KHNPDCDRAIsPEm Resource

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Sent:	Friday, October 09, 2015 4:44 PM
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Subject:	APR1400 Design Certification Application RAI 239-8076 (16.3.3 - Technical Specifications - Instrumentation)
Attachments:	APR1400 DC RAI 239 SPSB 8076.pdf

KHNP,

The attachment contains the subject request for additional information (RAI). This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs. However, KHNP requests, and we grant, 90 days to respond to this RAI. We may adjust the schedule accordingly.

Please submit your RAI response to the NRC Document Control Desk.

Thank you,

William R. Ward, P.E. Senior Project Manager U.S. Nuclear Regulatory Commission m/s T6-D38M Washington, DC, 20555-0001 NRO/DNRL/Licensing Branch 2 ofc T6-D31 ofc (301) 415-7038



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Mail Envelope Properties (a6ea456fa504491098a4b5c8c4174710)

Subject:APR1400 Design Certification Application RAI 239-8076 (16.3.3 - Technical
Specifications - Instrumentation)Sent Date:10/9/2015 4:43:47 PMReceived Date:10/9/2015 4:43:48 PMFrom:Ward, William

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U.S.NRC United States Nuclear Regulatory Commission Protecting People and the Environment

Issue Date: 10/09/2015 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: 16.3.3 Instrumentation

QUESTIONS

16-87

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

SRP Section 16.0, Part III.2.A states, in part, "when reviewing a difference between the proposed TS provision and the reference TS provision, verify that the applicant's written technical or administrative reasoning in support of the difference is logical, complete, and clearly written."

In generic TS 3.3.1, the ACTIONS Table Notes are incorrectly located as if they were APPLICABILITY Notes. Applicant is requested to correct the placement of the ACTIONS Table Notes in accordance with the STS human-factors informed format described in TSTF-GG-05-01, "Writer's Guide for Plant-Specific Improved Technical Specifications" (WG) Section 2.1.4, which says notes should be above the text it applies to … and span the width of the text it modifies, and Section 4.1.6, paragraph i.2, which states:

An ACTIONS Note that is applicable to all Conditions and Required Actions (such as allowing separate Condition entry for each inoperable component) is placed between the table heading "ACTIONS" and the table itself.

16-88

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

SRP Section 16.0, Part III.2.A states, in part, "when reviewing a difference between the proposed TS provision and the reference TS provision, verify that the applicant's written technical or administrative reasoning in support of the difference is logical, complete, and clearly written."

In generic TS 3.3.1, proposed new ACTIONS Table Note 2 is not clear. Notes such as this, which are not included anywhere in STS NUREG-1432 Rev. 4, occur as ACTIONS Table Notes in generic TS Subsections

- 3.3.1 Reactor Protection System (RPS) Instrumentation Operating,
- 3.3.2 Reactor Protection System (RPS) Instrumentation Shutdown, and
- 3.3.5 Engineered Safety Features Actuation System (ESFAS) Instrumentation.

The "Actions" section of the Bases for generic TS 3.3.1 explains Note 2 as follows: "Note 2 has been added to ensure the function of administrative controls." This statement is also not clear. The applicant is requested to justify why these Notes are needed in TS or delete them from the generic TS and Bases. Alternatively, the review requirement of Note 2 could be presented as a new ACTION. For example:

- Condition: One or more Functions with one automatic RPS trip channel in bypass as allowed by Required Action A.1 or Required Action C.2.1 for 7 days.
- Required Action: Review unit operation, as allowed by Required Action A.2 or Required Action C.2.2, in accordance with administrative controls.
- Completion Time: 24 hours <u>AND</u> Once per 7 days thereafter

Administrative review of whether continuing unit operation is justified (even though TS action requirements allow unit operation until the unit's next entry into Mode 5) is redundant to the requirement of 10 CFR 50.65 to "assess and manage risk" associated with unit operation with equipment important to safety out of service. Including this requirement in TS just for RPS trip Function and ESFAS actuation Function instrument (sensor and bistable processor) channels is too narrow in scope; even were the requirement deemed necessary. Another point is that presenting this requirement as an ACTIONS Table Note leaves open the question of how not completing the review in 24 hours should affect unit operation. By presenting this requirement as a new ACTION, as depicted above, if the review is not completed within 24 hours after 7 days of operation with an RPS automatic trip Function channel in bypass, it is clear that default Condition E would apply and require placing the unit in Mode 3 in 6 hours.

16-89

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

The applicant is requested to describe the correspondence between the testing depicted in DCD Tier 2 Figure 7.2-11, "PPS Testing Overlap," and the generic technical specifications (TS) surveillance requirements (SRs) that implement: Channel Check, Channel Calibration, and Channel Functional Test. These SRs are listed below; provide discussions applicable to (a) RPS and ESFAS Functions with two-out-of-four coincidence logic; (b) balance of plant (BOP) ESFAS Functions with one-out-of-two coincidence logic; and (c) diverse protection system (DPS) Functions included in the generic TS Section 3.3. Also provide Function-specific discussions for functions with features which need testing beyond that of a typical function.

The scope of the Channel Functional Test for RPS and ESFAS is quite broad as indicated on page B 3.3.4-11, under heading SR 3.3.4.1, where the Bases say

The RPS CHANNEL FUNCTIONAL TEST consists of overlapping tests as described in DCD Tier 2, Section 7.2 (Reference 3). These tests verify that the RPS is capable of performing its intended function, from bistable input through the RTSGs.

DCD Section 7.2 does not use the defined term CHANNEL FUNCTIONAL TEST, and the Bases do not use the terminology for testing described in Section 7.2. The applicant is requested to describe in detail how each CHANNEL FUNCTIONAL TEST specified in Section 3.3 and elsewhere in generic TS, corresponds, by name, to the PPS tests described in DCD Tier 2 Section 7.2. If a test is not specified to be performed "in accordance with the SCP," state the reason why.

16-90

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

The applicant is requested to consistently refer to the *associated automatic operating bypass removal function channel(s)* associated with RPS and ESFAS instrument[ation] Functions, which have the *automatic operating bypass removal* feature, in LCO, Condition, Required Action, and Surveillance statements in generic TS Section 3.3. For example, in generic TS 3.3.1 and 3.3.2, the following phrases are used for the *associated automatic operating bypass removal function channels*:

LCO 3.3.1 ... associated operating bypass removal channels... Condition C ... one *operating bypass removal* channel... ... two *operating bypass removal* channels...

Required Action C.1 ... bypass channel.

Required Action C.2.2... operating bypass removal channel...

Required Action D.1 ... bypass channel.

- SR 3.3.1.9 ... on each trip channel, including operating bypass removal functions...
- SR 3.3.1.12 ... automatic operating bypass removal channel.
- LCO 3.3.2 ... bypass removal channels...
- Condition C ... one automatic bypass removal channel...
- Condition D ... two automatic bypass removal channels...

Required Action C.1 ... bypass channel.

Required Action C.2.2... operating bypass removal channel...

- SR 3.3.2.3 ... each automatic bypass removal function.
- SR 3.3.2.4 ... on each [trip channel], including bypass removal function...

Although STS Section 3.3 is similarly inconsistent, the intent of the TS Writer's Guide is to use consistent terminology in improved TS. This comment also applies to the Section 3.3 Bases.

16-91

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

SRP Section 16.0, Part III.2.A states, in part, "when reviewing a difference between the proposed TS provision and the reference TS provision, verify that the applicant's written technical or administrative reasoning in support of the difference is logical, complete, and clearly written."

On generic TS page B 3.3.1-34, in the Surveillance Requirements section of the Bases for generic TS 3.3.1, under heading Trip Path Tests, the last sentence of first paragraph says "These [Trip path (initiation logic)] tests are performed only for one channel and one initiation logic." It is not clear whether the phrase "at a time" is implied, or whether only one fourth of the initiation logic is tested each surveillance interval. The applicant is requested to clarify the intended meaning by revising this sentence.

16-92

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

Generic TS Table 3.3.1-1 Footnotes (a) and (c) differ from corresponding Footnotes (a) and (c) in STS Table 3.3.1-1 and Footnotes (a) and (e) in CE System 80+ generic TS Table 3.3.1-1 for the following RPS Functions with operating bypass features:

- 2. Logarithmic Power Level High^(a)
- 14. Local Power Density High^(c)
- 15. Departure from Nucleate Boiling Ration Low^(c)

Since the reasons for the differences with the STS footnotes are not clear to the NRC staff, the applicant is requested to discuss the differences with the STS footnotes and justify the proposed generic TS footnotes (a) and (c); including all related Bases discussions.

16-93

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

The Bases for generic TS SR 3.3.1.8 says "CHANNEL CALIBRATION (of the linear power of excore neutron flux – Variable Overpower) must be performed consistent with the SCP" but the Bases for generic TS SR 3.3.1.9 says "CHANNEL CALIBRATION (RPS Instrument Functions 1 through 15) must be performed consistent with the plant protection system setpoint analysis." The applicant is requested to use the first version of the statement, which is appropriate.

16-94

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

SRP Section 16.0, Part III.2.A states, in part, "when reviewing a difference between the proposed TS provision and the reference TS provision, verify that the applicant's written technical or administrative reasoning in support of the difference is logical, complete, and clearly written."

Page 26 of Deviation Report between NUREG-1432 Rev. 4.0 and APR1400 Technical Specifications APR1400-K-O-NR-13001-NP states that the following proposed text

The performance shall be completed within 12 hours after THERMAL POWER \geq 15% RTP.

clarifies the meaning of STS text for the surveillance column Note of SR 3.3.1.6, which states,

Not required to be performed until 12 hours after THERMAL POWER ≥ 15% RTP.

In addition, the report states the difference "is an intrinsic design characteristic of APR1400." NRC staff disagrees with this difference from STS Rev. 4 and its claimed benefits and rationale, and requests that the applicant conform to the STS surveillance column Note of SR 3.3.1.6, whose meaning is adequately described in Specification 1.4.

16-95

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

The Bases for generic TS SR 3.3.1.4, uses the following terms:

- daily heat balance calibration,
- calorimetric calculation,
- secondary calorimetric,
- calorimetric calibration, and
- daily calibration.

The Bases for generic TS SR 3.3.1.8, uses the following term:

• daily calorimetric calibration.

If all of these terms are equivalent, please revise the Bases to use a consistent term for this test, or explain and justify the differences in meaning of these terms.

16-96

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

SRP Section 16.0, Part III.2.A states, in part, "when reviewing a difference between the proposed TS provision and the reference TS provision, verify that the applicant's written technical or administrative reasoning in support of the difference is logical, complete, and clearly written."

Page 26 of Deviation Report between NUREG-1432 Rev. 4.0 and APR1400 Technical Specifications APR1400-K-O-NR-13001-NP justifies:

a. Removing the word "shall" from STS SR 3.3.1.7 surveillance column Note 1 by asserting it is an editorial change. The proposed change is indicated by the following markup of the note:

The CPC CHANNEL FUNCTIONAL TEST shall include includes verification that the correct values of addressable constants are installed in each OPERABLE CPC.

The proposed difference from STS SR 3.3.1.7 Note 1 conveys a different meaning that is less restrictive. The STS phrasing is correct and clear. Request applicant use the STS Note to be consistent with STS.

b. Using reactor trip switch gear (RTSG) instead of reactor trip circuit breaker (RTCB) by saying generic TS SR 3.3.1.7 "NOTE 2 reflects intrinsic design characteristic of APR1400." There appears to be no logical difference between the two terms for these circuit breakers, of which there are eight, two per PPS division (which constitutes a RTCB channel) in two sets of four. Request applicant to be consistent with STS and use term "RTCB" in generic TS Section 3.3 and Bases, since RTCB is used almost exclusively in most other generic TS Sections.

16-97

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

In the "LCO" section of the Bases for generic TS Subsection 3.3.1, the applicant is requested to replace the second, third, and fourth paragraphs with the following revised versions, which more accurately conform to DCD Tier 2 Section 7.2 and proposed generic TS 5.5.19, Setpoint Control Program (SCP) [as modified as requested by the NRC staff]. For each paragraph, a markup of the original is shown, followed by the revised version.

Second paragraph

Actions allow maintenance (trip channel) trip channel (maintenance) bypass of individual channels. With one channel in of each Function in trip channel bypassed, this bypass, changes the coincidence logic for each trip Function changes into a two-out-of-three 2-out-of-3 logic configuration in those Functions.

Actions allow trip channel (maintenance) bypass of individual channels. With one channel of each Function in trip channel bypass, the coincidence logic for each Function changes into a 2-out-of-3 logic configuration.

Third paragraph

Bypassing the same parameter in more than one channel is restricted by the administrative procedural controls-procedure. The With one parameter in trip channel bypass, the coincidence logic for each supported trip Function becomes changes from a 2-out-of-4 into a 2-out-of-3 coincidence logic configuration. All-bypass The all-bypass function for bypassing all parameters in the one channel is interlocked in the LCL algorithm to prevent simultaneous bypass of two or more than one channels. The all-bypass interlock is implemented based on an analog circuit through-with hardwired cable between the LCLs in of all channels. The purpose of the all-bypass function is to support testing and maintenance of bistable processor (BP) racks whereas the trip channel bypass is used to support repair and testing of failed sensors-against sensor failure.

Bypassing the same parameter in more than one channel is restricted by administrative procedural controls. With one parameter in trip channel bypass, the coincidence logic for each supported trip Function changes from a 2-out-of-4 into a 2-out-of-3 logic configuration. The all-bypass function for bypassing all parameters in one channel is interlocked in the LCL algorithm to prevent simultaneous bypass of two or more channels. The all-bypass interlock is implemented based on an analog circuit with hardwired cable between the LCLs of all channels. The purpose of the all-bypass function is to support testing and maintenance of bistable processor (BP) racks whereas the trip channel bypass is used to support repair and testing of failed sensors.

Fourth paragraph

Only the Allowable Values The Nominal Trip Setpoint (NTSP), Allowable Value (AV), As-Found Tolerance (AFT), and As-Left Tolerance (ALT) are specified for each RPS trip Function in the SCP. The nominal setpoints NTSPs are selected to ensure that the setpoints as-found trip settings measured by CHANNEL FUNCTIONAL TESTS remain conservative with respect to the AFT band around the previous as-left setting

between successive CHANNEL CALIBRATIONS and do not exceed the Allowable Value AVs, if-provided the channel is performing normally as required expected. Operation with a trip setpoint setting less conservative than the nominal trip setpointNTSP, but within it's the AFT band and AV-Allowable Value, is acceptable provided that channel operation and testing are consistent with the assumptions of the plant specific setpoint calculations. A channel is considered degraded but OPERABLE if its actual trip setting is nonconservative with respect to its AFT band but within (more conservative than) its AV. The SCP requires entering such degraded channels in the plant's corrective action program. A channel is inoperable if its actual trip setting setpoint is not within its required allowable value AV. In accordance with the NRC-approved setpoint methodology specified in the SCP, each Each Allowable Value specified AV is determined by is set accounting for instrument uncertainties, appropriate to the RPS trip Function, function from conservatively applied to the analytical limit, which is the trip setpoint assumed in the safety analysis. After each CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION the trip setpoint is required by the SCP to be left within the ALT band around the NTSP.

The Nominal Trip Setpoint (NTSP), Allowable Value (AV), As-Found Tolerance (AFT), and As-Left Tolerance (ALT) are specified for each RPS trip Function in the SCP. The NTSPs are selected to ensure that the as-found trip settings measured by CHANNEL FUNCTIONAL TESTS remain conservative with respect to the AFT band around the previous as-left setting between successive CHANNEL CALIBRATIONS and do not exceed the AVs, provided the channel is performing normally as expected. Operation with a trip setting less conservative than the NTSP, but within the AFT band and AV, is acceptable provided that channel operation and testing are consistent with the assumptions of the plant specific setpoint calculations. A channel is considered degraded but OPERABLE if its actual trip setting is non-conservative with respect to its AFT band but within (more conservative than) its AV. The SCP requires entering such degraded channels in the plant's corrective action program. A channel is inoperable if its actual trip setting is not within its AV. In accordance with the NRC-approved setpoint methodology specified in the SCP, each specified AV is determined by accounting for instrument uncertainties, appropriate to the RPS trip Function, conservatively applied to the analytical limit, which is the trip setpoint assumed in the safety analysis. After each CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION the trip setpoint is required by the SCP to be left within the ALT band around the NTSP.

16-98

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

1. In the first paragraph of the "Actions" section of the Bases for generic TS Subsection 3.3.1, the first sentence says:

The most common causes of channel inoperability are outright failure or drift of the bistable or process module sufficient to exceed the tolerance allowed by the plant specific setpoint analysis.

Although this is identical to the sentence in the STS Bases, the part about "drift of the bistable module" needs to be clarified. Since software bistable logic does not drift, this text needs to be replaced by a description of what can drift within the typical APR1400 RTS instrument channel loop. The applicant is requested to clarify the quoted sentence where ever it occurs in generic TS Section 3.3.

2. In the Bases for generic TS Section 3.3, whenever the term Allowable Value is used, the proposed Bases add the modifier 'in SCP"; this modifier is not needed since the Bases already state that the Allowable Values are specified by the SCP, generic TS 5.5.19. The applicant is requested to remove all such modifiers of the term Allowable Value from generic TS Section 3.3, and where ever else the phrase occurs in the generic TS Bases.

16-99

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

The proposed ACTIONS Table for generic TS 3.3.1 contains the following differences from STS 3.3.1B that do not appear to be justified. The applicant is requested to conform to the STS phrasing and provisions, or justify the difference:

- 1. Required Action A.2 and associated Bases unnecessarily adds "trip" before "channel"; alternately, add trip to Required Action A.1.
- 2. Completion Time for required Actions A.2 and C.2.2 should match STS ("Prior to entering MODE 2 following next MODE 5 entry"); apply this change everywhere the Completion Time of "Prior to next entry into MODE 2 following entry into MODE 5" is used;
- 3. Condition B should match STS ("B. One or more Functions with two automatic RPS trip channels inoperable.");
- 4. Conditions C and D should match STS, but also include "operating" as proposed ("C. One or more Functions with one automatic operating bypass removal channel inoperable."), and ("D. One or more Functions with two automatic operating bypass removal channels inoperable.");
- 5. The Note in generic TS 3.3.1 for Required Action B.1 (besides being misplaced) does not seem to be relevant to the action requirement. Remove the Note;

- 6. The logical connector between Required Actions C.2.1 and C.2.2 should align with the period before the last digit of the labels C.2.1 and C.2.2;
- 7. The Note in the Required Action column of Condition D, that states "LCO 3.0.4 is not applicable" with the unit in Condition D, is unnecessary, since the ACTIONS will permit operation to continue indefinitely with bypass removal channels disabled, or one channel in trip and one channel in bypass for affected RPS Function(s).
- 8. Required Actions C.1 and D.1, which say "Disable [automatic operating] bypass [removal] channel(s)." are unclear. Since the function being disabled is to automatically remove the bypass and enable the associated RPS trip channel, unbypassing the RPS trip channel would need to be done manually before reaching the reset setting. The applicant is requested to clarify the meaning of these action requirements.

16-100

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

Generic TS Table 3.3.2-1 lists three RPS Functions that are required to be operable whenever any reactor trip switchgears (RTSGs) are closed, any control element assembly (CEA) is capable of being withdrawn, and fuel is loaded in reactor while in Mode 3, 4, or 5 for Logarithmic Power Level – High; and Modes 3 and 4 for Steam Generator Pressure #1 – Low, and Steam Generator Pressure #2 – Low. The table assigns SR 3.3.2.4 (Perform CHANNEL CALIBRATION on each logarithmic power channel, including bypass removal function in accordance with Setpoint Control Program.) to all three Functions. Therefore, it seems appropriate to state the surveillance like SR 3.3.1.9 (Perform CHANNEL CALIBRATION on each trip channel, including operating bypass removal functions in accordance with Setpoint Control Program.).

A similar issue exists with SR 3.3.2.1 (Perform CHANNEL CHECK of each logarithmic power channel.) and SR 3.3.2.2 (Perform CHANNEL FUNCTIONAL TEST on each logarithmic power channel in accordance with Setpoint Control Program.). These SRs are also assigned to the Steam Generator Pressure #1 and #2 – Low RPS automatic trip Functions. Therefore, it seems appropriate to state the surveillances like SR 3.3.1.1 (Perform CHANNEL CHECK of each RPS instrument channel.) and SR 3.3.1.7 (Perform CHANNEL FUNCTIONAL TEST for each RPS instrumentation channel in accordance with Setpoint Control Program.), respectively. (For consistency, the applicant should use "RPS *instrument* channel(s)," or "RPS *instrumentation* channel(s)," but not both in RPS and ESFAS surveillance statements and Bases discussions.)

Generic TS Table 3.3.2-1 assigns SR 3.3.2.3 (Perform CHANNEL FUNCTIONAL TEST on each automatic bypass removal function.) only to Function 1, Logarithmic Power Level – High. However, the surveillance statement implies there are more than one automatic bypass removal

functions. The NRC staff suggest revising the surveillance statement to say, "Perform CHANNEL FUNCTIONAL TEST on automatic *operating* bypass removal function channels associated with the Logarithmic Power Level – High RPS Function."

The applicant is requested to consider making the suggested changes in order to improve clarity and consistency of RPS Surveillance Requirements. For any suggested changes not made, explain why in the response to this question. As appropriate, revise the Bases for generic TS 3.3.1 and 3.3.2 to be consistent with changes made to the surveillance statement.

As a side issue, Steam Generator Pressure #1 and #2 – Low trip settings automatically increase as steam pressure increases, as stated in Note (c) of Table 3.3.2-1; the applicant is requested to explain how this feature is tested.

16-101

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

- 1. The applicant is requested to remove the blank line below the title, "SURVEILLANCE REQUIREMENTS," of the surveillance requirements table of generic TS 3.3.4, and ensure three blank lines separate the actions table from the title of the surveillance requirements table, to conform to STS format convention.
- 2. Generic TS SR 3.3.4.4 is apparently an unintended duplication of SR 3.3.4.1; applicant is requested to remove this specification from generic TS Subsection 3.3.4.
- 3. The Bases for generic TS SR 3.3.4.3 (Perform CHANNEL FUNCTIONAL TEST on each RPS manual trip channel. | 31 days) does not describe how this surveillance is performed. The applicant is requested to add such a description to the Bases. Also explain why a 31 day Frequency is proposed instead of the corresponding STS SR 3.3.4.4 Frequency of "Once within 7 days prior to each reactor startup."
- 4. On generic TS page B 3.3.1-34, under the heading Local Coincidence Logic Tests, the Surveillance Requirements section of the Bases for generic TS 3.3.1 says "Local coincidence logic (LCL) tests are described in LCO 3.3.4." On page B 3.3.4-11, under headings SR 3.3.4.1 and LCL Testing, there is one sentence, which says "Automatic LCL testing is performed to verify the operability of two-out-of-four logic and trip channel bypass logic." The applicant is requested to describe what is meant by "automatic LCL testing"; additional description of how the test is performed is also requested to be added to this LCL Testing discussion.

16-102

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

- 1. Generic TS LCO 3.3.4 requires in part that "four manual trip channels shall be OPERABLE"; STS LCO 3.3.4 requires in part that "four channels of Manual Trip shall be OPERABLE." Since the phrase "channel(s) of Manual Trip" or Manual Trip channel(s) is used in the generic TS 3.3.4 ACTIONS Table, as does the STS 3.3.4 ACTIONS table, the applicant is requested to also use "Manual Trip" in the statement of LCO 3.3.4 and in the statement of SR 3.3.4.3, and make conforming changes, where appropriate, to the generic TS 3.3.4 Bases.
- 2. The second Applicability statement of generic TS 3.3.4 wraps to a second line, but the second line is not indented as stipulated by STS format convention. The applicant is requested to correct this human interface format nonconformance.
- 3. Regarding generic TS 3.3.4 and STS 3.3.4:
 - a. The second condition statement of generic TS 3.3.4 Condition D and the corresponding second condition statement of STS 3.3.4 Condition E begin with the phrase "One or more Functions with more than . . ." Since none of the other condition statements use this phrase, the applicant is requested to justify using it in Condition D.
 - b. The second condition statement of Condition D of generic TS 3.3.4 differs from corresponding Condition E of STS 3.3.4 by saying "more than two channels" instead of "more than one channel"; and "inoperable for reasons other than Condition C" instead of "inoperable for reasons other than Condition D." Generic TS 3.3.4 Condition C (Two channels of Manual Trip, RTSG, or RPS logic affecting the same trip leg inoperable.) is equivalent to STS 3.3.4 Condition D (Two channels of Manual Trip, RTCB, or Initiation logic affecting the same trip leg inoperable.) The applicant is requested to justify the difference or revise Condition D of generic TS 3.3.4 to say:

One or more Functions with more than one channel of Manual Trip, RTSG, or RPS logic inoperable for reasons other than Condition C.

16-103

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

The design of the APR1400 Core Protection Calculator System (CPCS) differs from the CPCS design upon which NUREG-1432, STS Combustion Engineering Plants, Rev. 4, is based (San Onofre Nuclear Generating Station Units 2 and 3). The APR1400 has two CEACs in each of four CPCS channels, while the standard design has just two CEACs to support all four CPCS channels. The generic TS 3.3.3 ACTIONS propose to permit continued operation indefinitely in the event two CPCS channels with one CEAC or both CEACs inoperable by adding new Required Action A.1 (for the Condition of "One CEAC inoperable in one or more CPCS channels.") and Required Action B.1 (for the Condition of "Both CEACs inoperable in one or more CPCS channels."), and adding an ACTIONS Table Note that says, "Separate Condition entry is allowed for each CPCS channel." Consider the following operational cases:

Case 1 - One CPCS channel with one CEAC inoperable

If one CEAC is inoperable in <u>one</u> CPCS channel, generic TS 3.3.3 Condition A is entered and Required Action A.1, which says "Declare affected CPCS channel(s) inoperable." with a Completion Time of 1 hour, results in entering generic TS 3.3.1 Condition A ("One or more Functions with one automatic RPS trip channel inoperable.") and, within 1 hour, placing in bypass or trip the corresponding Reactor Protection System (RPS) trip channel for the RPS Functions of Local Power Density (LPD) – High and Departure From Nucleate Boiling Ratio (DNBR) – Low. By generic TS 3.3.1 Required Action A.2, the trip channel, which was declared inoperable, for the LPD – High and DNBR – Low trip Functions, and the associated CPCS channel, which was declared inoperable, must be restored to operable status prior to entering Mode 2 following next Mode 5 entry.

- a. With one channel in trip, the coincidence logic for each of these two RPS Functions in all four PPS divisions changes from 2-out-of-4 to 1-out-of-3;
- b. With one channel in [trip channel] bypass, the coincidence logic changes from 2-out-of-4 to 2-out-of-3.

In either logic configuration, these RPS Functions can withstand another single failure and still initiate a reactor trip consistent with the safety analyses. Since operation with the unit in either of these configurations until the next Mode 5 entry has minimal safety impact, Case 1 is acceptable.

Case 2 - Two CPCS channels each with one CEAC inoperable

If one CEAC is inoperable in two CPCS channels, generic TS 3.3.3 Condition A is entered and Required Action A.1, which says "Declare affected CPCS channel(s) inoperable." with a

Completion Time of 1 hour (each CPCS channel tracks its own 1 hour Completion Time), results in entering generic TS 3.3.1 Condition A and also Condition B ("One or more Functions with two [automatic RPS trip] channels inoperable.") and, within 1 hour, placing one channel in bypass and one channel in trip for the RPS Functions of LPD – High and DNBR – Low. By generic TS 3.3.1 Required Action A.2, each trip channel, which was declared inoperable, for the LPD – High and DNBR – Low trip Functions, and the two associated CPCS channels, which were declared inoperable, must be restored to operable status prior to entering Mode 2 following next Mode 5 entry.

With one channel in trip and one channel in bypass, the coincidence logic for each of these two RPS Functions in all four PPS divisions changes from 2-out-of-4 to 1-out-of-2. In this logic configuration, these RPS Functions can withstand another single failure and still initiate a reactor trip consistent with the safety analyses. Since operation with the unit in a 1-out-of-2 coincidence logic configuration until the next Mode 5 entry has minimal safety impact, Case 2 is acceptable.

Staff notes that Case 1a and Case 2 configurations are susceptible to a spurious reactor trip from a single failure that results in tripping one remaining operable channel in either RPS Function.

Case 3 - Three or four CPCS channels each with one CEAC inoperable

If one CEAC is inoperable in <u>three</u> or <u>four</u> CPCS channels, generic TS 3.3.3 Condition A is entered and Required Action A.1, which says "Declare affected CPCS channel(s) inoperable." with a Completion Time of 1 hour (each CPCS channel tracks its own 1 hour Completion Time), would result in entering generic TS 3.3.1 Condition A and Condition B. However, since the generic TS 3.3.1 ACTIONS specify no Condition for three or four inoperable trip channels for the same RPS Function, LCO 3.0.3 is immediately entered, which would require placing the unit in Mode 3 within 7 hours.

In the condition of one CEAC inoperable in each of <u>three</u> or <u>four</u> CPCS channels, following generic TS 3.3.3 Required Action A.1 would not be desirable because it leads to a unit shutdown, even though each CPC has one operable CEAC and can support all four channels of LPD - High and DNBR - Low. So, in this condition the preferred course would be to follow generic TS 3.3.3 Required Action A.2.1, which requires verifying indicated positions of all CEAs once every 4 hours, and Required Action A.2.2, which requires restoring the inoperable CEAC in each CPCS channel to operable status within 7 days (each CPCS channel tracks its own 7 day Completion Time). In the event a Required Action and associated Completion Time of Condition A are not met, generic TS 3.3.3 Condition B entry is required.

Case 4 – One CPCS channel with both CEACs inoperable

Upon discovery that both CEACs in one CPCS channel are concurrently inoperable, generic TS 3.3.3 Condition A is not entered again, if it was already entered because the same CPCS channel is affected. Choosing Required Action A.1, which says "Declare affected CPCS channel(s) inoperable." with a Completion Time of 1 hour, results in the unit entering generic TS 3.3.1 Condition A ("One or more Functions with one automatic RPS trip channel inoperable.") and, within 1 hour, placing in bypass or trip the corresponding RPS trip channel for the RPS Functions of LPD – High and DNBR – Low.

By generic TS 3.3.1 Required Action A.2, the trip channel, which was declared inoperable, for the LPD – High and DNBR – Low trip Functions, and the associated CPCS channel, which was declared inoperable, must be restored to operable status prior to entering Mode 2 following next Mode 5 entry.

- a. With one channel in trip, the coincidence logic for each of these two RPS Functions in all four PPS divisions changes from 2-out-of-4 to 1-out-of-3;
- b. With one channel in [trip channel] bypass, the coincidence logic changes from 2-out-of-4 to 2-out-of-3.

The above resulting configurations are the same as reached in Case 1. However, upon discovery that both CEACs in one CPCS channel are concurrently inoperable, generic TS 3.3.3 Condition B ("Both CEACs inoperable in one or more CPCS channels.") is also entered. Choosing Required Action B.1, which says "Declare affected [CPCS] channel(s) inoperable." with a Completion Time of 1 hour, also results in the unit entering generic TS 3.3.1 Condition A and, within 1 hour, placing in bypass or trip the corresponding RPS trip channel for the RPS Functions of LPD – High and DNBR – Low. Therefore, Case 1 and Case 4 result in the same states for the affected channel of the DNBR – Low and LPD – High RPS Functions. Staff concludes that Case 4 is acceptable.

Case 5 – Two CPCS channels each with both CEACs inoperable

Following the discussion for Case 2 and Case 4, it is clear that Case 5 would result in the same configuration as reached in Case 2, one channel in trip and one channel in bypass for each of the RPS Functions of DNBR – Low and LPD – High.

Case 6 – Three or four CPCS channels each with both CEACs inoperable

Following the discussion of Case 3, it is clear that the preferred course for Case 6 would be to follow generic TS 3.3.3 Required Actions B.2.1, B.2.2, B.2.3, B.2.4, and B.2.5, which compensate for the loss of automatic CEA position monitoring in three or more CPCS channels by completing the following actions within 4 hours:

- Required Action B.2.1 Verify departure from nucleate boiling ratio requirement of LCO 3.2.4 is met and Reactor Power Cutback System (RPCS) is disabled.
- Required Action B.2.2 Verify all full strength and part strength CEA groups are fully withdrawn and maintained fully withdrawn, except during Surveillance testing pursuant to SR 3.1.5.3, or for power control, when CEA group #5 may be inserted to a maximum of 323.9 cm (127.5 in).
- Required Action B.2.3 Verify addressable constant in each affected CPC is set to indicate that all two CEACs are inoperable and "RSPT/CEAC inoperable" status is indicated.
- Required Action B.2.4 Verify Digital Rod Control System (DRCS) is placed in "standby" and maintained in "standby," except during CEA motion permitted by Required Action B.2.2.

Required Action B.2.5 Verify indicated position of each full and part strength CEA is within 16.8 cm (6.6 in) of all other CEAs in its group.

In addition, B.2.5, which is identical to A.2.1 and SR 3.1.5.1, must also be completed once every 4 hours. Completing these actions may require reducing reactor power in order to avoid a reactor trip on DNBR – Low and LPD – High.

Question 1 – Since generic TS 3.3.3 Condition A contains two sets of actions divided by the logical connector "<u>OR</u>", the two sets of actions must have equal Completion Times, consistent with the examples of STS Section 1.3, and STS NUREG-1430 through -1434. Staff suggests modifying Completion Time of Required Action A.2.1 to "1 hour <u>AND</u> Once per 4 hours thereafter"; since generic TS 3.3.3 Condition B also contains two sets of actions divided by the logical connector "<u>OR</u>", the two sets of actions must have equal Completion Times. Staff suggests modifying Completion Time of Required Action B.2.5 to "1 hour <u>AND</u> Once per 4 hours thereafter" and reordering and renumbering the actions so that current B.2.5 becomes B.2.1, and current B.2.1, B.2.2, B.2.3, and B.2.4 become B.2.2, B.2.3, B.2.4, and B.2.5, respectively.

Question 2 – Any condition of one or more CPCS channels with <u>one</u> CEAC inoperable other than Case 1b, as described above, and any condition of one or more CPCS channels with <u>two</u> CEACs inoperable other than Case 4b, as described above either places the unit just one failure away from a spurious reactor trip, or leads to a unit shutdown. For this reason, the applicant is requested to revise generic TS 3.3.3 ACTIONS A and B to only allow the option of entering LCO 3.3.1 for Case 1b and Case 4b, respectively.

16-104

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

Applicant is requested to revise Section 3.3 LCO statements requiring operability of RPS or ESFAS Functions that have automatic operational bypass removal Functions to include the word "associated"; for example, revise LCO 3.3.2 as indicated by this markup:

Four RPS trip **channels** and **associated automatic operating** bypass removal channels for each Function in Table 3.3.2-1 shall be OPERABLE.

16-105

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 state that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, "Standard Technical Specifications-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.

The proposed ACTIONS Table for generic TS 3.3.2 contains the following differences from STS 3.3.2B that do not appear to be justified. The applicant is requested to conform to the STS phrasing and provisions, or justify the difference:

- 1. Required Actions A.2 and B.1and associated Bases unnecessarily add "trip" before "channel"; alternately, add trip to Required Action A.1.
- Completion Time for Required Actions A.2 and C.2.2 should match STS ("Prior to entering MODE 2 following next MODE 5 entry");
- 3. Not used
- 4. Confirm that only <u>one</u> RPS Function in Table 3.3.2-1 has an associated automatic operating bypass removal Function. If not, then Conditions C and D should match STS; regardless, Conditions C and D should also include "operating" as proposed ("C. One [or more Functions with one] automatic operating bypass removal channel inoperable."), and ("D. [One or more Functions with two] [Two] automatic operating bypass removal channels inoperable.");
- 5. Not used
- 6. The logical connector between Required Actions C.2.1 and C.2.2 should align with the period before the last digit of the labels C.2.1 and C.2.2;
- 7. Not used
- 8. Required Actions C.1 and D.1, which say "Disable [automatic operating] bypass [removal] channel(s)." are unclear. Since the function being disabled is to automatically remove the bypass and enable the associated RPS trip channel, unbypassing the RPS trip channel would need to be done manually before reaching the reset setting. The applicant is requested to clarify the meaning of these action requirements.