RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**508-8592**
SRP Section:	**16 – Technical Specifications**
Application Section:	**16 – Technical Specifications**
Date of RAI Issue:	**08/01/2016**

Question No. 16-178

Paragraph (a)(11) of 10 CFR 52.47 states that a design certification (DC) applicant is to propose Technical Specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. NUREG-1432, “Standard Technical Specifications (STS)-Combustion Engineering Plants,” Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements. Staff needs to evaluate all technical differences from standard TS (STS) NUREG-1432, STS Combustion Engineering Plants, Rev. 4, which is referenced by the DC applicant in DCD Tier 2 Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the generic TS to ensure adequate protection of public health and safety, and the completeness and accuracy of the generic TS Bases.

The Writer’s Guide for Plant-Specific Improved Technical Specifications (TSTF-GG-05-01) also provides guidance for the format and content of the TS. There are format and content differences between the DCD and the Writer’s Guide. These following corrections are necessary to ensure the completeness and accuracy of the TS and Bases.

Correct the following editorial errors within the Bases for Technical Specification 3.1.1.

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.”

- In the second paragraph of the Background section, the abbreviation “RCS” is used without defining it prior to its use.

- In the second paragraph of the Applicable Safety Analysis section, the abbreviation "k_{N-1}" is used without defining it prior to its use. This also occurs on page B3.1.2-2 in the final paragraph on the page.

- In the second paragraph of the Actions A.1 section, the abbreviation "IRWST" is used without defining it prior to its use.

These corrections are required to ensure the accuracy and completeness of the Bases and to align the text with the guidance contained in the Writer's Guide.

Response

The Background section and the Actions A.1 section of the Bases for Technical Specification 3.1.1 will be revised as the attached markup. Please refer to the response to RAI 189-8057, Question 16-60 for the definition of "k_{N-1}."

Impact on DCD

Same as changes described in Impact on Technical Specification section.

Impact on PRA

There is no impact on PRA.

Impact on Technical Specifications

The Bases for Technical Specification 3.1.1 will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.1 SHUTDOWN MARGIN (SDM) – T_{cold} > 99 °C (210 °F)

BASES

BACKGROUND

The reactivity control systems must be redundant and capable of holding the reactor core subcritical when shutdown under cold conditions, in accordance with GDC 26 (Reference 1). Maintenance of the SHUTDOWN MARGIN (SDM) ensures that postulated reactivity events will not damage the fuel. SDM requirements provide sufficient reactivity margin to ensure that acceptable fuel design limits will not be exceeded for normal shutdown and anticipated operational occurrences (AOOs). As such, the SDM defines the degree of subcriticality which would be obtained immediately following the insertion of all full strength control element assemblies (CEAs), assuming the single CEA of highest reactivity worth is fully withdrawn.

Reactor Coolant System (RCS)

The system design requires that two independent reactivity control systems be provided, and that one of these systems be capable of maintaining the core subcritical under cold conditions. These requirements are provided by the use of movable CEAs and soluble boric acid in the ~~RCS~~. The CEA system provides the SDM during power operation and is capable of making the core subcritical rapidly enough to prevent exceeding acceptable fuel damage limits, assuming that the CEA of highest reactivity worth remains fully withdrawn.

The soluble boron system can compensate for fuel depletion during operation and all xenon burnout reactivity changes and maintain the reactor subcritical under cold conditions.

During power operation, SDM control is ensured by operating with the shutdown CEAs fully withdrawn and the regulating CEAs within the limits of LCO 3.1.7, “Regulating Control Element Assembly (CEA) Insertion Limits.” When the unit is in the shutdown and refueling MODES, the SDM requirements are met by means of adjustments to the RCS boron concentration.

BASES

LCO

The MSLB accident (Reference 2) and the boron dilution accident (Reference 3) are the most limiting analyses that establish the SDM value of the LCO. For MSLB accidents, if the LCO is violated, there is a potential to exceed the DNBR limit and to exceed 10 CFR 50.34 limits (Reference 4). For the boron dilution accident, if the LCO is violated, then the minimum required time assumed for operator action to terminate dilution may no longer be applicable.

SDM, k_{N-1}, and criticality due to shutdown CEA withdrawal are a core physics design condition that can be ensured through CEA positioning (regulating and shutdown CEAs) and through the soluble boron concentration.

APPLICABILITY

In MODES 3 and 4, the SDM requirements are applicable to provide sufficient negative reactivity to meet the assumptions of the safety analyses discussed above.

In MODES 1 and 2, SDM is ensured by complying with LCO 3.1.6, “Shutdown Control Element Assembly (CEA) Insertion Limits,” and LCO 3.1.7 “Regulating Control Element Assembly (CEA) Insertion Limits.”

In MODE 5, the shutdown reactivity requirements are given in LCO 3.1.2, “SHUTDOWN MARGIN (SDM) – Tcold ≤ 99 °C (210 °F).” In MODE 6, the shutdown reactivity requirements are given in LCO 3.9.1, “Boron Concentration.”

ACTIONS

A.1

If the SDM requirements are not met, boration must be initiated promptly. A Completion Time of 15 minutes is adequate for an operator to correctly align and start the required systems and components. It is assumed that boration will be continued until the SDM requirements are met.

In the determination of the required combination of boration flow rate and boron concentration, there is no unique requirement that must be satisfied. Since it is imperative to raise the boron concentration of the RCS as soon as possible (above 4,000 ppm boric acid and 109.8 L/min (29 gpm) flow rate), the boron concentration should be a highly concentrated solution, such as boric acid in the ~~IRWST~~ in-containment refueling water storage tank (IRWST). The operator should borate with the best source available for the plant conditions.

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Question No. 16-179

Paragraph (a)(11) of 10 CFR 52.47 states that a design certification (DC) applicant is to propose Technical Specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. NUREG-1432, "Standard Technical Specifications (STS)-Combustion Engineering Plants," Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements. Staff needs to evaluate all technical differences from standard TS (STS) NUREG-1432, STS Combustion Engineering Plants, Rev. 4, which is referenced by the DC applicant in DCD Tier 2 Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the generic TS to ensure adequate protection of public health and safety, and the completeness and accuracy of the generic TS Bases.

The Writer's Guide for Plant-Specific Improved Technical Specifications (TSTF-GG-05-01) also provides guidance for the format and content of the TS. There are format and content differences between the DCD and the Writer's Guide. These following corrections are necessary to ensure the completeness and accuracy of the TS and Bases.

Clarify the deviation from the STS in the Bases for Technical Specification (TS) 3.1.4 Moderator Temperature Coefficient (MTC).

In the second paragraph of the Background section, the STS states "The reactor is designed to operate with a negative MTC over the largest possible range of fuel cycle operation." The same sentence in the APR1400 Bases states "The reactor is designed to operate with a non-positive MTC over the largest possible range of fuel cycle operation." The adjective "non-positive" is not as clear as the term "negative".

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

Response

The Background section of the Bases for Technical Specification 3.1.4 will be revised to ensure the completeness and accuracy of the TS Bases, as shown in the attached markup of this response.

Impact on DCD

Same as changes described in Impact on Technical Specification section.

Impact on PRA

There is no impact on PRA.

Impact on Technical Specifications

The Bases for Technical Specification 3.1.4 will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.4 Moderator Temperature Coefficient (MTC)

BASES

BACKGROUND

According to GDC 11 (Reference 1), the reactor core and its interaction with the reactor coolant system (RCS) must be designed for inherently stable power operation, even in the possible event of an accident. In particular, the net reactivity feedback in the system must compensate for any unintended reactivity increases.

The MTC relates a change in core reactivity to a change in reactor coolant temperature. A positive MTC means that reactivity increases with increasing moderator temperature; conversely, a negative MTC means that reactivity decreases with increasing moderator temperature. The reactor is designed to operate with a ~~non-positive~~ negative MTC throughout the possible range of fuel cycle operation. Therefore, a coolant temperature increase will cause a reactivity decrease, so that the coolant temperature tends to return toward its initial value. Reactivity increases that cause a coolant temperature increase will thus be self-limiting and stable power operation will result.

MTC values are predicted at selected burnups during the safety evaluation analysis and are confirmed to be acceptable by measurements. Both initial and reload cores are designed so that the beginning of cycle (BOC) MTC is less positive than that allowed by the LCO. The actual value of the MTC is dependent on core characteristics such as fuel loading and reactor coolant soluble boron concentration. The core design may require additional distributed absorber (burnable poison assemblies) to yield an MTC at the BOC within the range analyzed in the plant accident analysis. The end of cycle (EOC) MTC is also limited by the requirements of the accident analysis. Fuel cycles that are designed to achieve high burnups or that have changes to other characteristics are evaluated to ensure that the MTC does not exceed the EOC limit.

APPLICABLE SAFETY ANALYSES

The acceptance criteria for the specified MTC are:

a. The MTC values must remain within the bounds of those used in the accident analysis (Reference 2).

b. The MTC must be such that inherently stable power operations result during normal operation and during accidents, such as overheating and overcooling events.

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Question No. 16-180

Paragraph (a)(11) of 10 CFR 52.47 states that a design certification (DC) applicant is to propose Technical Specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. NUREG-1432, “Standard Technical Specifications (STS)-Combustion Engineering Plants,” Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements. Staff needs to evaluate all technical differences from standard TS (STS) NUREG-1432, STS Combustion Engineering Plants, Rev. 4, which is referenced by the DC applicant in DCD Tier 2 Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the generic TS to ensure adequate protection of public health and safety, and the completeness and accuracy of the generic TS Bases.

The Writer’s Guide for Plant-Specific Improved Technical Specifications (TSTF-GG-05-01) also provides guidance for the format and content of the TS. There are format and content differences between the DCD and the Writer’s Guide. These following corrections are necessary to ensure the completeness and accuracy of the TS and Bases.

Correct the sentence structure of a sentence in the Applicability section of the Bases for Technical Specification (TS) 3.1.5 Control Element Assembly (CEA) Alignment.

The first sentence of the section is incorrectly broken up into 2 sentences in the following manner: “…in MODES 1 and 2. Because these are the…” This deviates from the text in the STS and creates a sentence fragment.

This correction is required to ensure the accuracy of the TS Bases and to align the text with the STS.

Response

The first sentence in the Applicability section of the Bases for TS 3.1.5 CEA Alignment will be corrected from "…in MODES 1 and 2. Because these are the…" to "…in MODES 1 and 2 because these are the…" to ensure the accuracy of the TS Bases.

Impact on DCD

Same as the changes described in Impact on Technical Specifications.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

Page B 3.1.5-5 will be revised as indicated in the attachment.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

BASES

LCO

The limits on shutdown and regulating CEA alignments ensure that the assumptions in the safety analysis will remain valid. The requirements on CEA OPERABILITY ensure that upon reactor trip, the CEAs will be available and will be inserted to provide enough negative reactivity to shut down the reactor. The CEA OPERABILITY requirements (i.e., trippability) are separate from the alignment requirements that ensure the CEA banks maintain the correct power distribution and CEA alignment. The CEA OPERABILITY requirement is satisfied provided the CEA will fully insert in the required CEA drop time assumed in the safety analysis. CEA control malfunctions that result in the inability to move a CEA (e.g., CEA lift coil failures), but that do not impact trippability, do not result in CEA inoperability.

The requirement on OPERABILITY to maintain the CEA alignment to within 16.8 cm (6.6 in) between the highest and lowest CEAs in a subgroup is conservative. The minimum misalignment assumed in safety analysis is 48.3 cm (19 in), and in some cases, a total misalignment from fully withdrawn to fully inserted is assumed.

Failure to meet the requirements of this LCO can produce unacceptable power peaking factors and LHRs, or unacceptable SDMs, all of which can constitute initial conditions inconsistent with the safety analysis.

APPLICABILITY

The requirements on CEA OPERABILITY and alignment are applicable ~~in MODES 1 and 2.~~ ~~Because~~ in MODES 1 and 2 because these are the only MODES in which neutron (or fission) power is generated and the OPERABILITY (i.e., trippability) and alignment of CEAs have the potential to affect the safety of the plant. In MODES 3, 4, 5, and 6, the alignment limits do not apply because the CEAs are bottomed, and the reactor is shut down and not producing fission power. In the shutdown MODES, the OPERABILITY of the shutdown and regulating CEAs has the potential to affect the required SDM, but this effect can be compensated for by an increase in the boron concentration of the RCS. See LCO 3.1.1, “SHUTDOWN MARGIN (SDM) – T_{cold} > 99 °C (210 °F)” and LCO 3.1.2, “SHUTDOWN MARGIN (SDM) – T_{cold} ≤ 99 °C (210 °F)” for SDM in MODES 3, 4, and 5, and LCO 3.9.1 “Boron Concentration,” for boron concentration requirements during refueling.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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RAI No.:	**508-8592**
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Question No. 16-181

Paragraph (a)(11) of 10 CFR 52.47 states that a design certification (DC) applicant is to propose Technical Specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. NUREG-1432, "Standard Technical Specifications (STS)-Combustion Engineering Plants," Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements. Staff needs to evaluate all technical differences from standard TS (STS) NUREG-1432, STS Combustion Engineering Plants, Rev. 4, which is referenced by the DC applicant in DCD Tier 2 Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the generic TS to ensure adequate protection of public health and safety, and the completeness and accuracy of the generic TS Bases.

The Writer's Guide for Plant-Specific Improved Technical Specifications (TSTF-GG-05-01) also provides guidance for the format and content of the TS. There are format and content differences between the DCD and the Writer's Guide. These following corrections are necessary to ensure the completeness and accuracy of the TS and Bases.

Correct the use of the abbreviation MCR in the Bases for Technical Specification (TS) 3.1.6 Shutdown Control Element Assembly (CEA) Insertion Limits.

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."

In the fourth paragraph of the Background section, the abbreviation MCR is used without defining it prior to its use. The STS uses the phrase “control room” vice “MCR”. In the second paragraph of Surveillance Requirement (SR) 3.1.6.1, the text states “…by the main control room (MCR) operator, verification…”

If the Bases are to refer to the Main Control Room vice the “control room” which is utilized in the STS, then the text in the Background should define the term utilizing initial capitalization as follows: “…automatically by the Main Control Room (MCR) operator.” The text in SR 3.1.6.1 should then only contain the abbreviation “MCR” since it will have been previously defined in the Background Section.

These corrections are required to ensure the accuracy of the TS Bases and to align the text with the guidance contained in the Writer’s Guide.

Response

The Background section and Surveillance Requirement 3.1.6.1 of the Bases for Technical Specification 3.1.6 will be revised to ensure the completeness and accuracy of the TS Bases, as shown in the attached markup of this response.

Impact on DCD

Same as changes described in Impact on Technical Specification section.

Impact on PRA

There is no impact on PRA.

Impact on Technical Specifications

The Bases for Technical Specification 3.1.6 will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.6 Shutdown Control Element Assembly (CEA) Insertion Limits

BASES

BACKGROUND

The insertion limits of the shutdown CEAs are initial assumptions in all safety analyses that assume CEA insertion upon reactor trip. The insertion limits directly affect core power distributions and assumptions of available SDM, ejected CEA worth, and initial reactivity insertion rate.

The applicable criteria for these reactivity and power distribution design requirements are 10 CFR Part 50, Appendix A, GDC 10 and 26 (Reference 1), and 10 CFR 50.46 (Reference 2). Limits on shutdown CEA insertion have been established, and all CEA positions are monitored and controlled during power operation to ensure that the reactivity limits, ejected CEA worth, and SDM limits are preserved.

The shutdown CEAs are arranged into groups that are radially symmetric. Therefore, movement of the shutdown CEAs does not introduce radial asymmetries in the core power distribution. The shutdown and regulating CEAs provide the required reactivity worth for immediate reactor shutdown upon a reactor trip.

main control room (MCR)

The design calculations are performed with the assumption that the shutdown CEAs are withdrawn prior to the regulating CEAs. The shutdown CEAs can be fully withdrawn without the core going critical. This provides available negative reactivity for SDM in the event of boration errors. The shutdown CEAs are controlled manually or automatically by the ~~MCR~~ operator. During normal unit operation, the shutdown CEAs are fully withdrawn. The shutdown CEAs must be completely withdrawn from the core prior to withdrawing regulating CEAs during an approach to criticality. The shutdown CEAs are then left in this position until the reactor is shut down. They affect core power, burnup distribution, and add negative reactivity to shut down the reactor upon receipt of a reactor trip signal.

BASES

ACTIONS (continued)

B.1

When Required Action A.1.1, A.1.2, or Required Action A.2 cannot be met or completed within the required Completion Time, a controlled shutdown should be commenced. The allowed Completion Time of 6 hours is reasonable, based on operating experience, for reaching MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.6.1

Verification that the shutdown CEAs are within their insertion limits prior to an approach to criticality ensures that when the reactor is critical, or being taken critical, the shutdown CEAs will be available to shut down the reactor, and the required SDM will be maintained following a reactor trip. This SR and Frequency ensure that the shutdown CEAs are withdrawn before the regulating CEAs are withdrawn during a unit startup.

MCR

Since the shutdown CEAs are positioned manually by the ~~main control room (MCR)~~ operator, verification of shutdown CEA position at a Frequency of 12 hours is adequate to ensure that the shutdown CEAs are within their insertion limits. Also, the Frequency takes into account other information available to the operator in the MCR for the purpose of monitoring the status of the shutdown CEAs.

A NOTE in FREQUENCY column always assures that required SDM is maintained by verifying each shutdown CEA is withdrawn greater than or equal to 367.7 cm (144.75 in) (SR 3.1.6.1) within 15 minutes prior to withdrawal of any CEA in regulating groups during an approach to reactor criticality.

REFERENCES

1. 10 CFR Part 50, Appendix A, GDC 10 and 26.
2. 10 CFR 50.46.
3. DCD Tier 2, Section 15.0.

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Question No. 16-182

Paragraph (a)(11) of 10 CFR 52.47 states that a design certification (DC) applicant is to propose Technical Specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. NUREG-1432, "Standard Technical Specifications (STS)-Combustion Engineering Plants," Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements. Staff needs to evaluate all technical differences from standard TS (STS) NUREG-1432, STS Combustion Engineering Plants, Rev. 4, which is referenced by the DC applicant in DCD Tier 2 Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the generic TS to ensure adequate protection of public health and safety, and the completeness and accuracy of the generic TS Bases.

The Writer's Guide for Plant-Specific Improved Technical Specifications (TSTF-GG-05-01) also provides guidance for the format and content of the TS. There are format and content differences between the DCD and the Writer's Guide. These following corrections are necessary to ensure the completeness and accuracy of the TS and Bases.

Clarify the text with the Surveillance Requirement (SR) 3.1.8.1 text in the Bases for Technical Specification (TS) 3.1.8 Part Strength Control Element Assembly Insertion Limits.

Address the following issues within SR 3.1.8.1:

- The abbreviation "MCR" is used prior to defining it prior to its use.

- The first sentence reads "…group position every 12 hours is sufficient…" The phrase "every 12 hours" is not needed in the text. The Frequency is adequately discussed later in the paragraph.

These clarifications are required to ensure the accuracy of the TS Bases.

Response

The first sentence of Surveillance Requirement (SR) 3.1.8.1 discusses about frequency to detect part strength CEA position and time to undertake the Required Action(s). Thus, "every 12 hours" is important key word in that sentence. The full phrase of "MCR" will be added in SR 3.1.8.1 of the Bases for Technical Specification 3.1.8 as the attached markup.

Impact on DCD

Same as changes described in Impact on Technical Specification section.

Impact on PRA

There is no impact on PRA.

Impact on Technical Specifications

The Bases for Technical Specification 3.1.8 will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

BASES

ACTIONS (continued)

Restoring the CEAs to within limits or reducing THERMAL POWER to that fraction of RTP that is allowed by CEA group position, using the limits specified in the COLR, ensures that acceptable peaking factors are maintained.

Since these effects are cumulative, ACTIONS are provided to limit the total time the part strength CEAs can be out of limits in any 30 EFPD or 365 EFPD period. Since the cumulative out of limit times are in days, an additional Completion Time of 2 hours is reasonable for restoring the part strength CEAs to within the allowed limits.

B.1

When a Required Action cannot be completed within the required Completion Time, a controlled shutdown should commence. A Completion Time of 4 hours is reasonable, based on operating experience, for reducing power to less than or equal to 20 % RTP from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.8.1

Verification of each part strength CEA group position every 12 hours is sufficient to detect CEA positions that could approach the limits, and provide the operator with time to undertake the Required Action(s), should insertion limits be found to be exceeded. The 12-hour Frequency also takes into account the indication provided by the power dependent insertion limit alarm circuit and other information about CEA group positions available to the operator in the ~~MCR~~ main control room (MCR).

SR 3.1.8.2

Verification of the accumulated time of part strength CEA group insertion beyond the long term steady state insertion limits ensures the cumulative time limits are not exceeded. The 24-hour Frequency ensures the operator identifies a time limit that is being approached before it is reached.

REFERENCE

1. 10 CFR Part 50, Appendix A, GDC 10 and 26.
2. 10 CFR 50.46.
3. DCD Tier 2, Section 15.4.

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Question No. 16-186

Paragraph (a)(11) of 10 CFR 52.47 states that a design certification (DC) applicant is to propose Technical Specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. NUREG-1432, "Standard Technical Specifications (STS)-Combustion Engineering Plants," Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements. Staff needs to evaluate all technical differences from standard TS (STS) NUREG-1432, STS Combustion Engineering Plants, Rev. 4, which is referenced by the DC applicant in DCD Tier 2 Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the generic TS to ensure adequate protection of public health and safety, and the completeness and accuracy of the generic TS Bases.

The Writer's Guide for Plant-Specific Improved Technical Specifications (TSTF-GG-05-01) also provides guidance for the format and content of the TS. There are format and content differences between the DCD and the Writer's Guide. These following corrections are necessary to ensure the completeness and accuracy of the TS and Bases.

Justify/clarify the deviation from the STS in the Bases for Technical Specifications (TS) 3.2.1 Linear Heat Rate (LHR), 3.2.2 Planar Radial Peaking Factors (Fxy), 3.2.3 Azimuthal Power Tilt (Tq), 3.2.4 Departure from Nucleate Boiling Ratio (DNBR), and 3.2.5 Axial Shape Index (ASI).

The Background sections for the above listed TS all contain the following text: "The power distribution is derived from the characteristics of multiple parameters and their combinations which can result in acceptable power distribution. LCOs for departure from nucleate boiling (DNB) and LHR need to be set to operate the plant within the power distribution design limit."

The STS text for those statements reads “Power distribution is a product of multiple parameters, various combinations of which may produce acceptable power distributions. Operation within the design limits of power distribution is accomplished by generating operating limits on the LHR and departure from nucleate boiling (DNB).”

The STS text is clearer. The first sentence in the APR1400 text contains the grammatical error “which can”. It also states that the limits “need to be set” which is not as clear as the STS wording which clearly ties the operations to the limits.

In the Bases for TS 3.2.4, the two sentences referenced above are broken up differently in the paragraphs listed on the page than the text in TS 3.2.1, 3.2.2, 3.2.3, and 3.2.5.

This justification/clarification is required to ensure the clarity and accuracy of the TS Bases.

Response

The text in the Background section of the Bases for TS 3.2.1, 3.2.2, 3.2.3, 3.2.4, and 3.2.5 will be changed from “The power distribution is derived from the characteristics of multiple parameters and their combinations which can result in acceptable power distribution. LCOs for departure from nucleate boiling (DNB) and LHR need to be set to operate the plant within the power distribution design limit.” to “Power distribution is a product of multiple parameters, various combinations of which may produce acceptable power distributions. Operation within the design limits of power distribution is accomplished by generating operating limits on the linear heat rate (LHR) and the departure from nucleate boiling (DNB).” for clarification as described in the STS.

Impact on DCD

Same as the changes described in Impact on Technical Specifications.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

Page B 3.2.1-1, B 3.2.2-1, B 3.2.3-1, B 3.2.4-1, and B 3.2.5-1 will be revised as indicated in the attachment.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.1 Linear Heat Rate (LHR)

BASES

BACKGROUND

The purpose of this LCO is to limit the core power distribution to the initial values assumed in the accident analyses. Operation within the limits imposed by this LCO limits or prevents potential fuel cladding failures that could breach the primary fission product barrier and release fission products to the reactor coolant in the event of a loss of coolant accident (LOCA), loss of flow accident, ejected control element assembly (CEA) accident, or other postulated accidents requiring termination by a Reactor Protection System (RPS) trip function. This LCO limits the damage to the fuel cladding during an accident by ensuring that the plant is operating within acceptable bounding conditions at the onset of a transient.

Methods of controlling the power distribution include:

a. Using full or part strength CEAs to alter the axial power distribution

b. Decreasing CEA insertion by boration, thereby improving the radial power distribution

c. Correcting off optimum conditions (e.g., a CEA drop, misoperation of the unit) that cause margin degradations

The core power distribution is controlled so that, in conjunction with other core operating parameters (e.g., CEA insertion and alignment limits), the power distribution does not result in violation of this LCO. The limiting safety system settings (LSSS) and this LCO are based on the accident analyses (References 1 and 2), so that specified acceptable fuel design limits (SAFDL) are not exceeded as a result of anticipated operational occurrences (AOOs), and the limits of acceptable consequences are not exceeded for other postulated accidents.

Limiting power distribution skewing over time also minimizes xenon distribution skewing, which is a significant factor in controlling the axial power distribution.

~~The power distribution is derived from the characteristics of multiple parameters and their combinations which can result in acceptable power distribution. LCOs for departure from nucleate boiling (DNB) and LHR need to be set to operate the plant within the power distribution design limit.~~

Power distribution is a product of multiple parameters, various combinations of which may produce acceptable power distributions. Operation within the design limits of power distribution is accomplished by generating operating limits on the linear heat rate (LHR) and the departure from nucleate boiling (DNB).

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.2 Planar Radial Peaking Factors (F_{xy})

BASES

BACKGROUND

The purpose of this LCO is to limit the core power distribution to the initial values assumed in the accident analyses. Operation within the limits imposed by this LCO limits or prevents potential fuel cladding failures that could breach the primary fission product barrier and release fission products to the reactor coolant in the event of a loss of coolant accident (LOCA), loss of flow accident, ejected control element assembly (CEA) accident, or other postulated accidents requiring termination by a Reactor Protection System (RPS) trip function. This LCO limits the damage to the fuel cladding during an accident by ensuring that the plant is operating within acceptable bounding conditions at the onset of a transient.

Methods of controlling the power distribution include:

a. Using full or part strength CEAs to alter the axial power distribution;

b. Decreasing CEA insertion by boration, thereby improving the radial power distribution; and

c. Correcting off optimum conditions (e.g., a CEA drop or misoperation of the unit) that cause margin degradations.

The core power distribution is controlled so that, in conjunction with other core operating parameters (e.g., CEA insertion and alignment limits), the power distribution does not result in violation of this LCO. The limiting safety system settings (LSSS) and this LCO are based on the accident analyses (References 1 and 2), so that specified acceptable fuel design limits (SAFDLs) are not exceeded as a result of anticipated operational occurrences (AOOs), and the limits of acceptable consequences are not exceeded for other postulated accidents.

Limiting power distribution skewing over time also minimizes xenon distribution skewing, which is a significant factor in controlling the axial power distribution.

~~The power distribution is derived from the characteristics of multiple parameters and their combinations which can result in acceptable power distribution. LCOs for departure from nucleate boiling (DNB) and LHR need to be set to operate the plant within the power distribution design limit.~~

Power distribution is a product of multiple parameters, various combinations of which may produce acceptable power distributions. Operation within the design limits of power distribution is accomplished by generating operating limits on the linear heat rate (LHR) and the departure from nucleate boiling (DNB).

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.3 AZIMUTHAL POWER TILT (T_q)

BASES

BACKGROUND

The purpose of this LCO is to limit the core power distribution to the initial values assumed in the accident analyses. Operation within the limits imposed by this LCO limits or prevents potential fuel cladding failures that could breach the primary fission product barrier and release fission products to the reactor coolant in the event of a loss of coolant accident (LOCA), loss of flow accident, ejected control element assembly (CEA) accident, or other postulated accidents requiring termination by a Reactor Protection System (RPS) trip function. This LCO limits the damage to the fuel cladding during an accident by ensuring that the plant is operating within acceptable bounding conditions at the onset of a transient. Methods of controlling the power distribution include:

a. Using full or part strength CEAs to alter the axial power distribution

b. Decreasing CEA insertion by boration, thereby improving the radial power distribution

c. Correcting off optimum conditions (e.g., a CEA drop, misoperation of the unit) that cause margin degradations

The core power distribution is controlled so that, in conjunction with other core operating parameters (e.g., CEA insertion and alignment limits), the power distribution does not result in violation of this LCO. The limiting safety system settings (LSSS) and this LCO are based on the accident analyses (References 1 and 2), so that specified acceptable fuel design limits (SAFDLs) are not exceeded as a result of anticipated operational occurrences (AOOs), and the limits of acceptable consequences are not exceeded for other postulated accidents.

Limiting power distribution skewing over time also minimizes xenon distribution skewing, which is a significant factor in controlling the axial power distribution.

~~The power distribution is derived from the characteristics of multiple parameters and their combinations which can result in acceptable power distribution. LCOs for departure from nucleate boiling (DNB) and LHR need to be set to operate the plant within the power distribution design limit~~.

Power distribution is a product of multiple parameters, various combinations of which may produce acceptable power distributions. Operation within the design limits of power distribution is accomplished by generating operating limits on the linear heat rate (LHR) and the departure from nucleate boiling (DNB).

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.4 Departure from Nucleate Boiling Ratio (DNBR)

BASES

BACKGROUND

The purpose of this LCO is to limit the core power distribution to the initial values assumed in the accident analyses. Operation within the limits imposed by this LCO limits or prevents potential fuel cladding failures that could breach the primary fission product barrier and release fission products to the reactor coolant in the event of a loss of coolant accident (LOCA), loss of flow accident, ejected control element assembly (CEA) accident, or other postulated accidents requiring termination by a Reactor Protection System (RPS) trip function. This LCO limits the damage to the fuel cladding during an accident by ensuring that the plant is operating within acceptable bounding conditions at the onset of a transient.

Methods of controlling the power distribution include:

a. Using full or part strength CEAs to alter the axial power distribution

b. Decreasing CEA insertion by boration, thereby improving the radial power distribution

c. Correcting off optimum conditions (e.g., a CEA drop, misoperation of the unit) that cause margin degradations

The core power distribution is controlled so that, in conjunction with other core operating parameters (e.g., CEA insertion and alignment limits), the power distribution does not result in violation of this LCO. The limiting safety system settings (LSSS) and this LCO are based on the accident analyses (References 1 and 2), so that specified acceptable fuel design limits (SAFDLs) are not exceeded as a result of anticipated operational occurrences (AOOs), and the limits of acceptable consequences are not exceeded for other postulated accidents.

Limiting power distribution skewing over time also minimizes xenon distribution skewing, which is a significant factor in controlling the axial power distribution. ~~The power distribution is derived from the characteristics of multiple parameters and their combinations which can result in acceptable power distribution.~~

~~LCOs for departure from nucleate boiling (DNB) and LHR need to be set to operate the plant within the power distribution design limit.~~

Power distribution is a product of multiple parameters, various combinations of which may produce acceptable power distributions. Operation within the design limits of power distribution is accomplished by generating operating limits on the linear heat rate (LHR) and the departure from nucleate boiling (DNB).

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.5 AXIAL SHAPE INDEX (ASI)

BASES

BACKGROUND

The purpose of this LCO is to limit the core power distribution to the initial values assumed in the accident analyses. Operation within the limits imposed by this LCO limits or prevents potential fuel cladding failures that could breach the primary fission product barrier and release fission products to the reactor coolant in the event of a loss of coolant accident (LOCA), loss of flow accident, ejected control element assembly (CEA) accident, or other postulated accidents requiring termination by a Reactor Protection System (RPS) trip function. This LCO limits the damage to the fuel cladding during an accident by ensuring that the plant is operating within acceptable bounding conditions at the onset of a transient.

Methods of controlling the power distribution include:

a. Using full or part strength CEAs to alter the axial power distribution

b. Decreasing CEA insertion by boration, thereby improving the radial power distribution

c. Correcting off optimum conditions (e.g., a CEA drop, misoperation of the unit) that cause margin degradations

The core power distribution is controlled so that, in conjunction with other core operating parameters (e.g., CEA insertion and alignment limits), the power distribution does not result in violation of this LCO. The limiting safety system settings (LSSS) and this LCO are based on the accident analyses (References 1 and 2), so that specified acceptable fuel design limits (SAFDLs) are not exceeded as a result of anticipated operational occurrences (AOOs), and the limits of acceptable consequences are not exceeded for other postulated accidents.

Minimizing power distribution skewing over time also minimizes xenon distribution skewing, which is a significant factor in controlling the axial power distribution.

~~The power distribution is derived from the characteristics of multiple parameters and their combinations which can result in acceptable power distribution. LCOs for departure from nucleate boiling (DNB) and LHR need to be set to operate the plant within the power distribution design limit.~~

Power distribution is a product of multiple parameters, various combinations of which may produce acceptable power distributions. Operation within the design limits of power distribution is accomplished by generating operating limits on the linear heat rate (LHR) and the departure from nucleate boiling (DNB).

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**508-8592**
SRP Section:	**16 – Technical Specifications**
Application Section:	**16 – Technical Specifications**
Date of RAI Issue:	**08/01/2016**

Question No. 16-187

Paragraph (a)(11) of 10 CFR 52.47 states that a design certification (DC) applicant is to propose Technical Specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. NUREG-1432, "Standard Technical Specifications (STS)-Combustion Engineering Plants," Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements. Staff needs to evaluate all technical differences from standard TS (STS) NUREG-1432, STS Combustion Engineering Plants, Rev. 4, which is referenced by the DC applicant in DCD Tier 2 Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the generic TS to ensure adequate protection of public health and safety, and the completeness and accuracy of the generic TS Bases.

The Writer's Guide for Plant-Specific Improved Technical Specifications (TSTF-GG-05-01) also provides guidance for the format and content of the TS. There are format and content differences between the DCD and the Writer's Guide. These following corrections are necessary to ensure the completeness and accuracy of the TS and Bases.

Justify the deviation from the STS in the Bases for Technical Specifications (TS) 3.2.2 Planar Radial Peaking Factors (Fxy).

In the fourth paragraph of the Background section on page B3.2.2-2, the text includes "…operator how far the core is from the operating limits…" The same sentence in the STS reads "…operator how near the core is to the operating limits…"

When an approach to a limit is a concern, the proximity of "how near to the limit" vice "how far from the limit" is conventionally used, as it is in the STS.

This justification is required to ensure the clarity of the Bases.

Response

The wording in the fourth paragraph of the Background section on page B3.2.2-2 will be changed from “how far the core is from…” to “how near the core is to…” to ensure the clarity of the Bases.

Impact on DCD

Same as the changes described in Impact on Technical Specifications.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

Page B 3.2.2-2 will be revised as indicated in the attachment.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

BASES

BACKGROUND (continued)

Proximity to the DNB condition is expressed by the departure from nucleate boiling ratio (DNBR), defined as the ratio of the cladding surface heat flux required to cause DNB to the actual cladding surface heat flux. The minimum DNBR value during both normal operation and AOOs is calculated by the KCE-1 Correlation (Reference 3) and corrected for such factors as rod bow and grid spacers. It is accepted as an appropriate margin to DNB for all operating conditions.

There are two systems that monitor core power distribution online: the core operating limit supervisory system (COLSS) and the core protection calculators (CPCs). The COLSS and CPCs that monitor the core power distribution are capable of verifying that the LHR and the DNBR do not exceed their limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating core power operating limits corresponding to the allowable peak LHR and DNBR. The CPCs perform this function by continuously calculating an actual value of DNBR and local power density (LPD) for comparison with the respective trip setpoints.

DNBR penalty factors are included in both the COLSS and CPC DNBR calculations to accommodate the effects of rod bow. The amount of rod bow in each assembly is dependent upon the average burnup experienced by that assembly. Fuel assemblies that incur higher than average burnup experience a greater magnitude of rod bow. Conversely, fuel assemblies that receive lower than average burnup experience less rod bow. In design calculations for a reload core, each batch of fuel is assigned a penalty applied to the maximum integrated planar radial power peak of the batch. This penalty is correlated with the amount of rod bow determined from the maximum average assembly burnup of the batch. A single net penalty for the COLSS and CPCs is then determined from the penalties associated with each batch that comprises a core reload, accounting for the offsetting margins due to the lower radial power peaks in the higher burnup batches.

near

to

The COLSS indicates continuously to the operator how ~~far~~ the core is ~~from~~ the operating limits and provides an audible alarm if an operating limit is exceeded. Such a condition signifies a reduction in the capability of the plant to withstand an anticipated transient, but does not necessarily imply an immediate violation of fuel design limits. If the margin to fuel design limits continues to decrease, the RPS ensures that the SAFDLs are not exceeded during AOOs by initiating reactor trips.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**508-8592**
SRP Section:	**16 – Technical Specifications**
Application Section:	**16 – Technical Specifications**
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Question No. 16-188

Paragraph (a)(11) of 10 CFR 52.47 states that a design certification (DC) applicant is to propose Technical Specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. NUREG-1432, "Standard Technical Specifications (STS)-Combustion Engineering Plants," Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements. Staff needs to evaluate all technical differences from standard TS (STS) NUREG-1432, STS Combustion Engineering Plants, Rev. 4, which is referenced by the DC applicant in DCD Tier 2 Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the generic TS to ensure adequate protection of public health and safety, and the completeness and accuracy of the generic TS Bases.

The Writer's Guide for Plant-Specific Improved Technical Specifications (TSTF-GG-05-01) also provides guidance for the format and content of the TS. There are format and content differences between the DCD and the Writer's Guide. These following corrections are necessary to ensure the completeness and accuracy of the TS and Bases.

Justify the deviation from the STS in the Bases for Technical Specifications (TS) 3.2.2 Planar Radial Peaking Factors (Fxy).

In the third paragraph of the Applicable Safety Analysis section on page B3.2.2-4 in the STS, the text includes "…outside the limits of these LCOs for ASI, Fxy, and TQ during normal operation."

The same text in the fourth paragraph of the Applicable Safety Analysis section on page B3.2.2-4 in the APR1400 Bases, the text includes "…outside the limits of these LCOs during normal operation." The APR1400 Bases omits the specific LCOs.

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

Response

The sentence, “outside the limits of these LCOs during normal operation” has been stated at the several sections in the STS; B3.2.1, B3.2.3, B3.2.4, B3.2.5. Only in the third paragraph of the Applicable Safety Analysis section on page B3.2.2-4 in the STS, the text is expressed as “…outside the limits of these LCOs for ASI, Fxy, and TQ during normal operation.” So, the sentence, “outside the limits of these LCOs during normal operation” is used for consistency of TS Bases.

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**508-8592**
SRP Section:	**16 – Technical Specifications**
Application Section:	**16 – Technical Specifications**
Date of RAI Issue:	**08/01/2016**

Question No. 16-189

Paragraph (a)(11) of 10 CFR 52.47 states that a design certification (DC) applicant is to propose Technical Specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. NUREG-1432, "Standard Technical Specifications (STS)-Combustion Engineering Plants," Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements. Staff needs to evaluate all technical differences from standard TS (STS) NUREG-1432, STS Combustion Engineering Plants, Rev. 4, which is referenced by the DC applicant in DCD Tier 2 Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the generic TS to ensure adequate protection of public health and safety, and the completeness and accuracy of the generic TS Bases.

The Writer's Guide for Plant-Specific Improved Technical Specifications (TSTF-GG-05-01) also provides guidance for the format and content of the TS. There are format and content differences between the DCD and the Writer's Guide. These following corrections are necessary to ensure the completeness and accuracy of the TS and Bases.

Justify the deviation from the STS in the Bases for Technical Specification (TS) 3.2.4 Departure from Nucleate Boiling Ratio (DNBR).

In the second paragraph of the Applicable Safety Analysis section of the STS on page B3.2.4-4, the final sentence ends with a "Ref. 1" since the text refers to the accident analysis. The same sentence in the APR1400 Bases omits the "Ref. 1."

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

Response

The second paragraph of the Applicable Safety Analysis section of the STS on page B 3.2.4-4 is also stated at the other sections; B 3.2.1, B 3.2.2, B 3.2.3 and B 3.2.5, but the other sections have no reference of “Ref. 1”. So, it is not necessary to state the reference on page B 3.2.4-4.

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**508-8592**
SRP Section:	**16 – Technical Specifications**
Application Section:	**16 – Technical Specifications**
Date of RAI Issue:	**08/01/2016**

Question No. 16-190

Paragraph (a)(11) of 10 CFR 52.47 states that a design certification (DC) applicant is to propose Technical Specifications (TS) prepared in accordance with 10 CFR 50.36 and 50.36a. NUREG-1432, "Standard Technical Specifications (STS)-Combustion Engineering Plants," Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements. Staff needs to evaluate all technical differences from standard TS (STS) NUREG-1432, STS Combustion Engineering Plants, Rev. 4, which is referenced by the DC applicant in DCD Tier 2 Section 16.1, and the docketed rationale for each difference because conformance to STS provisions is used in the safety review as the initial point of guidance for evaluating the adequacy of the generic TS to ensure adequate protection of public health and safety, and the completeness and accuracy of the generic TS Bases.

The Writer's Guide for Plant-Specific Improved Technical Specifications (TSTF-GG-05-01) also provides guidance for the format and content of the TS. There are format and content differences between the DCD and the Writer's Guide. These following corrections are necessary to ensure the completeness and accuracy of the TS and Bases.

Clarify the text in the Bases for Technical Specification (TS) 3.2.4 Departure from Nucleate Boiling Ratio (DNBR).

In the paragraph for Actions A.1, the text includes: "…completion time of 1 hour is a reasonable for the operator…" This text is not grammatically correct.

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

Response

The word “time” was omitted. So, the sentence will be changed to “…completion time of 1 hour is a reasonable time for the operator…”.

Impact on DCD

Same as the changes described in Impact on Technical Specifications.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

TS 3.2.4 Page B 3.2.4-6 will be revised as indicated in the attachment.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environment Report.

BASES

APPLICABILITY

Power distribution is a concern any time the reactor is critical. The power distribution LCOs, however, are only applicable in MODE 1 above 20 % RTP. The reasons these LCOs are not applicable below 20 % RTP are:

a. The incore neutron detectors that provide input to the COLSS, which then calculates the operating limits, are inaccurate due to the poor signal to noise ratios at relatively low core power levels.

b. As a result of this inaccuracy, the CPCs assume minimum core power of 20 % RTP when generating LPD and DNBR trip signals. When core power is below 20 % RTP, the core is operating well below its thermal limits and the resultant CPC calculated LPD and DNBR trips are highly conservative.

ACTIONS

A.1

time

Operating at or above the minimum required value of the DNBR ensures that an acceptable minimum DNBR is maintained in the event of a postulated loss of flow transient. If the core power as calculated by the COLSS exceeds the core power limit calculated by the COLSS based on the DNBR, fuel design limits might not be maintained following a loss of flow, and prompt action must be taken to restore the DNBR above its minimum allowable value. With the COLSS in service, the allowed completion time of 1 hour is a reasonable for the operator to initiate corrective actions to restore the DNBR above its specified limit, because of the low probability of a severe transient occurring in this relatively short time.

B.1 and B.2.1 and B.2.2

If the COLSS is not available the OPERABLE DNBR channels are monitored to ensure that the DNBR is not exceeded. Maintaining the DNBR within this specified range ensures that no postulated accident results in consequences more severe than those described in Chapter 15 of DCD TIER 2. A 4-hour Frequency is allowed to restore the DNBR limit to within the region of acceptable operation. This Frequency is reasonable because the COLSS allows the plant to operate with less DNBR margin (closer to the DNBR limit) than when monitoring with the CPCs.

When operating with the COLSS out of service and DNBR outside the region of acceptable operation, there is a possibility of a slow undetectable transient that degrades the DNBR slowly over the 4-hour period and is then followed by an AOO or an accident.