AP1000DCDFileNPEm Resource

From: Adams II, Samuel L. [adamssl@westinghouse.com]
Sent: Friday, September 26, 2008 8:06 AM
To: Sikhindra Mitra
Cc: Perry Buckberg; Rhonda Carmon
Subject: FW: AP1000 CTSB RAIs 3.doc
Attachments: AP1000 CTSB RAIs 3.doc

Hi S.K.,

I acknowledge receipt of the attached RAIs on SRP16.

I will let you know as soon as possible if a clarification call is necessary.

Thanks.

Sam

From: Sikhindra Mitra [mailto:Sikhindra.Mitra@nrc.gov]
Sent: Wednesday, September 24, 2008 2:35 PM
To: Adams II, Samuel L.
Cc: Eileen McKenna; Theodore Tjader; Perry Buckberg; Rhonda Carmon; Sisk, Robert B.
Subject: AP1000 CTSB RAIs 3.doc

Hi Sam,

Please find attached additional RAIs on Section 16 - "Technical Specification." Please acknowledge the receipt. Let me know if you like to have a conference call on any of these RAIs. Thanks

SK

Hearing Identifier: AP1000_DCD_Review
Email Number: 109

Mail Envelope Properties (15C4FDCCF8DAC64088CF069737A9985B7FA68C0C51)

Subject: FW: AP1000 CTSB RAIs 3.doc
Sent Date: 9/26/2008 8:05:48 AM
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From: Adams II, Samuel L.

Created By: adamssl@westinghouse.com

Recipients:
"Perry Buckberg" <Perry.Buckberg@nrc.gov>
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Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
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RAI-SRP16-CTSB-42.

TS 3.3.1; Table 3.3.1-1, Page 2; Table 3.3.1-1, Note 1 (overtemperature ΔT) and Note 2 (overpower ΔT):

Provide the technical bases and derivation of the revised overtemperature ΔT and overpower ΔT reactor trip functions and submit a specific reference to a supporting analytical method that has been approved by the staff for these functions, or submit an appropriate methodology to the staff for further review. Per Generic Letter 88-16, include the approved method for these equations in TS Section 5.6.5. The current overtemperature ΔT and overpower ΔT equations (Rev. 15) were taken from WCAP-8745-P-A. However, Revision 16 makes a change to these equations but does not provide a revision to WCAP-8745 or a reference to another approved method containing the technical bases for the proposed equations.

In addition, provide definitions for f1(ΔI) and f2(ΔI). The definitions of these terms were not presented or referenced in Table 3.3-1. The definitions should be consistent with those provided in DCD 7.2.1.1.3 and the supporting analytical methods.

Per Generic Letter 88-16, "Removal of Cycle-Specific Parameter Limits from Technical Specifications," the analytical methods used to determine the core operating limits must be those previously reviewed and approved by the staff. The revised calculation formulas presented for these functions differ from those previously submitted in Revision 15 of DCD 7.2.1.1.3 and Technical Specification Table 3.3-1. Reference is also made in Note 1 of Table 3.3.1-1 to interpolation from tables of allowable core thermal power as a function of core inlet temperature at various pressures. The bases for these formulas and for development of the tables were not referenced to methods approved by the staff, either in the Bases for LCO 3.3.1 or in Technical Specification 5.6.5, "Core Operating Limits Report (COLR)."

RAI-SRP16-CTSB-43.

TS 3.1.8 PHYSICS TEST EXCPETIONS – MODE 2

Resolve the discrepancy between LCO 3.1.8 c, SR 3.1.8.3 and the Analytical Safety Analyses Section of BASES.

Item c and SR 3.1.8.3 state that THERMAL POWER is < 5% RTP along with the LCO Section and SR 3.1.8.3 of BASES. The Analytical Safety Analyses Section of BASES states that power is limited to <= 5% RTP.

RAI-SRP16-CTSB-44.

TS 3.3.1 Reactor Trip System Instrumentation

For Table 3.3-1, function 6 (over temperature ΔT) and function 7 (overpower ΔT), clarify the "required channels" column entry by adding appropriate notation that would make Table 3.3-1 consistent with DCD Table 7.2-2, sheet 1, and would be consistent with descriptions of other required channels presented on Table 3.3.1-1.

RAI-SRP16-CTSB-45.

TS 3.3.1 Reactor Trip System Instrumentation

For Table 3.3-1, function 12 (RCP speed - low), clarify the "required channels" column entry by adding the appropriate notation that would make Table 3.3-1 consistent with DCD Table 7.2-2, sheet 1, and would be consistent with descriptions of other required channels presented on Table 3.3.1-1.

RAI-SRP16-CTSB-46.

TS 3.3.2 Engineering Safety Features Actuation System

In the description of ESFAS safety functions, revise the proposed wording of function 15, and actuation signal descriptions 15.a and 15.c to more closely match the descriptions of automatic actions provided in DCD 7.3.1.2.14, "Boron Dilution Block."

More clarity is required in the description of the functions and the associated initiating conditions. DCD 7.3.1.2.14 provides a more explicit description of the boron dilution block function and its implementation in the design. The proposed TS descriptions should be revised accordingly to use similar component descriptions and provide an equivalent level of specificity. For example, for description 15.a, the proposed Bases description states "demineralized water is isolated from the makeup pumps and reactor coolant makeup is isolated from the reactor coolant system to preclude a boron dilution event." Following are the more specific descriptions presented in DCD 7.3.1.2.14.

(Applies to 15.a) "In the event of an excessive increasing rate of source range flux doubling signal, the block of boron dilution is accomplished by closing the chemical and volume control system makeup isolation valves and closing the makeup pump suction valves to the demineralized water storage tanks. This signal also provides a non-safety trip of the makeup pumps. These actions terminate the supply of potentially unborated water to the reactor coolant system as quickly as possible".

(Applies to 15.c) "In the event of a loss of ac power sources or a reactor trip (as indicated by P-4), the block of boron dilution is accomplished by closing the makeup pump suction valves to the demineralized water storage tanks and aligning the boric acid tank to the suction of the makeup pumps. This permits makeup as needed but ensures that it will be from a borated source that will not reduce the available shutdown margin in the reactor core."

RAI-SRP16-CTSB-47

TS 3.3.2 Engineering Safety Features Actuation System

Resolve the apparent conflict between the descriptions in Table 3.3.2-1, function 13.d, and DCD Table 7.3-1, actuation signal 12.e.

For the passive RHR heat exchanger actuation function, Table 3.3.2-1 describes function 13.d as ADS stages 1, 2, and 3 actuation. However, DCD Table 7.3-1, "Engineered Safety Features Actuation Signals," identifies input 12.e as "automatic

reactor coolant system depressurization (first stage)." As described, this appears to be a different signal.

RAI-SRP16-CTSB-48.

TS 3.3.2 Engineering Safety Features Actuation System

Resolve the apparent conflict between the descriptions in Table 3.3.2-1, function 2.d, and DCD Table 7.3-1, actuation signal 6.b.

For the core makeup tank injection function, Table 3.3.2-1 describes function 7.d as ADS stages 1, 2, and 3 actuation. However, DCD Table 7.3-1, "Engineered Safety Features Actuation Signals," identifies input 6.b as "automatic reactor coolant system depressurization (first stage)." As described, this appears to be a different signal.

RAI-SRP16-CTSB-49.

TS 3.3.2 Engineering Safety Features Actuation System

Resolve the apparent conflict between the descriptions in Table 3.3.2-1, function 11.a, and DCD Table 7.3-1, actuation signal 5.b.

For reactor coolant pump trip function, Table 3.3.2-1 describes one input as ADS stages 1, 2, and 3 actuation. However, DCD Table 7.3-1, "Engineered Safety Features Actuation Signals," identifies the input as "automatic reactor coolant system depressurization (first stage)." As described, this appears to be a different signal. Revise Table 3.3.2-1 to show that functions 11.a, 11.c, 11.d, and 11.e represent trips of all reactor coolant pumps. Show function 11.b (high reactor coolant pump bearing temperature) as tripping the affected pump.

Table 3.3.2-1 is not consistent with the design established by DCD Table 7.3-1, actuation signal 5, reactor coolant pump trip.

RAI-SRP16-CTSB-50.

TS 3.3.2 Engineering Safety Features Actuation System

Revise Table 3.3.2-1 to show that function 16 includes the flux doubling calculation as an input.

Table 3.3.2-1 is not consistent with the design established by DCD Table 7.3-1, actuation signal 14.f, flux doubling calculation.

RAI-SRP16-CTSB-51.

TS 3.3.2 Engineering Safety Features Actuation System

Justify the application of Note 8, DCD Table 7.3-1, "Engineered Safety Features actuation Signals," to signals 3.c, 16.b, and 22.a. Resolve the discrepancy between the application of Note 8 to signal 16.b and the TS Basis for TS signal 20.b.

Note 8 of Table 7.3-1 identifies that the signal associated with these functions does not meet the 10 CFR 50.36(c)(2)(ii) criteria and is not included in the Technical Specifications. The actuation signal to which Note 8 was applied is undervoltage to the Class 1E battery chargers for selected engineered safety features (ESF) functions. The respective ESF functions are: initiation of the automatic depressurization system; main control room isolation and air supply initiation; and opening of containment recirculation valves in series with check valves. The basis for exclusion of these actuation signals was not evident from the DCD.

In addition, the TS Bases 3.3.2 and Table 3.3.2-1 identifies that low battery charger input voltage is a required TS variable (20.b) for main control room isolation and air supply initiation; this is contrary to Note 8 of Table 7.3-1.

RAI-SRP16-CTSB-52.

TS 3.3.3 Post Accident Monitoring

Resolve the apparently conflicting bases for the required minimum number of core exit thermocouples per core quadrant, as described in Note (b) of Table 3.3.3-1 and B 3.3.3 for the core exit temperature function, and in DCD Table 7.5-1, Sheet 2. In addition, provide a specific reference to the appropriate supporting technical evaluation described in the text of B 3.3.3.

Note (b) of Table 3.3.3-1 states that the minimum requirement is two OPERABLE thermocouples in each of the two divisions, and that a channel consists of two thermocouples within a single division. The text on page B 3.3.3-5 stipulates in part that, based on evaluations (not presented or referenced in B 3.3.3), adequate detection of inadequate core cooling is assured with two valid core exit thermocouples per quadrant. However, DCD Table 7.5-1, Sheet 2, "Post-Accident Monitoring System," identifies that three instruments per quadrant are required.

RAI-SRP16-CTSB-53.

TS 3.3.5 Diverse Actuation System Manual Controls

Resolve the discrepancies between Table 3.3.5-1, "DAS Manual Controls," and DCD 7.7.1.11, "Diverse Actuation System."

Proposed Table 3.3.5-1 does not include or otherwise specifically address the following DAS manual controls that are described in DCD 7.7.1.11, pp. 7.7-15 and 7.7-16: turbine trip; reactor coolant pump trip; containment hydrogen igniter actuation; initiate in-containment refueling water storage tank drain to containment.

RAI-SRP16-CTSB-54.

TS 3.4.14 Low Temperature Overpressure Protection (LTOP) System

Explain an apparent inconsistency in the discussion of APPLICABLE SAFETY ANALYSES (SAS) in the TS bases B 3.4.14 regarding the Low Temperature

Overpressure Protection (LTOP) system. Revise TS 3.4.14 and the associated Bases B 3.4.14, as appropriate.

In the sixth paragraph of the ASA, a restart of one reactor coolant pump (RCP) with water in the steam generator secondary side 50 degree F hotter than the primary side water when the RCS is in water solid condition is considered as a heat input transient.

The eighth paragraph of the ASA states "to prevent the possibility of a heat input transient, and thereby limit the required flow rate of the RNS suction relief valve, an administrative requirement has been imposed that does not allow an RCP to be started with the pressurizer water level above 92% and the RCS temperature above 200 degree F. Under these imposed conditions, the transient created by the startup of an RCP when the RCS temperature is above 200 degree F can be accommodated without additional pressure relief". The RCS water solid condition was not addressed by this administrative restriction. An additional restriction which states "No reactor coolant pump shall be started unless the secondary side water temperature of each SG is less than or equal to 50 degree F above each of the RCS cold leg temperatures" should have been imposed.

This information is needed to ensure LCO requirements reflect all plant conditions assumed in the accident analyses.

RAI-SRP16-CTSB-55.

TS 3.4.4 Reactor Coolant System (RCS) Loops

Confirm that the temperature value of 200 degree F for RCS cold leg temperatures used in Note 3 of LCO 3.4.4 is the Low Temperature Overpressure Protection (LTOP) arming temperature specified in the PTLR.

AP1000 GTS 3.4.14 adopted the 275 degree F value. Another value of 200 degree F was proposed for use in AP1000 GTS 3.4.4 and 3.4.8 under Technical Report 74A, Revision 0 .

This information is needed to ensure consistency of LTOP requirements specified in TS 3.4.4, TS 3.4.8, and TS 3.4.14.

RAI-SRP16-CTSB-56.

TS 3.4.6 Pressurizer Safety Valves

Revise the values and units given for the RCS design pressure in the Background and LCO sections of B 3.4.6 to be consistent with each other.

The Background section gives the system Safety Limit as 2733.5 psig, which is 110% of the design pressure, whereas the LCO section shows the RCS design pressure as 2500psia. Although conversion from gage to absolute, and accounting for the 110%

factor yield consistent values, clarity would be best achieved if consistent pressure units were used.

RAI-SRP16-CTSB-57.

TS 3.4.6, Pressurizer Safety Valves. Technical Report (TR) 74A, Revision 1.

Revise DCD Section 15.2.2 and Table 1.6-1 and/or TS bases B 3.4.6 to cite the same reference concerning overpressure protection.

In the TS bases B 3.4.6, the preliminary document listed as Reference 2, [WCAP-7769, "Topical Report on Overpressure Protection", October 1971.] is being replaced with a final document WCAP-16779, "AP1000 Overpressure Protection Report", April 2007, under TR 74A, Revision 1, however DCD Section 15.2.2 and Table 1.6-1 (Sheets 14 and 17) are not being revised to reflect the new referenced document.

This is required to ensure consistency between the TS bases and referenced information provided in the AP1000 DCD.

RAI-SRP16-CTSB-58.

TS 3.5.1 Accumulators

Revise the TS bases B 3.5.1 to specify the number of accumulators. As an example, the Background subsection of Bases section B 3.5.2 specifies the number of core makeup tanks.

RAI-SRP16-CTSB-59.

TS 3.9.5 Containment Penetrations

Provide an explanation of (or provide a reference in the Bases) where the surveillance requirement, SR 3.9.5.3 requires that one VFS system can maintain a negative pressure of less than or equal to -0.125 inches water gauge, relative to outside atmospheric pressure in the fuel handling building, and if this is the slight negative pressure mentioned in Section 9.4.7.2.3, Abnormal Operation of the VFS.

The VAS is required to perform this function when the normal ventilation (VBS) isolates due to high radiation. Section 9.4.7.2.3, Abnormal Operation for the VFS does not mention this specific pressure. It only notes that a slight negative pressure is maintained for this configuration. The value of -0.125 inches water gauge pressure should be evaluated to verify that this is the "slight negative pressure" intended as described in Section 9.4.7.2.3. The DCD, Table 3.9-17 mentions this pressure for testing. (This RAI applies to LCO 3.9.6, SR 3.9.6.3).

Also applicable to TS 3.9.6.

RAI-SRP16-CTSB-60.

TS 3.1.7 Rod Position Indication

Clarification for consistency is needed between REQUIRED ACTION A.1 and the BASES for A.1.

BASES for A.1 state "If a bank has been significantly moved, the Actions of B.1 or B.2 below are required." This is not identified in the REQUIRED ACTION A.1, and appears incorrect in the Bases.

RAI-SRP16-CTSB-61.

TS Bases 3.6.1 Containment

Provide the specific sections of Chapter 15 that discuss the specific accident in the APPLICABLE SAFETY ANALYSIS section on bases page B 3.6.1-4. Note: This RAI also applies to LCO's 3.6.2 and 3.6.3 pages B 3.6.2-7 and B 3.6.3-9.

For LCO 3.6.1, on Bases page B 3.6.1-4, REFERENCES, Ref. 2 is stated as Chapter 15, "Accident Analysis". In the body of the Bases on page 3.6.1-2, APPLICABLE SAFETY ANALYSIS section, second paragraph, the LOCA and rod ejection accidents are mentioned. The specific sections of Chapter 15 are 15.6.5 and 15.4.8. Note: Several other listings of REFERENCES at the end of the Bases section, list specific sections of Chapter 15 that apply.

RAI-SRP16-CTSB-62.

TS 3.4.8 Minimum RCS Flow

Provide justification that a total core flow rate of 3,000 gpm is acceptable and revise the applicable Bases. RAI 440.106 developed the justification for 10,000 gpm based on conservatisms applied to results based from a small-scaled test facility. (Note: SRSB agrees with RAI).

RAI-SRP16-CTSB-63.

TS 3.9.1 Boron Concentration

Provide an explanation for why the third paragraph of the STS Bases, Background section was not used and the reference to GDC 26 was deleted, to be consistent with the STS's.

The Bases for the STS's LCO 3.9.1 "Boron Concentration" Bases page B 3.9.1-1, the third paragraph regarding compliance with GDC discusses the necessity of the Chemical Volume and Control System as the one providing the ability to maintain the proper boron concentration. This paragraph was deleted from LCO 3.9.1 Bases page 3.9.1-1 along with the reference to GDC 26. GDC 26 was not included in the References section on Bases page 3.9.1-3.

RAI-SRP16-CTSB-64.

TS 3.1.1 Shutdown Margin

Resolve inconsistency between Bases and SR.

The applicability of SR 3.1.1.1 (LCO 3.1.1), “in MODE 2 when Keff > 1.0,” was omitted. The Bases is not consistent with the SR. The applicability of LCO 3.1.1 is “MODE 2 with Keff < 1.0 and MODES 3, 4 and 5.”

Per NUREG 1431 Rev 3 Vol. 2; the sentence should read:
"In MODES 1 and 2 with Keff ≥ 1.0, SDM is verified"

DCD Chapter 16.1, rev 16 currently reads:
"In MODES 1 and 2, SDM is verified "

Following RAIs are Editorial in Nature, corrections are requested :

RAI-SRP16-CTSB-65

1. Correct the editorial error on page 1.1-5, in the 1st paragraph, it appears that "LCO 3.4.15" is incorrect.

RAI-SRP16-CTSB-66

1. The term RPS is used in several locations in TS 2.1 but is not defined; define RPS. This acronym needs to be defined or changed as appropriate (e.g.: RTS - Reactor Trip System). Upon the first reference in each Specification or Bases to a phrase for which an abbreviation is desired to be used, use the full phrase followed by the acronym set off by parentheses. Use the abbreviation alone on all subsequent references in that Specification or Bases.

RAI-SRP16-CTSB-67

1. The title of reference LCO 3.1.5 is missing an 's' at the end and should be corrected.
Currently states:
LCO 3.1.5, "Shutdown Bank Insertion Limit"
Should be changed to read :
LCO 3.1.5, "Shutdown Bank Insertion Limits"

RAI-SRP16-CTSB-68

1. Revise the TS bases B 3.2.3 to indicate where Reference 2, is used within the body of the bases. Delete it from the Reference List if not applicable.

RAI-SRP16-CTSB-69

1. For condition E of LCO 3.3.1, eliminate the existing page break transition that resulted in a logical connector (AND) with no subsequent text at the end of page 3.3.1-2, and omitted continuation of the condition description on page 3.3.1-3. The discontinuity in the existing presentation makes the content associated with the logical connectors more difficult to read and interpret.

2. For Table 3.3-1, Note 1 (overtemperature ΔT) and Note 2 (overpower ΔT), provide definitions for f1(ΔI) and f2(ΔI). The definitions of these terms were not presented or referenced in Table 3.3-1. The definitions must be consistent with those provided in DCD 7.2.1.1.3.

3. On Pages 3.3.2-18, 19, and 25, in Footnote (k), it appears that "LCO 3.4.13 and LCO 3.4.14" should be changed to "LCO 3.4.12 and LCO 3.4.13."
On Page 3.3.4-1, in APPLICABILITY, it appears that "after (Tavg) "> 350 degree F" is missing.

RAI-SRP16-CTSB-70

Correct the following editorial errors:

1. On page 3.4.10-2, in SR 3.4.10.3, is the word "Not" correct?

2. On page B 3.4.3-7, in Reference 2, is the reference correct? Should the reference be "Regulatory Guide 1.99, Radiation Embrittlement of Reactor Vessel Materials."

RAI-SRP16-CTSB-71

Correct the following editorial errors:

1. (Page B 3.5.2) In Applicability first sentence, delete "4" to read "In Modes 1,2 and 3"

2. (Page 3.5.4-3) In SR 3.5.4.5, delete "System level"

3. (Page B 3.5.4-3) In Actions D.1 and D.2 first sentence, delete "or the LCO is not met for reasons other than Conditions A, B, or C."

4. (Page B 3.5.8-1) In LCO second paragraph, change from "sump recirculation isolation valves must be closed" to "sump recirculation isolation valves must be open"

RAI-SRP16-CTSB-72

1. Provide a reference to Reference 3, on Bases page B 3.6.9-4 in the appropriate section of the Bases.

2. LCO 3.6.9, Bases page B 3.6.9-4, Reference 3 is not quoted in the body of the Bases. (See also LCO 3.7.2, 3.7.6 and 3.9.1 Bases)

RAI-SRP16-CTSB-73

1. Bases 3.7.11
Delete the revision number (DCD Rev. 15) for Reference 1 on bases page 3.7.11-3.

2. Bases 3.7.12
Delete the revision number (DCD Rev. 15) for Reference 3 on bases page 3.7.12-4 and correct the typographical error for Reference 3 on page B 3.7.12-4. (Section 9.12 to Section 9.1.2)

The revision numbers are not necessary as the most recent revision is the one implied.
3. In Bases section 3.7.2, provide a reference to Reference 4 in the appropriate section of the Bases.

4. In Bases section 3.7.6, provide references to References 2 and 5 in appropriate sections of the Bases.

RAI-SRP16-CTSB-74

Correct the following editorial errors:

1. (Page 3.9.5-2) In SR 3.9.5.2, change from "LCO 3.9.4.d.1" to "LCO 3.9.5.d.1"

2. In Bases section 3.9.1, provide references to References 1 and 2 in appropriate sections of the Bases.

RAI-SRP16-CTSB-75

1. Correct the following editorial errors:

(Page 5.6-4) In the 2nd paragraph, change from "LCO 3.4.15" to "LCO 3.4.14"

(Page 5.6-5) In the last paragraph, change from "LCO 3.4.15" to "LCO 3.4.14"
E-TS Section 5

1. Correct the following editorial errors:

(Page 5.6-4) In the 2nd paragraph, change from "LCO 3.4.15" to "LCO 3.4.14"

(Page 5.6-5) In the last paragraph, change from "LCO 3.4.15" to "LCO 3.4.14"