to this sub-question with the response to similar Sub-question 37.3. The applicant is requested to explain whether the N-2L– Power Range Linear Power Permissive, which allows manually bypassing of MPS Functions 3.3.1.**1.a** and 3.3.1.**1.b** with Thermal Power > 15% RTP, should be referred to as the N-2L interlock when it automatically enables these Functions at ≤ 15% RTP. The staff needs to ensure that the terms 'permissive' and 'interlock' are used consistently when referring to MPS operating bypass and enable Functions.

8. No response required because Revision 2 of DCA part 2, on FSAR page 7.1-110, has already corrected the following error, by changing "THOT" to "TCOLD." The staff noted that on Figure 7.1-1n, in FSAR Revision 1, the table describing the active and not-active state of the T-1 interlock mistakenly lists the T-1 ACTIVE status as when "3oo4 **THOT** INPUTS > T-1 SETPOINT" and the T-1 NOT ACTIVE status as when "2oo4 **THOT** INPUTS ≤ T-1 SETPOINT." The staff believes that "THOT" should be "WR RCS TCOLD," or just "TCOLD."

9. A separate response is not required because the response to this sub-question will be provided with a supplemental response to RAI 9034, Question 16-30, Sub-question a.1. The proposed definition of SDM in Revision 2 of DCA part 4, Section 1.1, departs from the W-STS definition as indicated by the following mark up of the W-STS definition:

> SDM shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming:
>
> a. Moderator temperature is 420°F; and
>
> b. All ~~rod cluster control assemblies (RCCAs)~~ CRAs are fully inserted except for the single ~~RCCA~~ assembly of highest reactivity worth, which is assumed to be fully withdrawn. However, with all ~~RCCAs~~ CRAs verified fully inserted by two independent means, it is not necessary to account for a stuck ~~RCCA~~ CRA in the SDM calculation. With any ~~RCCA~~ CRA not capable of being fully inserted, the reactivity worth of ~~the RCCA~~ the affected CRA must be accounted for in the determination of SDM~~, and~~
>
> ~~b. In MODES 1 and 2, the fuel and moderator temperatures are changed to the [nominal zero power design level]~~.

The change in the order of parts a and b, and the use of CRA instead of RCCA, are editorial administrative changes to reflect NuScale nomenclature and the applicant's preferred presentation. Since the acronym "CRA" is previously defined in the definition of "MODE," not defining it upon its first use in this definition, is acceptable. However, the staff suggests defining the acronym again for clarity. Regardless, subsequent use of the word "assembly" and "assemblies" should be changed to "CRA" and "CRAs" to conform to the improved TS writer's guide convention concerning acronyms. The W-STS definition does not appear to consider more than one RCCA to be incapable of being fully inserted; however, the W-AP1000-STS SDM definition does consider more than one uninsertable RCCA. Revision 1 of the DCA contains no justification of why NuScale needs to consider more than one CRA that cannot be fully inserted. Finally, the DCA does not justify using the minimum temperature for criticality, 420°F, in place of the statement, "In MODE 1, the fuel and moderator temperatures are changed to the [nominal zero power design level]." (Note that NuScale MODE 1 corresponds to W-STS MODES 1 and 2; and NuScale MODE 2 corresponds to W-STS MODE 3 with RCS average temperature ≥ 420°F.) The applicant is requested to resolve these issues by providing the noted missing justifications, provided they are acceptable to the staff, and by editing the SDM definition to state:

> SDM shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming:
>
> a. Moderator temperature is 420°F; and

b. All control rod assemblies (CRAs) are fully inserted except for the single CRA of highest reactivity worth, which is assumed to be fully withdrawn. However, with all CRAs verified fully inserted by two independent means, it is not necessary to account for a stuck CRA in the SDM calculation. With any CRA not capable of being fully inserted, the reactivity worth of the affected CRA must be accounted for in the determination of SDM.

10. A response is not required because in the November 6, 2018, public meeting conference call, the applicant stated the requested changes will be incorporated in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, GTS page 1.2-2, Example 1.2-1; and page 1.2-3, Example 1.2-2:

10.1 Include 0.1 inch left and right margins in Actions table Condition cells, Required Action cells, and Completion Time cells, including in the header row.

10.2 Column titles in Actions table header row should be center aligned.

10.3 In Example Actions tables, the staff recommends that the Condition column be **1.42** inches wide, Required Action column be **1.93** inches wide, and Completion Time column be **1.65** inches wide. Actions table should be **5.00** inches wide.

10.4 In Example Actions tables, the staff recommends that the hanging indentation for Condition statements be **0.2** inches, and Required Action statements be **0.3** inches, which are less than the 0.26 inches and 0.55 inches used in the regular Actions tables. <u>There is one exception</u>. In Example 1.2-2, which shows a second and third level of nesting of logical connectors; the staff recommends using a **0.55** inch hanging indentation for all action statements.

10.5 In Example 1.2-2, Required Action column, the second and third levels of nesting of the logical connectors should be left aligned with second and third periods, respectively, of the preceding Required Action designator.

11. A response is not required because in the November 6, 2018, public meeting conference call, the applicant stated the requested change will be incorporated in Revision 3 of DCA part 4. GTS page 1.3-2, second paragraph, list item "a" --- Applicant is requested to underline the word "first" to match STS presentation.

12. A response is not required because in the November 6, 2018, public meeting conference call, the applicant stated the requested changes will be incorporated in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, GTS page 1.3-3 through page 1.3-10, Applicant is requested to apply comments 10.1, 10.2, 10.3, and 10.4 to Examples 1.3-1, 1.3-2, 1.3-3, 1.3-4, 1.3-5, 1.3-6, and 1.3-7.

13. A response is not required because in the November 6, 2018, public meeting conference call, the applicant stated the requested change will be incorporated in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, GTS page 1.3-9, In the discussion of Example 1.3-6, the second sentence should begin as indicated: "The initial 8 <u>hour</u> ~~hours~~ interval of Required Action A.1 begins ..."

14. A response is not required because in the November 6, 2018, public meeting conference call, the applicant stated the requested changes will be incorporated in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, GTS page 1.4-2 through page 1.4-7, in Example Surveillance Requirements tables, Include 0.1 inch left and right margins in Surveillance column and Frequency column, including the header row.

15. A response is not required because in the November 6, 2018, public meeting conference call, the applicant stated the requested changes will be incorporated in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, GTS page 2.0-1, SL 2.1.1.2: In the expression

≤ 4901 - (1.37E-3 x Burnup, MWD/MTU) °F

use the math multiplication ascii character symbol "×" in place of the lower case ascii character for the letter "x" and add braces, as shown:

≤ {4901 - (1.37E-3 × Burnup, MWD/MTU)} °F

16. A response is not required because in the November 6, 2018, public meeting conference call, the applicant stated the requested changes will be incorporated in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, GTS page 3.1.3-2, Note for third Frequency of SR 3.1.3.2 must end with a period; "Only required when projected end of cycle MTC is not within limit."

17. A response is not required because in the November 6, 2018, public meeting conference call, the applicant stated the requested changes will be incorporated in Revision 3 of DCA part 2. In Revision 2 of DCA part 2, FSAR Tier 2 page 3.9-40, last paragraph of Subsection 3.9.4.1.1 under heading **Sensor Coil Assembly**. The first sentence should be two sentences with the indicated corrections:

> The sensor coil assembly contains the rod position indication coils. The coil ~~coils the coil~~ assembly slides over the rod travel housing and sits ~~sets~~ on a ledge at the base of the rod travel housing.

18. The applicant is requested to make the indicated changes or make appropriate equivalent changes:

18.1 A response is not required because in the November 6, 2018, public meeting conference call, the applicant stated the requested change will be incorporated in Revision 3 of DCA part 4. The applicant is requested to change Revision 2 of DCA part 4, Condition A of Subsection 3.1.5 to be consistent with Condition A of Subsection 3.1.6, which is more consistent with STS style and phrasing conventions, as follows: "Shutdown group ~~not within~~ insertion limits not met."

18.2 A response is not required because this sub-question is withdrawn. Condition B (third condition statement) of Subsection 3.1.9, for clarity, as follows: "Boric Acid Storage Tank boric acid concentration not within limits.

19. In Revision 2 of DCA part 4, GTS pages 3.1.5-1 and 3.1.6-1: The NOTE to LCO 3.1.5 and the NOTE to LCO 3.1.6 modify the Applicability of Subsection 3.1.5 and Subsection 3.1.6, respectively, and not the LCO statement itself. For consistency with a similar NOTE in W-AP1000-STS Subsection 3.1.6, and in W-STS Subsection 3.1.5 and 3.1.6, and the writer's guide, these NOTES should be located below the Applicability statement of LCO 3.1.5 and LCO 3.1.6, and should use the STS phrasing:

"APPLICABILITY: MODE 1[with $k_{eff} \geq 1.0$].
----------NOTE----------
This LCO is not applicable while performing SR 3.1.4.2.
----------"

Staff notes that SR 3.1.4.2 is performed with one shutdown group or one regulating group in manual control. Each of the four CRAs in each group is manually moved "≥ 4 steps in either direction" individually. Also, while performing this Surveillance, the CRA alignment limits of Subsection 3.1.4, LCO 3.1.4 continue to apply ("Individual CRA positions shall be within 6 steps of their group position.") Therefore, the STS NOTE's phrasing is sufficient, and the proposed more detailed phrasing ("Not applicable to shutdown groups inserted while performing SR 3.1.4.2." and "Not applicable to regulating groups inserted while performing SR 3.1.4.2.") is not needed to understand the exception to the Subsection's Applicability. The applicant is requested to revise Subsections 3.1.5 (LCO and Applicability statements), B 3.1.5 (LCO and Applicability sections), 3.1.6 (LCO and Applicability statements), and B 3.1.6 (LCO and Applicability sections) to be consistent with the W-STS.

20. In Revision 2 of DCA part 4, GTS Bases page B 3.1.5-1, Background section:

20.1 The applicant is requested to clarify the first sentence as indicated:

> The insertion limits of the shutdown bank ~~group~~ control rod assemblies (CRAs) are initial assumptions in all safety analyses that assume shutdown ~~group~~ bank CRA insertion upon reactor trip.

The revised sentence is consistent with the design terminology ("shutdown bank CRAs"), which is used in the first sentence of the third paragraph of the Background section. Also, there is no need to capitalize "control rod assemblies."

20.2 The applicant is requested to clarify the third paragraph as indicated:

The shutdown bank CRAs are arranged into two groups; each group has four CRAs that are arranged in radially symmetric positions, and are normally moved together as a group. Therefore, movement of ~~the shutdown~~ a group of shutdown bank CRAs does not introduce radial asymmetries in the core power distribution. The shutdown bank and regulating ~~group~~ bank CRAs provide the required reactivity worth for immediate reactor shutdown upon a reactor trip.

20.3 The applicant is requested to clarify the fourth paragraph as indicated:

The design calculations are performed with the assumption that the CRA shutdown group ~~CRAs~~ are withdrawn prior to the CRA regulating group ~~CRAs~~. The CRA shutdown group ~~CRAs~~ can be fully withdrawn without the core going critical. This provides available negative reactivity for SDM in the event of unintended dilution of the RCS boron concentration. The CRA shutdown group ~~CRAs~~ are controlled manually or automatically by the control room operator. During normal unit operation, the CRA shutdown group ~~CRAs~~ are fully withdrawn. The CRA shutdown group ~~CRAs~~ must be completely withdrawn from the core prior to withdrawing the CRA regulating group ~~CRAs~~ during an approach to criticality. The CRA shutdown group ~~CRAs~~ are then left in ~~this~~ the fully withdrawn position until the reactor is shut down. ~~They~~ The eight CRAs of the shutdown bank add negative reactivity to shut down the reactor upon receipt of a reactor trip signal.

The applicant is also requested to insert in the above paragraph (1) an explanation of how automatic control "by the control room operator" is distinct from manual control "by the control room *operator"; and (2) a statement about when automatic control of [movement of] CRA shutdown groups is appropriate and designed to be used.*

21. In Revision 2 of DCA part 4, GTS Bases page B 3.1.6-1, Background section:

21.1 The applicant is requested to clarify the second paragraph, second sentence as indicated:

... Limits on CRA regulating group ~~CRA~~ insertion have been established, and all regulating ~~group~~ CRA positions are monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking, ejected CRA worth, and SDM limits are preserved.

21.2 The applicant is requested to clarify the third, fourth, and fifth paragraphs, as indicated:

3rd The ~~control rod assemblies (CRAs)~~ 16 CRAs are divided among the two regulating groups and the two shutdown groups, with each group consisting of four CRAs in radially symmetric core locations. The regulating bank consists of two groups of four CRAs, which ~~that~~ are electrically paralleled to step simultaneously. See LCO 3.1.4, "Rod Group Alignment Limits," for regulating and shutdown ~~rod~~ CRA OPERABILITY and alignment requirements, and LCO 3.1.7, "Rod Position Indication," for CRA position indication requirements.

4th The regulating group insertion limits are specified in the COLR. Each CRA of a ~~The~~ regulating group~~s are~~ is required to be at or above ~~the~~ its regulating group insertion limit lines, as well as within its CRA group alignment limits.

5th The CRA regulating group ~~CRAs~~ are used for precise reactivity control of the reactor. The positions of the CRAs in a regulating group are ~~group CRAs is~~ normally controlled automatically by the Module Control System (MCS) together as a group of four CRAs; ~~, but~~ a regulating group's CRAs can also be manually controlled, both individually and as a group. ~~They~~ The CRA regulating groups are capable of changing core reactivity very quickly (compared to borating or diluting).

22. In Revision 2 of DCA part 4, on GTS Bases page B 3.1.5-2 and page B 3.1.5-3,

22.1 The applicant is requested to clarify the first paragraph of the ASA section as indicated:

On a reactor trip, all CRAs (eight ~~shutdown group~~ CRAs in two shutdown groups and eight CRAs in two regulating groups), except the most reactive CRA, are assumed to insert into the core. The CRA shutdown groups and regulating group ~~CRAs~~ shall be at or above their insertion limits and available to insert the maximum amount of negative reactivity on a reactor trip signal. The CRA regulating group ~~CRAs~~ may be partially inserted in the core as allowed by LCO 3.1.6, "Regulating Group Insertion Limits." The CRA shutdown and regulating group ~~CRA~~ insertion limits are established to ensure that a sufficient amount of negative reactivity is available to shut down the reactor and maintain the required SDM (see LCO 3.1.1, "SHUTDOWN MARGIN (SDM)") following a reactor trip from full power. The combination of CRA regulating ~~group CRAs~~ and shutdown group ~~CRAs~~ (less the most reactive CRA, which is assumed to be fully withdrawn) is sufficient to take the reactor from full power conditions at rated temperature to zero power, and to maintain the required SDM at rated no load temperature (Ref. 3). The CRA shutdown group ~~CRA~~ insertion limits also ~~limits~~ ensures that the reactivity worth of an ejected shutdown CRA is within safety analysis assumptions.

22.2 The applicant is requested to clarify the second paragraph of the ASA section as indicated:

The acceptance criteria for addressing CRA shutdown ~~CRA~~ group as well as regulating group ~~CRA~~ insertion limits and CRA inoperability or misalignment are that:

a. With the most reactive CRA stuck out there will be no violations of either:

1. Specified acceptable fuel design limits; or

2. Reactor Coolant System pressure boundary ~~damage~~ integrity; and

b. The core remains subcritical after **design basis events** with all CRAs fully inserted.

The CRA shutdown group ~~CRA~~ insertion limits satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).

The applicant is requested to justify the above shaded text, which is in addition to or **different from** the corresponding passage in the W-AP1000 STS Subsection B 3.1.5, on page B 3.1.5-2. The staff also notes that Acceptance Criteria 'a' and 'b' appear to differ by 'b' not assuming that the most reactive CRA is stuck out. The applicant is requested to justify this apparent inconsistency.

The staff points out that the titles of Subsections 3.1.5 and 3.1.6 also support changing to the phrases "CRA shutdown group(s)" and "CRA regulating group(s)" in place of the phrases "shutdown group CRAs" and "regulating group CRAs."

Subsection B 3.1.6, ASA section, the passage about CRA insertion limits, misalignment, and inoperability, has unexplained phrasing differences with the equivalent passage above. These are (i) the word "either" is included in the CRA shutdown group Criterion a; (ii) the word "acceptable" is omitted in the CRA regulating group Criterion a.1 (it is included in W-STS B 3.1.6, but not in W-AP1000-STS B 3.1.6, which appears to be in error); (iii) the word "damage" is (apparently mistakenly) included in CRA shutdown group Criterion a.2; (iv) the phrase "in the core" is appended to the CRA regulating group Criterion b, but is not in the CRA shutdown group Criterion b.

As also stated in Item 23.1 below, the applicant is requested to reconcile these inconsistencies by correcting the passage so it reads the same in both locations.

22.3 The applicant is requested to modify Subsection B 3.1.5, LCO section as indicated, for consistency with the previous comments:

The CRA shutdown groups ~~CRAs~~ must be within their insertion limits any time the reactor is critical or approaching criticality. This ensures that a sufficient amount of

negative reactivity is available to shut down the reactor and maintain the required SDM following a reactor trip.

The CRA shutdown group insertion limits are ~~defined~~ specified in the COLR.

The LCO is modified by a Note indicating the LCO requirement is not applicable to shutdown groups being inserted while performing SR 3.1.4.2. The SR verifies the freedom of the rods to move, and may require the shutdown group to move below the LCO limits, which would normally violate the LCO. This Note applies to each shutdown group as ~~it's~~ the group is moved below the insertion limit to perform the ~~SR~~ Surveillance. This Note is not applicable should a malfunction stop performance of the ~~SR~~ Surveillance.

The third paragraph above should be moved to the Applicability section and modified as necessary as requested in Sub-question No. 19 above and Sub-question No. 22.4 below.

22.4 The applicant is requested to modify Subsection B 3.1.5, Applicability section as indicated, for consistency with the previous comments:

The CRA shutdown group ~~CRAs~~ must be within their insertion limits, with the ~~reactor~~ unit in MODE 1. This ensures that a sufficient amount of negative reactivity is available to shut down the reactor and maintain the required SDM following a reactor trip. In MODE 1 with k_{eff} < 1.0, and in MODE 2, the CRA shutdown groups, whether fully withdrawn or fully inserted in the core, contribute to the SDM. In MODES ~~2, 3,~~ 3 and 4, the CRA shutdown group ~~CRAs~~ are fully inserted in the core and contribute to the SDM. Refer to LCO 3.1.1, "SHUTDOWN MARGIN (SDM)," for SDM requirements in MODE 1 with k_{eff} < 1.0, and in MODES 2, 3, and 4. LCO 3.5.3, "Ultimate Heat Sink," ensures adequate SDM in MODE~~S 4 and~~ 5.

The staff also suggests the above indicated changes to make this paragraph consistent with Table 1.1-1 and the NuScale design. The staff also requests the applicant to move the following paragraph from the B 3.1.5 LCO section to the Applicability section, with suggested clarifying changes:

The ~~LCO~~ Applicability is modified by a Note indicating the LCO is not applicable while performing SR 3.1.4.2. This Note permits exceeding the CRA shutdown group insertion limits while inserting each CRA in the group in accordance with ~~being inserted while performing~~ SR 3.1.4.2. ~~The SR~~ This Surveillance verifies the freedom of the ~~rods~~ CRAs to move, and may require the shutdown group to move below the ~~LCO~~ insertion limits specified in the COLR, which would normally violate the LCO. This Note applies to each CRA shutdown group as ~~it's~~ the group is moved below the insertion limit to perform the ~~SR~~ Surveillance. This Note is not applicable should a malfunction stop performance of the ~~SR~~ Surveillance. Note that while performing this Surveillance, the rod group alignment limits of LCO 3.1.4 remain applicable to the CRAs in the shutdown group being exercised.

23. In Revision 2 of DCA part 4, on GTS Bases page B 3.1.6-2 and page B 3.1.6-3,

23.1 The applicant is requested to clarify the second and third paragraphs of the ASA section, as indicated:

The acceptance criteria for addressing CRA shutdown and regulating group insertion limits and inoperability or misalignment are that:

a. With the most reactive CRA stuck out there will be no violations of:

1. specified acceptable fuel design limits; or

2. Reactor Coolant System (RCS) pressure boundary integrity; and

b. The core remains subcritical after **design basis events** with all CRAs fully inserted in the core.

As such, the CRA shutdown and regulating group insertion limits affect safety analysis involving core reactivity and power distributions (Ref. 3).

The SDM requirement is ensured by limiting the control and shutdown group insertion limits so that allowable inserted worth of the CRAs is such that sufficient reactivity is available in the CRAs to shut down the reactor to hot zero power with a reactivity margin which assumes the maximum worth CRA remains fully withdrawn upon trip (Ref. 3).

The applicant is requested to justify the above shaded text, which is in addition to or ***different from*** *the corresponding passage in the W-STS Subsection B 3.1.6, on page B 3.1.6-2. The staff also notes that Acceptance Criteria 'a' and 'b' appear to differ by 'b' not assuming that the most reactive CRA is stuck out. The applicant is requested to justify this apparent inconsistency.*

The staff points out that the titles of Subsections 3.1.5 and 3.1.6 also support changing to the phrases "CRA shutdown group(s)" and "CRA regulating group(s)" in place of the phrases "shutdown group CRAs" and "regulating group CRAs."

In Subsection B 3.1.5, ASA section, the passage about CRA insertion limits, misalignment, and inoperability has unexplained phrasing differences with the equivalent passage above. These are (i) the word "either" is included in the CRA shutdown group Criterion a; (ii) the word "acceptable" is omitted in the CRA regulating group Criterion a.1 (it is included in W-STS B 3.1.6, but not in W-AP1000-STS B 3.1.6, which appears to be in error); (iii) the word "damage" is (apparently mistakenly) included in CRA shutdown group Criterion a.2; (iv) the phrase "in the core" is appended to the CRA regulating group Criterion b, but is not in the CRA shutdown group Criterion b.

As also stated in Item 22.2 above, the applicant is requested to reconcile these inconsistencies by correcting the passage so it reads the same in both locations.

23.2 In the Subsection B 3.1.6, Applicability section, in the first paragraph, second sentence, the applicant is requested to change the phrase "reactivity rate insertion assumptions" to "reactivity insertion rate assumptions"; in the second paragraph, second sentence, the applicant is requested to change "freedom of the rods to move," to "freedom of the CRAs to move,"

24. In Revision 2 of DCA part 4, on GTS pages 3.1.5-1 and 3.1.5-2; and GTS Bases pages B 3.1.5-3 and B 3.1.5.4:

24.1 In the Bases discussion of Action A, the first sentence ("When one shutdown group CRA is not within insertion limits, 2 hours are allowed to restore the shutdown group CRA to within insertion limits.") clearly conveys that Condition A ("Shutdown group not within limits.") describes the situation of just one CRA in one of the two shutdown groups "not [being] within [insertion] limits." However, to ensure the meaning is unambiguous, the applicant is requested to revise the Condition statement to say "One shutdown group with one CRA not within shutdown group insertion limits."

24.2 In the Bases discussion of Action A, the applicant is requested to revise the first paragraph for consistency with the previous comments and NuScale terminology:

When one CRA in one shutdown group ~~CRA~~ is not within insertion limits, 2 hours are allowed to restore the CRA to within its shutdown group ~~CRA to within~~ insertion limits. This is necessary because the available SDM may be significantly reduced with one ~~showdown group~~ CRA not within ~~their~~ its shutdown group insertion limits. Also, verification of the required SDM within 1 hour, or initiation of boration ~~within 1 hour~~ to restore SDM to within the limits of LCO 3.1.1 within 1 hour is required, since the SDM in MODE 1 is *continuously monitored* and adhered to, in part, by meeting the ~~control~~ CRA regulating group and shutdown group insertion limits ~~(see LCO 3.1.1)~~.

The applicant is requested to explain how SDM is continuously monitored in MODE 1; else remove this assertion.

24.3 In the Bases discussion of SR 3.1.5.1, the applicant is requested to revise the first and second paragraphs for consistency with previous comments and NuScale terminology:

> Verification that the CRAs of each shutdown group ~~is within its~~ are within the shutdown group insertion limits within 12 hours prior to an approach to criticality, and at regular intervals thereafter, ensures that when the reactor is critical, or being taken critical, the shutdown group will be available to shut down the reactor, and the required SDM will be maintained following a reactor trip. ~~This SR and~~ The first Surveillance Frequency ensures that the two shutdown groups ~~is~~ are withdrawn before the regulating groups are withdrawn during a unit startup, since the reactor is normally taken critical by withdrawing the regulating groups after the shutdown groups are fully withdrawn.
>
> The second Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

The staff notes that the Frequency of SR 3.1.5.1 is "In accordance with the Surveillance Frequency Control Program"; and that FSAR Table 16.1-1 states that the base Frequency is 12 hours. It is understood that before entering MODE 1, LCO 3.1.5 shutdown group insertion limits must be satisfied, and that requires fully withdrawing the two shutdown groups from the core. The 12 hour Frequency plus the 3 hour extension of SR 3.0.2 means that regulating group withdrawal may begin no more than 15 hours since the shutdown group insertion limits were last verified. The applicant is requested to modify the Frequency of SR 3.1.5.1 by inserting a Frequency as described in the above paragraph, but which is not subject to the Surveillance Frequency Control Program and the 25% extension of SR 3.0.2. The revised Frequency would say:

> Once within 12 hours prior to an approach to criticality
>
> AND
>
> In accordance with the Surveillance Frequency Control Program

25. In Revision 2 of DCA part 4, on GTS page 3.1.5-1 and page 3.1.6-1: The applicant is requested to explain why Subsection 3.1.5 Condition A ("[One s]hutdown group not within [insertion] limits."), and Subsection 3.1.6 Condition A ("Regulating group insertion limits not met.") are phrased differently, when the only difference is which kind of CRA group is addressed.

26. In Revision 2 of DCA part 4, on GTS Bases page B 3.1.6-4. In the discussion of Action A, the first sentence has a grammatical error: "When the regulating *group* ***are*** *outside* the ~~acceptance~~ specified insertion limits, ***they*** must be restored to within those limits." The word "group" would need to be "groups" to match the verb "are" and the pronoun "they." However, the statement of Condition A ("Regulating group insertion limits not met.") is ambiguous because it cannot be concluded whether the Condition applies to one or both regulating groups. Required Action A.2 ("Restore regulating group to within limits.") seems to imply that just one regulating group is the intended meaning. Also, the last paragraph of the Bases discussion refers to "restoring the regulating group to within insertion limits,..." The applicant is requested to revise Subsection 3.1.6, Condition A and the Bases to make clear the intended meaning.

27. In Revision 2 of DCA part 4, on GTS Bases page B 3.1.6-4: In the discussion of Action A, the applicant is requested to make the suggested editorial improvements, as indicated:

> A.1.1, A.1.2, and A.2
>
> When the position of a CRA of a regulating group ~~are~~ is outside the ~~acceptance~~ acceptable regulating group insertion limits specified in the COLR, ~~they~~ the CRA position must be restored to within those limits. This restoration can occur in two ways:
>
> a. Reduce power to be consistent with ~~rod~~ CRA position; or

b. ~~Moving rods~~ Move CRAs to be consistent with power.

Also, verification of SDM or initiation of boration to regain SDM is required ~~in~~ within 1 hour, since the SDM in MODE 1 with k_{eff} ~~is~~ ≥ 1.0, which is normally ensured by adhering to the ~~control~~ regulating group and shutdown group insertion limits (see LCO 3.1.1, "Shutdown Margin (SDM)"), has been upset.

The allowed Completion Time of 2 hours for restoring the regulating group to within insertion limits, provides an acceptable time for evaluating and repairing minor problems without allowing the unit to remain ~~in an unacceptable condition~~ outside the insertion limits for an extended period of time.

28. *The applicant is requested to treat this comment as a global comment on the Bases.*

- In Revision 2 of DCA part 4, on GTS Bases page B 3.1.5-3: The Bases for Action B.1 begins, "If the Required Actions and associated Completion Times are not met, the unit must be brought to a MODE where the LCO is not applicable."

- In Revision 2 of DCA part 4, on GTS Bases page B 3.1.6-4: The Bases for Action B.1 begins, "If the Required Actions cannot be completed within the associated Completion Times, the unit must be brought to a MODE where the LCO is not applicable."

- In Revision 2 of DCA part 4, on GTS Bases page B 3.1.7-5: The Bases for Action E.1 begins, "If the Required Actions cannot be completed within the associated Completion Time, the unit must be brought to a MODE in which the requirement does not apply."

There is no reason why these statements should not be identical, nor why they refer to "Required Actions" and "Completion Times"; the associated Condition statements all say "Required Action and associated Completion Time..."

The applicant is requested to replace these and all such sentences with a standard sentence, such as: "If a Required Action [of Condition A or B...] cannot be accomplished within its associated Completion Time[*, or if the LCO is not met as specified by another condition statement in the same Action table row,*] the unit must be brought to a MODE ['where the LCO is not applicable' *or* 'in which the LCO does not apply']."

Some Bases for default Actions provide an acceptable alternative to the preceding statement, by describing the action [sometimes from a list of action descriptions] which is not accomplished within the specified Completion Time. *The applicant is requested to verify the clarity and accuracy of such Bases statements.*

29. In Revision 2 of DCA part 4, on GTS pages 3.1.7-1 and 3.1.7-2, acronym definition and usage in statement of LCO 3.1.7; Actions table Note; Conditions A, B, C; and D; and Required Actions A.1, B.1, B.2, C.1, D.1, and D.2. With the understanding that each of the 16 CRAs has one control rod drive mechanism (CRDM), two rod position indicators (RPIs), and one counter position indicator (CPI), the staff suggests the following editorial improvements in clarity and consistency, as shown by markup (ignore formatting) :

LCO 3.1.7 The Control Rod Drive System (CRDS) Rod Position Indication ~~(RPI)~~ System (RPIS) and the Control Rod Assembly (CRA) Counter Position Indication ~~(CPI)~~ System (CPIS) shall be OPERABLE.

ACTIONS

----------NOTE----------

Separate Condition entry is allowed for each inoperable CRDS rod position indicator (RPI) and each CRA counter position indicator (CPI).

A. One or more CRAs with one RPI ~~per CRDM~~ inoperable ~~for one or more CRDMs~~.

A.1 Verify the position of ~~the~~ each CRA with an inoperable ~~position indicators~~ RPI by using ~~with~~ the Module Control System (MCS). | Once per 8 hours

B. One or more ~~More than one RPI per CRDM~~ CRAs with two RPIs inoperable.

B.1 Place ~~the~~ affected CRAs under manual control. | Immediately

AND

B.2 Verify the position of ~~the~~ each affected CRA ~~with inoperable CRDS position indicators~~ indirectly by using the incore detectors. | Once per 8 hours

AND

B.3 Restore ~~inoperable rod position indicators~~ one RPI per CRA to OPERABLE status~~ such that a maximum of one RPI per CRDM is inoperable~~. | 24 hours

C. One or more ~~control rod drive mechanisms (CRDMs)~~ CRAs with one or two RPIs ~~inoperable position indicators~~ inoperable that have been moved in excess of 6 steps in one direction since the last position determination of the affected CRAs~~ position~~.

C.1 Verify the position of ~~the~~ each affected CRA ~~with inoperable position indicators~~ by using the MCS. | 4 hours

D. One or more CRAs with ~~CRA~~ CPI ~~position indicator~~ inoperable~~ for one or more CRAs~~.

The phrase "by administrative means" for verifying operability of all RPIs for all affected groups (groups with one or more CRAs with the CPI inoperable) is unclear, and is not explained in the Bases for Actions D.1 and D.2, which state:

> With one *demand* position indicator per group inoperable, the CRA positions can be determined by the RPI System. Since normal full power operation does not require excessive movement of CRAs, verification by administrative means that CRDS [CRA] position indicators are OPERABLE and the most withdrawn CRA and the least withdrawn CRA are ≤ 6 steps apart within the allowed Completion Time of once every 8 hours is adequate.

The applicant is requested to respond to the following items:

(i) Is a "demand position indicator" the same as a CPI? If so, the applicant is requested to only use "CPI." If not, the Bases needs to explain the distinction.

(ii) Does each CRA in each group have its own CPI? Or do the four CRAs in each of the four groups use the same CPI; i.e., one CPI per group?

(iii) The phrasing of SR 3.1.7.1 is ambiguous. Consider the following suggested clarifications:

> SR 3.1.7.1 For each CRA, verify ~~Verify~~ each RPI channel agrees within 6 steps of the group step counter demand position for the full indicated range of CRA travel. | Prior to reactor criticality after coupling ~~of one or more~~ each CRA to the associated CRDM for one or more CRAs

Also consider the following edit of the associated Bases (page B 3.1.7-5):

> SR 3.1.7.1
>
> Verification that the ~~Counter Position Indication~~ CPI (group step counter demand position) agrees with ~~the~~ each direct-reading RPI ~~and demand position~~ channel within 6 steps provides assurance that the RPI channel is operating correctly.

This surveillance is performed prior to reactor criticality after coupling of one or more CRAs to the associated CRDM, as there is the potential for unnecessary unit transients ~~if~~ were the ~~SR~~ Surveillance ~~were~~ performed with the reactor ~~at power~~ critical in MODE 1.

The applicant is requested to describe in the Bases how SR 3.1.7.1 is performed; in particular, are the two RPI channels on each CRA of a shutdown group or regulating group compared to the CPI group step counter demand position, at each step, (1) for each RPI channel for each CRA, (2) for each RPI channel for each group of four CRAs, (3) for both RPI channels for each CRA, or (4) for both RPI channels for each group of four CRAs? Also, can the surveillance be performed in MODE 3, as well as MODE 2?

The staff notes that Revision 2 of DCD Tier 2 page 4.3-56, Figure 4.3-18: Control Rod and Incore Instrument Locations, indicates that

Regulating Bank consists of

Group 1 Four CRAs – inner ring (**0**, 3π/6, **6π/6**, 9π/6) (**0°**, 90°, **180°**, 270°)

Group 2 Four CRAs – outer ring (**0**, 3π/6, **6π/6**, 9π/6) (**0°**, 90°, **180°**, 270°)

Shutdown Bank consists of

Group 3 Four CRAs – middle ring (**2π/6**, 5π/6, **8π/6**, 11π/6) (**60°**, 150°, **240°**, 330°)

Group 4 Four CRAs – middle ring (**π/6**, 4π/6, **7π/6**, 10π/6) (**30°**, 120°, **210°**, 300°)

The applicant is requested to describe in the Background section of Subsections B 3.1.4, B 3.1.5, B 3.1.6, and B 3.1.7 that there are two CRA shutdown groups of four CRAs each and two CRA regulating groups of four CRAs each. The applicant is also requested to describe in the Bases for SR 3.1.4.2 and in the Background section of Subsection B 3.1.7, how the CPI is maintained consistent with the RPI indicated position during performance of SR 3.1.4.2, the surveillance involving manual movement of each CRA by four steps individually.

30. In Revision 2 of DCA part 4, on GTS page 3.1.7-1, Required Action B.2 of Subsection 3.1.7 is the only place in the Specifications where the term "**incore detectors**" is used. SR 3.2.2.1 is the only place in the Specifications where the term "**OPERABLE in-core instrumentation channels** is used." The Bases refer to this neutron monitoring instrumentation as follows:

—— Page B 3.1.7-4, Subsection B 3.1.7, Actions section, first sentence under Action A.1:

When one RPI train per CRDM fails, the position of the CRA can still be determined by use of the **In-Core Instrumentation System (ICIS)**.

The applicant is requested to consider whether the phrase "RPI train" is appropriate since Subsection 3.1.7 does not use this phrase.

—— Page B 3.2.1-1, first sentence of fourth paragraph of the Background section of Subsection B 3.2.1:

$F_{\Delta H}$ is not directly measurable but is inferred from a power distribution map obtained with the **fixed incore detector system**. Specifically, the measurements taken from the **fixed incore instrument system** are analyzed by a computer to determine $F_{\Delta H}$.

—— Page B 3.2.1-2, first sentence of sixth paragraph of the Applicable Safety Analyses section of Subsection B 3.2.1:

$F_{\Delta H}$ is measured periodically using the **fixed incore detector system**. Measurements are generally taken with the core at, or near, steady state conditions.

—— Page B 3.2.1-3, first sentence of the Surveillance Requirements section of Subsection B 3.2.1:

The value of $F_{\Delta H}$ is determined by using the **fixed incore detector system** to obtain a flux distribution map.

—— Page B 3.2.2-1, first and second sentences of third paragraph of the Background section of Subsection B 3.2.2:

The **in-core instrumentation system's neutron detectors** are arranged equally spaced radially and axially throughout the core. This **neutron detector** arrangement promotes an accurate indication for the **M**odule **C**ontrol **S**ystem to analyze core power distributions and will be used to monitor AO.

—— Page B 3.2.2-2, first sentence of the LCO section of Subsection B 3.2.2:

Information about the unit's AO is provided to the operator from the **incore instrumentation system (ICIS)**. (Ref. 2) Separate signals are taken from the four **detectors** on each of the 12 strings of **in-core instrumentation**. The AO is defined in Section 1.1.

The applicant is requested to revise the above sentences to use a more consistent terminology for the Incore Instrumentation System (ICIS) fixed neutron detectors; also describe in the Bases for Subsections B 3.1.7, B 3.2.1, and B 3.2.2, the number of neutron detector strings and the number of neutron detectors in each ICIS channel. In addition, the applicant is requested to revise the Bases to state (1) the minimum number of neutron detectors for a channel to be operable, and (2) the minimum number of operable neutron detectors and the minimum number of operable ICIS fixed neutron detector channels needed to produce an adequate core flux map.

31. In Revision 2 of DCA part 4, on GTS page 3.1.9-1, the LCO statement of Subsection 3.1.9, regarding the maximum CVCS makeup pump demineralized water flow path flowrate, should state that the "flowrate ~~is~~ shall be within the limits specified in the COLR", which is appropriate for an LCO statement, and consistent with the other two LCO statements about CVCS DWSI valve operability and boric acid storage tank boron concentration limits.

In Revision 2 of DCA part 2, on page 15.4-23, FSAR Section 15.4.6.3.4, "Boron Mixing, Thermal Hydraulic, and Subchannel Analyses -- Input Parameters and Initial Conditions," states "A minimum makeup temperature of 40 degrees F is assumed for the analysis of boron dilution of the RCS during Modes 1 through 3." Since this temperature assumption is not explicitly surveilled or specified by LCO 3.1.9, the applicant is requested to include the rationale for omitting this makeup water minimum temperature limit from LCO 3.1.9 both in the Applicable Safety Analyses section of Subsection B 3.1.9, and in FSAR Section 15.4.6.3.4. That rationale should justify that there exists a reasonable expectation of ambient temperatures always exceeding 40 degrees F in the viicinity of the demineralized water storage tank, thereby precluding the injection of water with a temperature of < 40 degrees F into the RCS with the unit in Mode 1, 2, or 3.

32. See RAI 506-9614, Question 16-53, Part B.

33. In Revision 2 of DCA part 4, on GTS page 3.1.9-3, the staff suggests revising SR 3.1.9.1 as indicated for clarity:

SR 3.1.9.1 Verify that CVCS makeup pump demineralized water flow path is configured to ensure that ~~it~~ the maximum demineralized water flowrate remains within the limits specified in the COLR.

The applicant is requested to make the above suggested change, or an appropriate equivalent change.

34. A separate response is not required, because in the November 6, 2018, public meeting conference call with the staff, NuScale stated it would respond to this sub-question when it responds to RAI 506-9614, Question 16-52, which also addresses GTS Subsection 3.7.1 Actions. In Revision 2 of DCA part 4, on GTS pages 3.7.1-1 and -2, the applicant is requested to revise GTS Subsection 3.7.1, "MSIVs," Actions A and B, as indicated by mark up:

A. One *or more* ~~required MSIV valves~~ *MSIVs* inoperable. | A.1 Isolate the affected main steam line MSIV flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange. | 72 hours AND A.2 Verify the affected main steam line MSIV flow path is isolated. | Once per 7 days

B. One *or more* ~~required~~ MSIV bypass *valves* inoperable. | B.1 Isolate the affected main steam line bypass flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange. | 72 hours AND A.2 Verify the affected main steam line bypass flow path is isolated. | Once per 7 days

The staff observes that the word "required" in Conditions A and B appears to be unnecessary. The LCO requires two operable MSIVs and two operable MSIV bypass valves in the common main steam line from each SG. As long as the MSIV and associated MSIV bypass valve in either the inner valve set or outer valve set, are capable of closing with leakage within the specified limits, the main steam line isolation function to support the actuation of the associated DHRS train remains operable, although there is no capability to withstand a single failure of one of these valves.

The applicant is requested to confirm that the intent of the word "required" is to convey that an MSIV and associated bypass valve are not "required" to be operable for automatic closure if (1) the other MSIV and associated bypass valve in the same main steam line are both closed and de-activated with leakage within specified limits, or (2) the associated flow paths containing the other MSIV and associated bypass valve are otherwise isolated by use of at least one closed manual valve, or blind flange with leakage within specified limits. If this is correct, the applicant is requested to revise Subsection B 3.7.1 by adding an explicit discussion explaining the intended meaning of the word 'required.' This explanation should discuss that each main steam line contains four flow paths, (1) an inner pair of parallel flow paths, one with an MSIV and one with an MSIV bypass valve, located just outside the containment vessel downstream of the steam line penetration, and (2) an outer pair of parallel flow paths, one with an MSIV and one with an MSIV bypass valve, located downstream of the main steam line spool piece. Isolation of a main steam line requires at least the isolation of either the inner pair of flow paths or the outer pair of flow paths.

The applicant is requested to clarify Actions table Note 1, as indicated: "Separate Condition entry is allowed for each MSIV and each MSIV bypass ~~inoperable~~ valve." It is understood that Conditions are entered for inoperable valves, which are required to be operable by the LCO.

As written, Condition A applies when one SG's main steam line has (1) an open MSIV flow path which is incapable of isolation using the MSIV on either an automatic or manual actuation signal, or (2) an open or closed MSIV with leakage outside the specified limit. By specifying that separate Condition entry is allowed for each MSIV, Condition A could be stated as "One or more MSIV flow paths with the MSIV inoperable." Likewise, Condition B could be stated as "One or more MSIV bypass flow paths with the MSIV bypass valve inoperable."

35. No response required because Revision 2 of DCA part 4, on GTS page 3.7.1-2, has already corrected Subsection 3.7.1, Required Actions D.1 and D.2 by capitalizing "Mode" so these actions read:

D.1 Be in MODE 2. | 6 hours

AND

D.2 Be in MODE 3 and PASSIVELY COOLED. | 36 hours

36. A response is not required because this item is being referred to the NRO technical branch responsible for reviewing FSAR Section 10.3. In Revision 2 of DCA part 2, FSAR page 10.3-3, Section 10.3.2.1, states, "The MSS piping upstream of the secondary MSIVs is designed to not exceed its service limits during a design basis event. Administrative procedures preclude filling the SG and MSS piping water-solid during normal operation, as well as during DHRS operation." The staff requests that the applicant explain how these administrative procedures would be implemented to ensure this is done during DHRS operation that was automatically initiated, without operator action.

37. The staff reviewed Revision 1 of DCA part 4, GTS Chapter 3; the Actions Conditions provided to require a unit shutdown from MODE 1 above 25% RTP whenever a Required Action for another entered Condition of the LCO Subsection is not met within the associated Completion Time. In a few instances, the initially entered Condition specifies an Action to exit the applicability (e.g., LCO 3.1.4 Required Action A.2). The staff compared the default Required Actions and Completion Times to reach different RCS temperatures in Mode 3 based on the affected systems, parameter limits, and instrumentation functions, and their relative importance to safety.

37.1 In Revision 2 of DCA part 4, Required Action F.1 of LCO 3.3.3 says "Isolate CVCS charging and letdown flow paths to the Reactor Coolant System ..."; but Required Action F.1 of LCO 3.3.4 says "Isolate the flow

paths from the CVCS to the Reactor Coolant System ...."; the applicant is requested to make the phrasing of these actions more consistent.

37.2. In Revision 2 of DCA part 4, the various Required Actions to isolate the demineralized water source to the CVCS makeup pumps are phrased in a variety of ways; these Actions are LCO 3.1.9 Action B, LCO 3.3.1 Actions H and M, LCO 3.3.3 Action E, and LCO 3.3.4 Action E. The staff requests that the applicant consider phrasing these Required Actions more consistently, since they all intend to accomplish the same objective of precluding the CVCS system from injecting demineralized water and diluted boric acid from the boron addition system into the RCS.

37.3. Coordinate response to this sub-question with the response to similar Sub-question No. 7. In Revision 2 of DCA part 4, Required Action E.1 of LCO 3.3.1 states "Reduce THERMAL POWER" to below the N-2L interlock. | 6 hours"; this Action applies to the following MPS Functions which are applicable in Mode 1 with power above the N-2H interlock according to Footnote (b) of Table 3.3.1-1.

2.a RTS on High Power Range Positive and Negative Rate

18.a RTS on Low Main Steam Pressure

18.b DHRS on Low Main Steam Pressure

18.c PHT on Low Main Steam Pressure

The staff observes that to be consistent, Required Action E.1 ought to say N-2H instead of N-2L. However, since both interlocks use 15% RTP to switch from active to inactive, this error appears to have no practical impact on the meaning of the action statement. Nevertheless, the applicant is requested to make this correction.

38. A response is not required because the Surveillance Requirements section of Subsection B 3.3.2, for SR 3.3.2.1, fourth paragraph, regarding the Actuation Logic Test for the RTS, in Revision 1 of the DCA part 4, was revised (in response to RAI 506-9614, Question 16-50) by Revision 2 of DCA part 4, as indicated, to correct errors:

> The ACTUATION LOGIC TEST includes testing of the APL on all RTS ~~and ESFAS~~ EIMs, the enable nonsafety control switches, ~~the main control room isolation switches, the override switches,~~ and the operating bypass switches. The ACTUATION LOGIC TEST includes a review of any alarms or failures reported by the ~~self-checking~~ self-testing features.

39. In Revision 2 of DCA part 4, on GTS page 3.4.1-2, SR 3.4.1.2 says "Verify RCS **cold** temperature is less than or equal to the limit specified in the COLR." However, on Bases page B 3.4.1-4, the basis for SR 3.4.1.2 begins, "This surveillance demonstrates that the **average** RCS temperature remains less than or equal to the limit specified in the COLR. Also notice that LCO 3.4.1.b and Condition A refer to RCS **cold** temperature limits. The applicant is requested to reconcile these statements. Also, in Revision 2 of DCA part 4, Required Action C.1 of Subsection 3.4.1 should state "Be in MODE 2."; and not "Be in Mode 2."

In the November 6, 2018, public meeting conference call with NuScale, the staff acknowledged that the June 12, 2018, response to RAI 457-9501, Question 15-12, discussed the relationship between RCS average temperature and RCS cold temperature, as follows:

> ... Core flow is a function of thermal power, given the flow resistance of the reactor coolant system (RCS) and the elevation difference between the core and the steam generators that provide the heat sink. FSAR Table 5.1-2, "Primary System Temperatures and Flow Rates," lists the nominal operating parameters of the RCS at various power levels, including primary flow and RCS temperatures.
>
> LCO 3.4.2, "RCS Minimum Temperature for Criticality," establishes the minimum temperature at which thermal energy may be generated in the reactor core. Critical operations will begin at approximately 425ºF, with the average RCS temperature rising to approximately 543ºF, and then remaining constant from about 15% of rated thermal power (RTP) to full power.

> In this design with a constant average RCS temperature above 15% RTP, the RCS hot and cold temperatures vary as a function of reactor power. This is illustrated in FSAR Table 5.1-2 by the core delta-T column. By specifying the average RCS temperature (Tavg), the reactor power, and the RCS flow resistance, the RCS maximum and minimum temperatures are established. LCO 3.4.1 establishes a cycle-specific, COLR-defined limit on RCS cold temperature that includes consideration of the initial conditions in the Chapter 15 analyses.
>
> Based on these physical relationships and the methodology used to establish the limits in the COLR, LCO 3.4.1 will protect the RCS pressure ranges and average RCS temperature shown in Table 15.0-6 for all design basis events, including LOCA, non-LOCA, and peak containment pressure analyses....

Despite the above explanation, SR 3.4.1.2 still says "Verify RCS cold temperature is less than or equal to the limit specified in the COLR."

For a given thermal power, and best estimate flow, Revision 2 of DCA part 2, FSAR Table 5.1-2, "Primary System Temperatures and Flow Rates," lists percent of rated thermal power (RTP) (100% = 160 MWt); percent mass flow (100% = 587.0 Kg/s); and cold, average, and hot RCS temperatures. For thermal power at or above 15% RTP, average temperature is kept constant at 543.3 °F, and the corresponding cold and hot RCS temperatures are listed as 496.6 °F and 590.1 °F, respectively.

Revision 2 of DCA part 2, FSAR Table 15.0-6, "Module Initial Conditions Ranges for Design Basis Event Evaluation," lists the variation in these parameters' initial values assumed in the design basis event safety analyses:

Thermal Power	102% RTP
RCS mass flow at 100% RTP	535-670 kg/s (mid-range value 602.5 kg/s)
RCS average temperature	535-555 °F (at normal operating conditions 545 °F)

The applicant is still requested to explain why the Bases for SR 3.4.1.2 still refers to verifying **average** RCS temperature being less than or equal to the limit specified in the COLR. Also, please explain how the RCS cold, average, and hot temperature limits will be presented in the COLR. Please revise the Bases to clarify how this Surveillance verifies T_{avg} is within COLR limits by verifying T_{cold} is within COLR limits.

40. In Revision 2 of DCA part 4, on GTS page B 3.4.9-2, the second paragraph of the Applicable Safety Analyses section of Subsection B 3.4.9, states in part:

> The analysis for design basis accidents and transients other than a SGTF assume the SG tubes retain their structural integrity (i.e., they are assumed not to fail.) In these analyses, the steam discharge to the atmosphere is based on the total primary to secondary LEAKAGE from all SGs *or is assumed to increase as a result of accident induced conditions*.

The phrase in italics appears to be incorrect given that NuScale's accident induced leakage doesn't account for a potential increase in operational leakage due to accident conditions. The applicant is requested to revise the statement to be consistent with the accident analyses for non-SGTF events.

41. In Revision 2 of DCA part 4, on GTS page B 3.3.1-3, the applicant is requested to replace the second occurrence of "10 CFR 100" with "10 CFR 34" in addition to the first occurrence, which was changed in response to RAI 490-9556, Question 16-48.

42. A response is not required because the applicant stated in the November 6, 2018, public meeting conference call that it would make the indicated changes in Revision 2 of TR-1116-52011-NP, "Technical Specifications Regulatory Conformance and Development" report (RCDR). In Revision 1 of the RCDR, Appendix C, "Industry / NRC STS Traveler Consideration," regarding Table C-1, the applicant clarified the previous version of the third and fourth paragraphs; the staff suggests an additional clarification as indicated by shaded text:

> The ~~following~~ table provides details of the extent of ~~applicability, use, and incorporation~~ consideration of features from the listed ~~TSTF~~ STS travelers that correspond ~~directly or indirectly~~ with specifications included in the proposed NuScale GTS.
>
> The ~~TSTF~~ travelers that ~~are~~ were considered are those that were issued as new or revised since the earliest manuscript date of [Revision 4 of] the NUREG STS, October 2011, and by comparison of ~~the TSTF traveler content with the contents of~~ the STS with the changes identified in ~~the TSTF~~ each traveler.

The applicant is requested to make the indicated clarification denoted by shaded text. The staff also requests that the applicant consider adding an explanation in the Discussion field of RCDR Table C-1, regarding TSTF-493, that "the SP language follows the W-AP1000-STS Subsection 5.5.14 phrasing, which is better suited for new reactor generic TS and the 10 CFR Part 52 licensing process."

43. A response is not required because the applicant stated in the November 6, 2018, public meeting conference call that it would address this sub-question in Revision 2 of the RCDR. Appendix C, Table C-1, Revision 1 of the RCDR states, regarding TSTF-561-T, Rev. 0 (Grammatical corrections shown in shaded text):

> Addition of optional content or reviewer's notes to STS ~~are~~ is not applicable or appropriate for a DCA GTS submittal. Only COL-specific content is presented as bracketed content to be modified by applicants referencing the certified design.

The staff disagrees with the first sentence. GTS may and GTS Bases should include bracketed reviewer's notes when appropriate and can include optional bracketed provisions as COL items. The applicant is asked to see the example of the ESBWR GTS and Bases, including the list of COL items, and revise the above statement accordingly.

44. The applicant is requested to state where the DCD describes how a COL applicant will meet the three conditions for adoption of TSTF-366-A, "Elimination of Requirements for a Post Accident Sampling System." These conditions are provided in a Reviewer's Note in W-STS Subsection 5.5.3.

45. In Revision 2 of DCA part 4, on Bases Pages B 3.3.1-36 and -37 regarding Narrow Range Containment pressure, in particular, High Narrow Range Containment Pressure Decay Heat Removal System Actuation:

> Four High Narrow Range Containment Pressure DHRS channels are required to be OPERABLE in MODES 1 and 2, and MODE 3 without PASSIVE COOLING in operation. In MODE 3 with PASSIVE COOLING in operation, sufficient cooling for decay heat loads is met. In MODES 4 and 5 the reactor is subcritical and passively cooled.

The applicant is requested to capitalize "passively cooled" in the last sentence, because this expression is a defined term. It is suggested that a global search of DCA part 4 be done to verify all occurrences of defined terms are in all capital letters.

46. In Revision 2 of DCA part 4, on Page 3.0-3 regarding the Reviewer's Note for LCO 3.0.8, which addresses barriers that are unable to provide their related support for TS LCO required safety functions. (i) Regarding format, the Note as presented in DCA Rev. 1, includes an extra blank line after the Note; the applicant is requested to remove the extra blank line---there should be only one. (ii) On Bases Page B 3.0-11 regarding the end of the LCO 3.0.8 Note statement, the "-A" appended to "Revision 2" is requested to be moved to the traveler designator, so the reference says: '...bounding generic risk assessment provided in TSTF-427-A, "Allowance for Non-Technical Specification Barrier Degradation on Supported System OPERABILITY," Revision 2.' (iii) Since the NRC staff must review the risk assessment for the NuScale design (to be provided by the COL applicant) to verify it is consistent with the bounding generic risk assessment provided in TSTF-427-A, the staff requests that the applicant modify the Note so that is says, "A COL applicant who wants to adopt LCO 3.0.8 must perform or reference a risk assessment for the NuScale design that has been submitted to and accepted by the the NRC,..." Notice that this request also applies to the same Reviewer's Note in the Bases for LCO 3.0.8.

47. In Revision 2 of DCA part 4, on Page B 3.0-11 regarding the Reviewer's Note for the Bases of LCO 3.0.8, which addresses barriers that are unable to provide their related support for TS LCO required safety functions. Regarding format, the Note includes a blank line before and after the Note's statement (below the top dashed line and above the bottom dashed line); these blank lines are requested to be removed because they are contrary to the STS convention for the presentation of Notes.

48. A response is not required because the applicant stated in the November 6, 2018, public meeting conference call that it would address this purely editorial item in Revision 3 of DCA part 4. In general, keep a numerical value and its associated unit of measure on the same line. E.g., Revision 2 of DCA part 4, on page 3.0-4, the first sentence of SR 3.0.3: "24 hours" is split across adjacent lines.

49. In Revision 2 of DCA part 4, on Page B 3.0-16, regarding the Bases for SR 3.0.2, the GTS includes the following paragraph after the second paragraph that is not included in the W-STS 3.0.2 Bases:

> When a Section 5.5, "Programs and Manuals," Specification states that the provisions of SR 3.0.2 are applicable, a 25% extension of the testing interval, whether stated in the Specification or incorporated by reference, is permitted.

The applicant is requested to explain why this paragraph is needed, including a list of the Section 5.5 subsections it would apply to.

50. In Revision 2 of DCA part 4, on Page B 3.0-17, regarding the Bases for SR 3.0.2, fourth paragraph (after the paragraph addressed by Item 49). The applicant is requested to explain why the W-STS paragraph is split into three paragraphs, the second at the beginning of the third sentence ("The exceptions to SR 3.0.2 are ..."), the third at the beginning of the eighth sentence ("As stated in SR 3.0.2, the 25% extension also does not apply...").

Also, the second of the three paragraphs revises the example of exceptions to LCO 3.0.2, as indicated in the following markup:

> The exceptions to SR 3.0.2 are those Surveillances for which the 25% extension of the interval specified in the Frequency does not apply. These exceptions are stated in the individual Specifications. The requirements of regulations take precedence over the TS. ~~An example~~ Examples of where SR 3.0.2 does not apply ~~is~~ are in the Containment Leakage Rate Testing Program required by 10 CFR 50, Appendix J, and the inservice testing of pumps and valves in accordance with applicable American Society of Mechanical Engineers Operation and Maintenance Code, as required by 10 CFR 50.55a. These programs establish testing requirements and Frequencies in accordance with the requirements of regulations. The TS cannot, in and of themselves, extend a test interval specified in the regulations directly or by reference.

The applicant is also requested to explain why the phrase "directly or by reference" added at the end is needed.

51. In Revision 2 of DCA part 4, on Page B 3.0-18, regarding Bases for SR 3.0.3, the following new paragraph, which is not included in the W-STS Bases and is inserted after the first paragraph, states:

> When a Section 5.5, "Programs and Manuals," Specification states that the provisions of SR 3.0.3 are applicable, it permits the flexibility to defer declaring the testing requirement not met in accordance with SR 3.0.3 when the test~~ing~~ has not been performed ~~completed~~ within the specified test~~ing~~ interval; this interval includes ~~(including~~ the allowance of SR 3.0.2 if ~~invoked by~~ the Section 5.5 Specification specifies that SR 3.0.2 is applicable~~)~~.

The applicant is requested to explain why this paragraph is needed. Also consider the suggested edits, indicated by mark up, for improved clarity. The DCA Revision 1 version of this paragraph was changed in DCA Revision 2, as indicated by shaded text. The applicant is requested to explain the reason for this change.

52. In Revision 2 of DCA part 4, on Page B 3.0-19, regarding Bases for SR 3.0.3, the W-STS paragraph that begins with the phrase "Failure to comply ...," is split into two paragraphs beginning at the sentence that begins with, "The missed Surveillance should be treated as an emergent condition..." The applicant is requested to explain why this split is needed.

53. In Revision 2 of DCA part 4, on Page B 3.1.4-4, SRs section, the third paragraph of the Bases for SR 3.1.4.1, says that "The SR is modified by a Note that permits it not to be performed for rods associated with **an** inoperable rod position indicator. The alignment limit is based on rod position indicator which is not available if the indicator is inoperable. LCO 3.1.7, 'Rod Position Indication,' provides Actions to verify the rods are in alignment when one or more rod position indicators are inoperable." The surveillance column Note states, "Not required to be performed for rods associated with inoperable rod position indicator." Since the Rod Position Indication (RPI) System has two analog indicators for each control rod assembly (CRA or "rod"), and loss of one indicator reduces position accuracy by one half (± 6 steps instead of ± 3 steps), which is apparently considered insufficient for

concluding that the affected CRA's rod group alignment limit is met, the surveillance column Note functions as a required action to immediately enter LCO 3.1.7, which is a highly unusual construct; in addition, one must read the Bases for Subsection 3.1.4 to know that the Note actually means this. The staff observes that the CE-STS equivalent SR 3.1.4.1 does not include such a Note.

The applicant is requested (i) to change the presentation of SR 3.1.4.1 to omit the Note, and rephrase the surveillance statement to say:

> SR 3.1.4.1 Verify the two rod position indicators of each CRA together indicate that the position of the ~~individual CRAs~~ CRA is within the CRA's rod group alignment limit. | 12 hours

and (ii) to add Action A as follows (ignore formatting issues):

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more CRAs with one or both rod position indicators inoperable.	A.1 Enter applicable Conditions and Required Actions of LCO 3.1.7, "Rod Position Indication."	Immediately
B. One or more CRAs inoperable. OR One or more CRAs not within alignment limits.	B.1.1 Verify SDM to be within limits specified in the COLR. OR B.1.2 Initiate boration to restore SDM to within limit. AND B.2 Be in MODE 2.	1 hour 1 hour 6 hours

and (iii) to make appropriate changes to the Actions and SRs sections of the Bases for Subsection 3.1.4.

(iv) The applicant is also requested to clarify the sixth paragraph of the Background section of the Bases for Subsection 3.1.7 on page B 3.1.7-1 as indicated:

> The axial position of shutdown group CRAs and regulating group CRAs are determined by two separate and independent systems: the Counter Position Indication (CPI) System ~~(CPI)~~ (commonly called group step counters) and the Rod Position Indication (RPI) System.

(v) The applicant is also requested to clarify the seventh paragraph, third sentence of the Background section of the Bases for Subsection 3.1.7 on page B 3.1.7-2 as indicated:

> The CRA CPI ~~Position Indication~~ System is considered highly precise (± 1 step or ± {3/8} inch).

(vi) The applicant is also requested to clarify the third sentence of the eighth paragraph of the Background section of the Bases for Subsection 3.1.7 on page B 3.1.7-2 as indicated; also describe that each of the two RPI channels is associated with just one of the data systems:

> To increase the reliability of the RPI system, the inductive coils of a CRA's two RPI channels are alternately connected to two independent data systems. Each RPI channel is associated with just one of the data systems.

54. In Revision 2 of DCA part 4, on Page B 3.1.8-6, References section: Be sure to update Reference 5. "NuScale Reload Safety Evaluation Methodology (later)."

55. In Revision 2 of DCA part 4, Subsection B 3.1.9: (i) on Page B 3.1.9-1, third paragraph of Background section, first sentence: The applicant is requested to clarify that there are four channels of MPS instrumentation Functions that send trip signals to Divisions 1 and 2 of ESFAS DWSI Logic and Actuation. Consider the following suggested revision:

> There are two demineralized water isolation valves in series; one controlled by Division I of the MPS ESFAS DWSI Logic and Actuation, and one controlled by Division II of the MPS ESFAS DWSI Logic and Actuation. MPS instrumentation Functions, each with four measurement channels, that initiate DWSI actuation signals to each Logic and Actuation division are described in Subsection B 3.3.1, "Module Protection System (MPS) Instrumentation," and are specified in Table 3.3.1-1.

(ii) On Page B 3.1.9-2, fourth paragraph of ASA section: The applicant is requested to clearly state that "the maximum allowed CVCS dilution flow rate ranges from the maximum flow of one makeup pump at lower reactor power levels to the maximum flow of two makeup pumps at higher reactor power levels, as specified in the COLR." In addition, which Subsection 5.6.3 listed methodology is used to determine the maximum allowed CVCS demineralized water flow path flow rate as a function of core design, RCS boron concentration, and core thermal power?

(iii) On Page B 3.1.9-2, fifth paragraph of ASA section: The applicant is requested to revise the second sentence to address the limits on dilution flow rate, as indicated by the following suggestion: "The COLR limits on boron concentration in the boric acid supply and the CVCS makeup pump demineralized water flow path flow rate ~~satisfies~~ satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii)."

(iv) On Page B 3.1.9-3, third paragraph of Applicability section: Insert a space between the first and second sentences.

(v) On Page B 3.1.9-3, fourth paragraph of Applicability section: The applicant is requested to revise the first sentence for clarity, as indicated by the following suggestion: "In MODES 4 and 5, a dilution event is precluded because the CVCS RCS injection and discharge flow paths ~~is~~ are not connected to the ~~normal CVCS~~ RCS, thus eliminating the possibility of a boron dilution event in the RCS."

56. A response is not required because the applicant stated in an email dated November 12, 2018, to follow up the November 6, 2018, public meeting conference call, that it would address this purely editorial item in Revision 3 of DCA part 4. Per the writer's guide, if a SR table begins on a page that an Actions table ends, three blank lines separate the tables (three blank lines above the title "SURVEILLANCE REQUIREMENTS"). The number of lines appears to be more than three on Pages 3.2.1-1, 3.2.2-1, 3.3.4-3, 3.4.2-1, 3.4.3-2, 3.4.7-2, and 3.6.1-1. The applicant is requested to conform to the STS format convention.

57. A response is not required because the applicant stated in an email dated November 12, 2018, to follow up the November 6, 2018, public meeting conference call, that it would address this purely editorial item in Revision 3 of DCA part 4. In Subsection 3.3.1, the "OR" logical connector should align with the period before the last digit of "N.2.1" and "N.2.2"; it is a bit too far to the right. In Required Action M.3, a space is missing between "temperature" and "below." The applicant is requested to correct these typographical errors.

58. A response is not required because the applicant stated in an email dated November 12, 2018, to follow up the November 6, 2018, public meeting conference call, that it would address this purely editorial item in Revision 3 of DCA part 4. In Subsection 3.2.2, the Completion Time for Required Action A.1 should say "6 hours" not "6 Hours" The applicant is requested to correct this typographical error.

59. In Revision 2 of DCA part 4, Subsection 3.3.1: The applicant is requested to revise

(i) Required Action C.1, as indicated, because the Table 3.3.1-1 table matches a Condition to each MPS instrumentation Function (It appears that using "channel(s)" in the equivalent Required Action C.1 of W-AP1000-STS Subsections 3.3.1 and 3.3.8 is an error.) Also note that the removal of "(s)" is consistent with the separate condition entry example of Example 1.3-5:

> C.1 Enter the Condition referenced in Table 3.3.1-1 for the ~~channel(s)~~ affected Function. | Immediately

(ii) Required Action F.1, as indicated, for consistency with similar action statements related to inoperable channels of the CVCS isolation actuation Function, or the isolation valves the CVCSI Function closes:

> F.1 Isolate the CVCS charging and letdown flow paths to the Reactor Coolant System (RCS). | 6 hours

The applicant is requested to explain whether the intent of this action is to isolate all CVCS flow paths listed in LCO 3.4.6, "CVCS Isolation Valves"; if not, then explain which flow paths must be isolated, and why; and explain why the other flow paths are not required to be isolated. Consider whether meeting the action, as written, is sufficient to ensure the CVCSI actuation Function would be satisfied. Compare Subsection 3.3.3, Required Action F.1. Also the phrasing Subsection 3.3.4 Required Action F.1 ("Isolate the flow paths from the CVCS to the Reactor Coolant System ...") should also be made consistent with similar actions.

60. In Revision 2 of DCA part 4, Subsection 3.3.1, Table 3.3.1-1, Function 24 title. The applicant is requested to consider revising the title to say "24. High Wide Range RCS Pressure – Low Temperature Overpressure Protection"; also make conforming changes to the Bases on page B 3.1.1-38, paragraph 10.a. Since the "wide range RCS pressure" is "measured at the steam space near the top of the reactor vessel" does this mean the steam space near the top of the pressurizer? If so, why not say wide range pressurizer pressure instead of wide range RCS pressure?

61. A response is not required because the applicant stated in an email dated November 12, 2018, to follow up the November 6, 2018, public meeting conference call, that it would address this purely editorial item in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, Subsection 3.3.1, Header Row of Table 3.3.1-1. For consistency with the STS format convention, one blank line should appear above and below the single spaced text, with the text positioned using ¶, as follows (ignore double spacing):

¶	¶	¶	¶
¶	APPLICABLE MODES OR	¶	¶
¶	OTHER SPECIFIED	REQUIRED	¶
FUNCTION¶	CONDITIONS¶	CHANNELS¶	CONDITIONS¶

The applicant is requested to revise all such tables in the generic TS to conform to this convention. Also notice that "APPLICABLE" and "MODES OR" appear in separate lines on page 1 of Table 3.3.1-1, but in the same line on pages 2 through 7; the applicant is requested to be consistent in the presentation of the title of each column in the instrumentation function tables.

62. A response is not required because the applicant stated in an email dated November 12, 2018, to follow up the November 6, 2018, public meeting conference call, that it would address this item in "Part 2, Item 10" of a supplemental response to RAI 197-9051, Question 16-28, and in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, Subsection 3.3.3, Required Action G.1 Note says "Heater(s) may be energized intermittently under manual controls." Why not say "under administrative controls"? The Bases for this Required Action, on page B 3.3.3-8, uses "administrative controls." The applicant is requested to change "manual" to "administrative" in the Note.

63. Based on Revision 2 of DCA part 4, the applicant is requested to verify that the adjective "required" in Condition, Required Action, and Surveillance statements is used only when needed. For example, the staff notes the following instances where its use may not be needed: SR 3.3.1.1, SR 3.3.1.4, SR 3.3.3.2.

64. Based on Revision 2 of DCA part 4, Subsection 3.3.1 Actions table Note. The applicant is requested to consider whether the following additional Note would clarify the intent of the existing Note on separate Condition entry (ignore formatting):

----------NOTES----------

1. Separate Condition entry is allowed for each Function.

2. Separate Condition entry is allowed for each steam generator for Functions 17, 18, 19, 20, and 21; and for each bus for Function 25.

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65. Based on Revision 2 of DCA part 4, Subsection 3.3.2. The applicant is requested to revise:

(i) LCO statement to say: "Two Reactor Trip System (RTS) Logic and Actuation divisions shall be OPERABLE." for improved clarity.

(ii) Conditions B and C and Required Action B.1 by using title case for "RTS logic and actuation"; i.e., "RTS Logic and Actuation", for consistency with the LCO statement and Subsection 3.3.3 Actions table.

66. Based on Revision 2 of DCA part 4, Subsection 3.3.3. The applicant is requested to revise:

(i) Condition A as indicated:

A. ~~One or more divisions of the~~ LTOP ~~Logic and Actuation~~ actuation Function with one or both Logic and Actuation divisions inoperable.

(ii) Condition B statement so that "required" is not needed to modify the word "Function" as indicated:

B. One ~~division of required~~ or more actuation Functions, ~~function in Table 3.3.3-1 inoperable~~ other than the LTOP ~~function~~ actuation Function, with one ESFAS Logic and Actuation division inoperable.

(iii) Required Action B.1

B.1 Enter the Condition referenced in Table 3.3.3-1 for the affected Function~~(s)~~. | 6 hours

(iv) Actions table by using title case for the word "function"; i.e., "Function" in Required Action B.1 and Conditions C, D, E, F, G; and for "reactor coolant system" in Required Action E.1; i.e., "Reactor Coolant System" (to match Required Action F.1, *and Required Actions E.1 and F.1 of Subsection 3.3.4*).

(v) Condition G, second condition statement for consistency with the Function's title in Table 3.3.3-1 and Conditions C, D, E, and F, as indicated:

G. Both divisions of Pressurizer Heater Trip ~~de-energization~~ actuation Function ~~function~~ inoperable.

67. Based on Revision 2 of DCA part 4, Subsection 3.3.4: The applicant is requested to revise Required Actions A.1 and B.1, as indicated:

A.1 Enter the Condition referenced in Table 3.3.4-1 for the affected Function~~(s)~~. | 48 hours

B.1 Enter the Condition referenced in Table 3.3.4-1 for the affected Function~~(s)~~. | 6 hours

The "(s)" is not consistent with Example 1.3-5, and should be removed. The staff suggests using title case for "Function" in the context of a GTS Section 3.3 Function. The staff also suggests modifying "Function" to say "affected Function" for clarity.

68. A response is not required because the applicant stated in an email dated November 12, 2018, to follow up the November 6, 2018, public meeting conference call, that it would address this purely editorial item in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, Subsection B 3.4.1, Surveillance Requirements section, last paragraph. The applicant is requested to improve the clarity of this paragraph as indicated:

> The frequency requires this surveillance to be performed once after each refueling. ~~The potential for inadvertent~~ Inadvertent changes that might impact ~~on~~ flow resistance ~~is~~ are most likely to occur during refueling operations. Other credible changes to flow resistance are slow developing phenomena and unlikely to change significantly between performances of the surveillance.

69. A response is not required because the applicant stated in an email dated November 12, 2018, to follow up the November 6, 2018, public meeting conference call, that it would address this item in "Part 2, Item 10" of a supplemental response to RAI 197-9051, Question 16-28, and in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, Table 3.3.3-1 Footnote (c), and Table 3.3.4-1 Footnote (d) modify the Modes 2 and 3 Applicability of **actuation** Function 3.3.3.6, "Pressurizer Heater Trip," and **manually actuated** Function 3.3.4.7, "Pressurizer Heater Trip," respectively. These footnotes state:

> Not required when pressurizer heater trip breakers are open and **deactivated**.

Subsection 3.3.1, Table 3.3.1-1 Footnote (f) modifies the Modes 2 and 3 Applicability of MPS **instrumentation** Functions that initiate a "Pressurizer Heater Trip" (PHT)

7.c	PHT on "High Pressurizer Pressure"	Modes 1, 2(f), 3(f)	G
8.d	PHT on "Low Pressurizer Pressure"	Mode 1(g)	G
9.d	PHT on "Low Low Pressurizer Pressure"	Modes 1, 2	G
11.b	PHT on "Low Pressurizer Level"	Modes 1, 2(f), 3(f)	G
12.d	PHT on "Low Low Pressurizer Level"	Modes 1, 2(f), 3(f)	G
13.c	PHT on "High NR RCS Hot Temperature"	Modes 1, 2(f), 3(f)	G
17.c	PHT on "High Main Steam Pressure"	Modes 1, 2(f), 3(f)	G
18.c	PHT on "Low Main Steam Pressure"	Mode 1(b)	E
19.c	PHT on "Low Low Main Steam Pressure"	Modes 1, 2(f)	G
20.c	PHT on "High Steam Superheat"	Mode 1	G
21.c	PHT on "Low Steam Superheat"	Mode 1	G
22.e	PHT on "High NR Containment Pressure"	Modes 1, 2(f), 3(f)	G
25.e	PHT on "Low AC Voltage to ELVS BCs"	Modes 1, 2(f)	M
26.e	PHT on "High Under-the-Bioshield Temp."	Modes 1, 2(f), 3(f)	M

Table 3.3.1 Footnote (f) states:

(f) With pressurizer heater trip breakers closed.

(i) The applicant is requested to explain why Table 3.3.3-1, Footnote (c), and Table 3.3.4-1, Footnote (d), are different from Table 3.3.1-1, Footnote (f). Else, make the phrasing consistent.

(ii) The applicant is requested to explain the significance of "open and **deactivated**" in Table 3.3.3-1, Footnote (c), and Table 3.3.4-1, Footnote (d).

(iii) The applicant is requested to explain why the Required Actions for inoperable PHT related Functions are phrased differently. Else, make the statements consistent. These differences are evident in the following quotations:

LCO 3.3.1 Required Action:

"E.1 Reduce THERMAL POWER to below the N-2L interlock. | 6 hours"

"G.1 Open pressurizer heater breakers. | 6 hours"

"M.5 Open pressurizer heater breakers. | 96 hours"

LCO 3.3.3 Required Action:

"G.1 De-energize **p**ressurizer **h**eaters. | 6 hours"

LCO 3.3.4 Required Action:

"G.1 De-energize affected pressurizer heaters. | 24 hours"

(iv) The applicant is requested to revise the Note for LCO 3.3.3 Required Action G.1 and the (almost) identical Note for LCO 3.3.4 Required Action G.1 as indicated:

Pressurizer heater breakers ~~Heater(s)~~ may be ~~energized~~ closed intermittently under ~~manual~~ administrative controls.

The applicant is also requested to explain why it has not proposed the same Note for LCO 3.3.1, Required Actions G.1 and M.5.

(v) The surveillance statement of SR 3.3.3.4 defines an acronym, PHTB, which stands for "pressurizer heater trip breaker"; however, PHTB is used nowhere else in the GTS. Likewise, the Bases for SR 3.3.3.4 t defines PHTB, using it twice in the first two sentences, but nowhere else. The applicant is requested to (A) not define and not use PHTB; and (B) consistently refer to the 'pressurizer heater trip breakers' or the 'pressurizer heater breakers' in the Section 3.3 Actions and SRs, and Bases. (The staff observes that the Bases for LCO 3.3.3, Background section, defines the acronym, PHT, which stands for "Pressurizer Heater Trip"; PHT can be used to refer to the ESFAS PHT logic and actuation Function; it can also be used in reference to a PHT breaker. PHT is not used in Subsection 3.3.3, however.)

70. A response is not required because the applicant stated in an email dated November 12, 2018, to follow up the November 6, 2018, public meeting conference call, that it would address this item in the response to RAI 506-9614, Question 16-59, and in Revision 3 of DCA part 4. DCA Revision 2, part 4, on DCA pages B 3.3.1-14 and 15, describe the T-3 interlock as automatically bypassing MPS Functions 9.b, 9.c, and 9.d when wide range RCS hot temperature is < 350°F (T-3 interlock); but an RCS hot temperature below 350°F implies the NPM is in MODE 3, which is outside the stated Applicability of these Functions, which is MODES 1 and 2.

The Bases rationale for not including MODE 3 seems to be the passage on page B 3.3.1-25:

Four Low Low Pressurizer Pressure DHRS, CVCSI and Pressurizer Heater Trip channels are required to be OPERABLE when operating in MODES 1 and 2. In MODES 3, 4, and 5 the reactor is subcritical.

The applicant is requested to explain and clarify this rationale.

71. A response is not required because the applicant stated in an email dated November 12, 2018, to follow up the November 6, 2018, public meeting conference call, that it would address this purely editorial item in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, on page B 3.1.5-3, in the next to last paragraph of the Background section of Subsection B 3.5.1, the first two sentences need editing for improved clarity. The applicant is requested to make the changes to the first sentence suggested by markup, or provide an equivalent change:

> In MODE 4 the ECCS is not required ~~when~~ because the ECCS valves are open and de-energized, ~~or~~ and the unit is being PASSIVELY COOLED, which ~~ensuring~~ ensures decay heat removal is being accomplished.

The applicant is requested to clarify the second sentence to more clearly describe the pool water flow path during the unbolting and removal of the upper part of the containment, and movement of the RPV and lower containment to the reactor tool. The second sentence states:

> Additionally, in MODE 4 during module relocation between the containment tool and the reactor tool, the de-energized and opened RRVs provide direct communication between the reactor pool water inside the containment and the RCS.

72. In Revision 2 of DCA part 2, FSAR Tier 2, Section 5.2, page 5.2-24 states,

> Maintaining acceptable containment leakage detection performance using the containment pressure monitoring and CES condensate monitoring systems is dependent on maintaining containment pressure below the vapor pressure for the lowest internal containment wall temperature. For conservatism, the minimum containment wall temperature is assumed to be equal to the reactor pool bulk temperature. Figure 5.2-3 provides a containment pressure saturation curve as a function of reactor pool bulk temperature with an adjustment to account for containment pressure instrumentation uncertainty. When containment pressure is in the Not Acceptable region of Figure 5.2-3, condensation may exist inside the containment thus impacting the accuracy of the containment pressure monitoring and CES condensate monitoring systems.

(i) Based on this discussion, the applicant is requested to confirm that the CNV pressure vs. CNV inner wall temperature limit curve of FSAR Figure 5.2-3 defines the CNV pressure above which CES condensate channels and CES inlet pressure channels are insufficiently accurate and therefore inoperable.

(ii) The applicant is requested to consider adding a Surveillance to Subsection 3.4.7 that verifies CNV pressure is within limits with a Frequency of 12 hours.

(iii) The staff observes that the Bases for Subsection 3.4.7 does not discuss the relationship between CES performance, as indicated by CNV pressure (and CNV wall temperature), and operability of the CES RCS leakage detection methods (CES condensate channels and CES inlet pressure channels). The applicant is requested to revise Subsection B 3.4.7 by including a discussion of the dependency of these RCS leakage detection methods on CNV narrow range pressure (and CNV inner wall temperature assumed to match UHS temperature), and whether the gaseous radioactivity monitor channel operability is affected by CNV pressure.

73. A response is not required because the applicant stated in an email dated November 12, 2018, to follow up the November 6, 2018, public meeting conference call, that it would address this item in "Part 2, Item 10" of a supplemental response to RAI 197-9051, Question 16-28, and in Revision 3 of DCA part 4. In Revision 2 of DCA part 4, Notes that say "...may be unisolated intermittently under administrative controls." are listed below. The applicant is requested to consider whether all the "(s)" on the word "path(s)" or "heater(s)" can be changed to "s" as an improvement over the STS. The "(s)" actually means "one or more" and that is clearly implied by using "paths" and "heaters."

- LCO 3.1.9 Required Action B.1 Note: "[Dilution source] Flow path(s) [in the CVCS makeup line] may be unisolated intermittently under administrative controls."
- 73.2 LCO 3.3.1 Required Action F.1 Note: "CVCS flow path(s) may be unisolated intermittently under administrative controls."
- LCO 3.3.3 Required Action E.1 Note: "Flow path(s) [from the demineralized water storage tank to the RCS] may be unisolated intermittently under administrative controls."

- LCO 3.3.3 Required Action F.1 Note: "[CVCS charging and letdown] Flow path(s) may be unisolated intermittently under administrative controls."
- LCO 3.3.3 Required Action G.1 Note: "[Pressurizer] Heater(s) may be energized intermittently under **manual** controls."
- LCO 3.3.4 Required Action E.1 Note: "Flow path(s) [from the demineralized water storage tank to the RCS] may be unisolated intermittently under administrative controls."
- LCO 3.3.4 Required Action F.1 Note: "Flow **paths** [from CVCS to the RCS] may be unisolated intermittently under administrative controls."
- LCO 3.3.4 Required Action G.1 Note: "[Pressurizer] Heater(s) may be energized intermittently under administrative controls."
- LCO 3.4.6 Actions table Note 1: "CVCS flow path(s) may be unisolated intermittently under administrative controls."
- LCO 3.6.2 Actions table Note 1: "Penetration flow path(s) may be unisolated intermittently under administrative controls."
- LCO 3.7.1 Actions table Note 2: "Main steam line flow path(s) may be unisolated intermittently under administrative controls."
- LCO 3.7.2 Actions table Note 2: "Feedwater flow path(s) may be unisolated intermittently under administrative controls."

74. In Revision 2 of DCA part 4, Subsections 3.4.6 and 3.6.2. The applicant is requested to explain how the operability of the eight CVCS containment isolation valves specified by LCO 3.4.6 differs from the operability of these valves specified by LCO 3.6.2. In particular, the CVCS isolation valves are required in Mode 3 with RCS hot temperature < 200°F by LCO 3.4.6. Does this imply that below 200°F, the eight CVCS isolation valves do not need to meet SR 3.6.2.2 and SR 3.6.2.5 (verify combined leakage rate of all containment bypass leakage paths is $\leq 0.6\ L_a$ when pressurized $\geq P_a$)?

- Can meeting SR 3.6.2.1 (verify **required** valves accumulator [nitrogen] pressures) or meeting SR 3.4.6.1 (verify **required** valves accumulator [nitrogen] pressures) be credited as meeting the other? Should each of these two SRs include a Note that permits this?
- Can meeting SR 3.6.2.3 (verify isolation time of each containment isolation valve) or meeting SR 3.4.6.2 (verify isolation time of each automatic power operated CVCS valve) be credited as meeting the other? Should each of these two SRs include a Note that permits this?
- Can meeting SR 3.6.2.4 (verify each automatic containment isolation valve ... actuates to the isolation position on an actual or simulated actuation signal) or meeting SR 3.4.6.3 (verify each automatic CVCS valve ... actuates to the isolation position on an actual or simulated actuation signal) be credited as meeting the other? Should each of these two SRs include a Note that permits this?

75. In Revision 2 of DCA part 4, Subsection B 3.6.2, Actions section. The applicant is requested to

- Correct the Bases for Action B.1. The first paragraph ends with the phrase "...with two condition isolation valves" but should say ""...with two containment isolation valves."
- Revise the Bases discussions of the Notes for Condition A and Condition B, which state, "Only applicable to penetration flow paths with two containment isolation valves." The staff suggests that Subsection B 3.6.2 state the containment penetrations that are for a closed system or that have just one active containment isolation valve; and the LCOs that govern the containment isolation function operability of such penetration flow paths.