

KHNPDCDRAIsPEm Resource

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Subject: APR1400 Design Certification Application RAI 189-8057 (16 - Technical Specifications)
Attachments: APR1400 DC RAI 189 SPSB 8057.pdf; image001.jpg

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Thank you,

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REQUEST FOR ADDITIONAL INFORMATION 189-8057

Issue Date: 09/01/2015
Application Title: APR1400 Design Certification Review – 52-046
Operating Company: Korea Hydro & Nuclear Power Co. Ltd.
Docket No. 52-046
Review Section: 16 - Technical Specifications
Application Section: 16.3.1 Reactivity Control Systems

QUESTIONS

16-59

Justify deviation from the STS regarding Technical Specification (TS) 3.1.1. Shutdown Margin (SDM).

The STS has one TS (3.1.1) for SDM, applicable in MODES 3, 4, and 5. The applicant has proposed dividing the TS into two separate TS, 3.1.1. SHUTDOWN MARGIN (SDM) – $T_{\text{cold}} > 99^{\circ} \text{C}$ (210°F) and 3.1.2 SHUTDOWN MARGIN (SDM) – $T_{\text{cold}} \leq 99^{\circ} \text{C}$ (210°F).

The deviation report, APR1400-K-O-NR-14001-NP, states that the SDM specifications are divided into 2 sections according to the applicable mode dependent shutdown margin in APR1400. This is reflected in the APPLICABILITY of the TS, with the proposed TS 3.1.1 being applicable in MODES 3 and 4 and the proposed TS 3.1.2 being applicable in MODE 5. Other than the difference in APPLICABILITY, the proposed TS 3.1.1 and 3.1.2 (LCO statements, ACTIONS, and SURVEILLANCE REQUIREMENTS) are identical.

This justification is required to ensure that the division of TS 3.1.1 into two TS is necessary, despite the fact that the new proposed TS are identical.

16-60

Clarify the term k_{N-1} in Technical Specifications (TS) 3.1.1 and 3.1.2.

The LCO statement “b” for both 3.1.1 and 3.1.2 read “b. k_{N-1} shall be < 0.99 .” The term k_{N-1} is never previously defined. The term is then used again in CONDITION B for both 3.1.1 and 3.1.2.

Section 3.2.2.a of the Writer’s Guide for Plant Specific Improved Technical Specifications states: “Upon the first reference in each Specification or Bases to a phrase for which an abbreviation is desired to be used (except as allowed in Writer’s Guide Section 3.2.2.b below), use the full phrase followed by the acronym or initialism set off by parenthesis. Use the abbreviation alone on all subsequent references in that Specification or Bases.” Section 3.2.2.b discusses commonly used and understood acronyms and initialisms, which “ k_{N-1} ” does not fall under.

This clarification is required to ensure the TS are complete and accurate and that the guidance contained in the Writer’s Guide is followed.

16-61

Clarify an omission from the STS in Surveillance Requirement (SR) 3.1.4.1.

The text in the STS reads “Verify MTC is within the upper limit specified in the COLR.” The APR1400 text reads “Verify MTC is within the upper limit.” The phrase “specified in the COLR” is commonly used in the APR1400 text when referring to limits, which aligns the text with the STS.

REQUEST FOR ADDITIONAL INFORMATION 189-8057

The deviation report, APR1400-K-O-NR-14001-NP, states that "The actual value of the MTC is dependent on core characteristics such as fuel loading and reactor core soluble boron concentrations. Since positive MTC limits assumed in the safety analysis are not to be challenged or must be met using burnable absorbers for both initial and the reload cores, thus, those are not classified as COLR item in APR1400." However, the LCO statement and the NOTE for SR 3.1.4.2 both refer to COLR limits.

This clarification of the SR is required to ensure the completeness of the Technical Specifications.

16-62

Justify the deviation from the STS in the NOTE for Figure 3.1.5-1, Required Power Reduction after CEA Deviation.

The STS text reads "When core power is reduced to 60% RTP per this limit curve, further reduction is not required by this Specification." The APR1400 text reads "When core power is reduced to 55 % rated thermal power (RTP) per this limit curve, further reduction is not required by this Specification."

The applicant is requested to address the following:

- Justify the different RTP value (55% vice 60%).
- It is unnecessary to write out rated thermal power in the NOTE. The abbreviation RTP is commonly understood and used throughout the APR1400 Technical Specifications (TS) without defining it prior to its use.
- It is unwarranted to include spaces between the value and the unit (i.e. "55%" vice "55 %"). This is a common issue throughout the TS and the Bases and should be globally addressed.

These justifications/clarifications are required to ensure the accuracy and completeness of the TS and to better align the text with the STS.

16-63

Verify the Frequency of Surveillance Requirement (SR) 3.1.6.1 is correct in the TS.

The Shutdown Control Element Assembly (CEA) Insertion Limits are found in section 3.1.6 of the TS, which corresponds to section 3.1.5 of the STS. The Frequency of SR 3.1.6.1 in the TS reads "24 hours" with a NOTE. The Frequency of SR 3.1.5.1 in the STS reads "12 hours" with the same NOTE. The discussion of the SR Frequency in the APR1400 Bases states "...verification of shutdown CEA position at a Frequency of 12 hours is adequate..."

This verification is required to ensure that SR 3.1.6.1 will be performed at the correct Frequency.

16-64

Justify a deviation from the STS regarding the NOTE for Surveillance Requirement (SR) 3.1.7.1.

The NOTE in the STS reads "Not required to be performed until 12 hours after entry into MODE 2." The NOTE in the APR1400 reads "This Surveillance is not required to be performed prior to entry into MODE 2."

The applicant is requested to address the following:

- The inclusion of the text "This Surveillance is". Typically, this phrase is not used in NOTES because it is unnecessary.
- The difference of the time frame, i.e. "prior to entry into MODE 2" vice "until 12 hours after entry into MODE 2."

These clarifications are to ensure that the NOTE is accurate for SR 3.1.7.1 and that unnecessary wording in the Technical Specifications is avoided.

REQUEST FOR ADDITIONAL INFORMATION 189-8057

16-65

Clarify the wording in the LCO statement for Technical Specification (TS) 3.1.9.

The LCO statement ends with "...and removing the power to the above valve." The use of the phrase "above valve" should be avoided. The name of the valve should be repeated.

This clarification is required to ensure that non-specific wording is avoided in the TS.

16-66

Correct the formatting of the NOTE in the REQUIRED ACTION column of Technical Specification (TS) 3.1.9 and discuss the NOTE in the Bases.

Section 2.1.4.a of the Writer's Guide for Plant Specific Improved Technical Specifications states "Notes should be above the text it applies to except when associated with the LCO or Applicability statement." The NOTE in TS 3.1.9 is below ACTION A.1 and above the Logical Connector "OR". The Logical Connector "OR" is located above ACTION A.2. It is unclear if the NOTE applies to ACTION A.1 or A.2. The ACTIONS portion of the Bases for TS 3.1.9 does not contain any reference to the NOTE.

The applicant is requested to address the following:

- Ensure the formatting is correct in the TS so it is clear as to which ACTION the NOTE applies.
- Include a discussion of the NOTE with the applicable ACTION in the Bases.

This formatting correction is required to reflect the guidance in the Writer's Guide and to ensure clarity as to which ACTION the NOTE applies in the TS. The additional discussion in the Bases is required to ensure the Bases accurately and completely reflect the information in the TS.

16-67

Correct the formatting of the ACTIONS table for Technical Specification 3.1.10 which poses a significant human factors threat.

On page 3.1.10-1, the ACTIONS table contains CONDITION A, REQUIRED ACTION A.1, and the associated COMPLETION TIME. Following the table, there is a double line which signifies the end of the table. However, on page 3.1.10-2, it states that CONDITION A is continued and contains a Logical Connector "OR" and a second Condition. The REQUIRED ACTION and COMPLETION TIME sections are blank on page 3.1.10-2. This is contradictory to the text in the STS.

Section 2.5.7.e.2 of the Writer's Guide for Plant Specific Improved Technical Specifications states "...never split the text of the Condition column across pages..."

This correction is to ensure that the formatting guidance contained in the Writer's Guide is followed and to ensure that the human factors threat is eliminated.

16-68

Justify the deviation from the STS by omitting the NOTE in Surveillance Requirement (SR) 3.1.10.2

The STS has a NOTE associated with SR 3.1.10.2 that reads "Not required to be performed during initial power escalation following a refueling outage if SR 3.1.4.5 has been met." The APR1400 Technical Specification (TS) omits this NOTE.

This justification is required to ensure that SR 3.1.10.2 is performed as required.

REQUEST FOR ADDITIONAL INFORMATION 189-8057

16-69

Justify an omission from the STS in the Bases of Technical Specification 3.1.1 in the Actions section.

The STS contains a paragraph discussing the determination of boration flow rate based on the time in core life. This discussion is omitted from the APR1400 Bases.

This justification is required to ensure the accuracy and completeness of the Bases.

16-70

Clarify the text contained in the first paragraph of the Background section on page B3.1.3-1 of the Technical Specification (TS) Bases.

The final sentence of the paragraph reads "Comparing predicted versus measured core reactivity validates the nuclear methods used in the safety analysis and supports the SDM demonstrations (LCO 3.1.1, "SHUTDOWN MARGIN (SDM) – $T_{\text{cold}} > 99^{\circ}\text{C}$ (210°F)") in ensuring the reactor can be brought safely to cold, subcritical conditions." The same sentence in the STS references LCO 3.1.1 as well. However, unlike the STS, APR1400 TS divided TS 3.1.1 into two TS, 3.1.1 and 3.1.2. TS 3.1.2 is identical to 3.1.1 except that it is " $\leq 99^{\circ}\text{C}$ (210°F)". In order to fully capture the reference to LCO 3.1.1, the text may need to include a reference to TS 3.1.2.

This clarification is required to ensure the accuracy and completeness of the TS Bases.

16-71

Clarify the deviation from the STS in the Bases for Technical Specification (TS) 3.1.5 Control Element Assembly (CEA) Alignment.

In the second to last paragraph of the Applicable Safety Analysis section on page B3.1.5-3, the APR1400 Bases states "The second type of analysis considers the case of a single CEA withdrawn from a bank inserted to its insertion limit." The same sentence in the STS states "The second type of analysis considers the case of a single CEA withdrawn [] inches from a bank inserted to its insertion limit." The sentence is unclear and void of important information by omitting "[] inches".

The clarification is required to ensure the accuracy and completeness of the TS Bases.

16-72

Address the following issues within the Surveillance Requirements (SR) section of the Bases for Technical Specification (TS) 3.1.5 Control Element Assembly (CEA) Alignment:

- In SR 3.1.5.1 and 3.1.5.2, the text reads "The specified 12-hour Frequency..." There should not be a hyphen in between the "12" and "hour" (captured in another RAI) and the word "specified" is not needed. The inclusion of "specified" deviates from the STS.
- In SR 3.1.5.1, the abbreviation "MCR" is used without defining it prior to its use. The STS uses the phrase "control room" vice "MCR". The abbreviation is used again in SR 3.1.5.2 and 3.1.5.3, therefore the definition is required.
- The text of SR 3.1.5.3 states "...are exercised every 92 days to provide..." The same sentence in the STS states "...are exercised to provide..." The phrase "every 92 days" is a restrictive phrase that is not needed and deviates from the STS. The 92 day Frequency is adequately discussed later in that paragraph.
- The APR1400 Bases for SR 3.1.5.4 omits text from the STS. The omitted text describes the following: what actions may be used to constitute a successful test of the required contact(s) of a channel relay and why it is successful and a sentence of the end of the paragraph that concludes the SR Frequency is acceptable from a reliability standpoint.

The addressing of the above stated issues are required to ensure the accuracy and completeness of the TS Bases and, where applicable, to align the text with the STS.

REQUEST FOR ADDITIONAL INFORMATION 189-8057

16-73

Clarify the Actions listed in Actions B.1 in the Bases for Technical Specification (TS) 3.1.6 Shutdown Control Element Assembly (CEA) Insertion Limits.

Actions B.1 states "When Required Action A.1.1, A.1.2, or Required Action A.2 cannot be met..." There is only one Required Action (A.1) for TS 3.1.6.

This clarification is required to ensure the accuracy of the TS Bases.

16-74

Clarify the deviation from the STS in the Bases for Technical Specification (TS) 3.1.8 Part Strength Control Element Assembly Insertion Limits.

In the Applicable Safety Analysis section of the APR1400 Bases, item b states "...that the hot fuel rod in the core..." The same sentence in the STS states "...that the hot fuel CEA in the core..."

This clarification is required to ensure the accuracy and clarity, whether the text should read "rod" or "CEA", in the TS Bases.

16-75

Justify the deviation from the STS in the Bases for Technical Specification (TS) 3.1.8 Part Strength Control Element Assembly Insertion Limits.

The final paragraph in the Applicable Safety Analysis section of the APR1400 Bases omits a statement that is contained in the STS. The STS includes a statement that reads "The part length CEAs are required due to the potential peaking factor violations that could occur if part length CEAs exceed insertion limits." The statement further describes the need for part length CEAs (referred to as part strength CEAs in the APR1400 design).

The justification for this omission is required to ensure the completeness and accuracy of the TS Bases.

16-76

Expand/clarify the discussion in the Bases for Technical Specification (TS) 3.1.9 Charging Flow.

The discussion contained in the Bases is vague and non-descriptive. Many of the sections repeat the same items, "closing the orifice bypass valve and removing power to the valve" without fully explaining the how and why the applicable regulations are met.

In the Applicable Safety Analysis section, the phrase "removing power to the above valve" is used. Referring to the "the above valve" is unclear and against the standard practice of using the specific valve's name.

The Actions A.1 section states "an auxiliary charging pump, which supplies a restricted charging flow, may be turned on if necessary." The text does not explain what the pump would be used for clearly and how that achieves the requirements of the LCO.

The Actions A.2 section states "...suspend all operations immediately involving positive reactivity changes under the operator's control..." without discussing exactly what operations may cause positive reactivity control and how the operator would suspend these operations.

In the Background Section, the abbreviations "CVCS" and "RCS" are used without defining them prior to their uses.

The text in Surveillance Requirement (SR) 3.1.9.1 states "...for this Surveillance is enough to verify..." The phrase "is enough" is unclear and not commonly used to describe the adequacy of a SR Frequency. Frequencies commonly used the phrases "ensures" or "is sufficient" when describing their adequacy.

This expansion and clarification of the Bases for TS 3.1.9 Charging Flow is required to ensure that the Bases fully discuss the aspects of proposed TS 3.1.9.

REQUEST FOR ADDITIONAL INFORMATION 189-8057

16-77

Clarify a deviation from the STS in the Bases for Technical Specification (TS) 3.1.10 Special Test Exceptions (STE) – Shutdown Margin (SDM).

The final sentence of the second to last paragraph in the Applicable Safety Analysis states “The limits for these variables are specified in their respective LCOs.” The same sentence in the STS states “The limits for these variables are specified for each fuel cycle in the COLR.”

This clarification is required to ensure the accuracy and completeness of the TS Bases.

16-78

Clarify a deviation from the STS in the Bases for Technical Specification (TS) 3.1.10 Special Test Exceptions (STE) – Shutdown Margin (SDM), TS 3.1.11 Special Test Exceptions (STE) – MODES 1 and 2, and TS 3.1.12 Special Test Exceptions (STE) – Reactivity Coefficient Testing.

In the second to last paragraph in the Applicable Safety Analysis sections of TS 3.1.10 and 3.1.12 and the third to last paragraph in the Applicable Safety Analysis section of TS 3.1.11, the final sentence ends with “...are specified in their respective LCOs.” The same text in the STS ends with “...specified for each fuel cycle in the COLR.”

This clarification is required to ensure the accuracy and completeness of the TS Bases.

16-79

Justify a deviation from the APR1400 Technical Specifications (TS) within the Bases for Technical Specification (TS) 3.1.10 Special Test Exceptions (STE) – Shutdown Margin (SDM).

Surveillance Requirement (SR) 3.1.10.3 in the TS for APR1400 contains a NOTE stating “Applicable to operation in MODE 3 only.” This NOTE is not discussed in the Bases for SR 3.1.10.3.

This justification is required to ensure the accuracy and completeness of the TS Bases.

16-80

Justify an omission for the STS in the Bases for Technical Specification (TS) 3.1.11 Special Test Exceptions (STE) – MODES 1 and 2.

In the LCO section of the STS there is a paragraph that reads “Additionally, it permits the center CEA to be misaligned during PHYSICS TESTS required to determine the isothermal temperature coefficient (ITC), MTC, and power coefficient.” The APR1400 Bases omits this paragraph.

This justification is required to ensure the accuracy and completeness of the TS Bases.

