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Your ref: Project Number 740
Our ref: DCP/NRC1828

February 8, 2007

Subject: AP1000 COL Response to Request for Additional Information (TR #39)

In support of Combined License application pre-application activities, Westinghouse is submitting responses to the NRC requests for additional information (RAI) on AP1000 Standard Combined License Technical Report 39, APP-GW-GLN-004, Rev. 0, Instrumentation and Controls Design Changes. These RAI responses are submitted as part of the NuStart Bellefonte COL Project (NRC Project Number 740). The information included in the response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification.

Responses are provided for requests TR39-1 through TR39-17 transmitted in NRC letter dated January 9, 2007 from Steven D. Bloom to Andrea Sterdis, Subject: Westinghouse AP1000 Combined License (COL) Pre-application Technical Report 39 – Request for Additional Information (TAC No. MD1849).

Pursuant to 10 CFR 50.30(b), the responses to requests for additional information on Technical Report 39 are submitted as Enclosure 1 under the attached Oath of Affirmation.

It is expected that when the RAIs on Technical Report 39 are complete, the technical report will be revised as indicated in the responses and submitted to the NRC. The RAI responses will be included in the document.

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

D. F. Hutchings for

A. Sterdis, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

D079

/Attachment

1. "Oath of Affirmation," dated February 8, 2007

/Enclosure

1. Response to Request for Additional Information on Technical Report No. 39

cc:	S. Bloom	-	U.S. NRC	1E	1A
	S. Coffin	-	U.S. NRC	1E	1A
	G. Curtis	-	TVA	1E	1A
	P. Grendys	-	Westinghouse	1E	1A
	P. Hastings	-	Duke Power	1E	1A
	C. Ionescu	-	Progress Energy	1E	1A
	D. Lindgren	-	Westinghouse	1E	1A
	A. Monroe	-	SCANA	1E	1A
	M. Moran	-	Florida Power & Light	1E	1A
	C. Pierce	-	Southern Company	1E	1A
	E. Schmiech	-	Westinghouse	1E	1A
	G. Zinke	-	NuStart/Entergy	1E	1A

ATTACHMENT 1

"Oath of Affirmation"

ATTACHMENT 1

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:	)
NuStart Bellefonte COL Project	)
NRC Project Number 740	)

APPLICATION FOR REVIEW OF
"AP1000 GENERAL COMBINED LICENSE INFORMATION"
FOR COL APPLICATION PRE-APPLICATION REVIEW

W. E. Cummins, being duly sworn, states that he is Vice President, Regulatory Affairs & Standardization, for Westinghouse Electric Company; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission this document; that all statements made and matters set forth therein are true and correct to the best of his knowledge, information and belief.

W. E. Cummins
Vice President
Regulatory Affairs & Standardization

Subscribed and sworn to
before me this 8th day
of February 2007.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Debra McCarthy, Notary Public
Monroeville Boro, Allegheny County
My Commission Expires Aug. 31, 2009
Member, Pennsylvania Association of Notaries

Debra McCarthy
Notary Public

ENCLOSURE 1

Response to Request for Additional Information on Technical Report No. 39

RAI-TR39-001 through RAI-TR39-017

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-001
Revision: 0

Question:

In Figure 7.2-1 Sheet 1 of 20 [Revised Version] the "MEMORY WITH ACTUATION BLOCK" symbol is shown in the legend, but does not have a truth table (with time transition, actuation input, block input, and output) to go with the diagram to aid interpretation and avoid misunderstanding. Provide a detailed description on how this symbol works including output verses inputs using a truth table (with time transition, actuation input, block input, and output, etc.).

Westinghouse Response:

The following transition table will be added to Sheet 1 of 20 [REVISED VERSION] for the L/R MEMORY WITH ACTUATION BLOCK device.

L	0	1	1	1	0	1	0	0	0	1
R	0	0	1	0	0	0	0	1	0	1
O	0	1	0	0	0	1	1	0	0	0

Reference:

1. APP-GW-GEE-067, PMS Logic Changes, Revision 1

Design Control Document (DCD) Revision:
Add transition table to Sheet 1 of 20 of Figure 7.2-1 as described above.

PRA Revision:
None

Technical Report (TR) Revision:
See DCD Revision above

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-002
Revision: 0

Question:

The bullet on Page 3 for Figure 7.2-1 Sheet 2 said "Deleted the logic for automatic bypass of a PMS division. This feature is not part of the protection system architecture using Westinghouse Common-Q platform." Removal on the revised version was verified. Discuss why Common-Q platform is different from AP-600 on this feature?

Westinghouse Response:

The division bypass logic depicted in the figure placed an entire division in a bypass mode, thus blocking any trip from that division. It was a design feature of the Eagle product family used by Westinghouse at the time of the development of the AP600 design. It did not reflect any design criterion (i.e., regulatory requirement or industry standard) but, rather, a design decision made in the early 1980's. The purpose of the logic was to permit an entire protection system division to be placed into a bypass mode for testing or maintenance purposes.

Westinghouse has more recently developed the Common Q product family that is the current offering for safety related applications. The Common Q family uses internal redundancy within a division so that any complete subsystem within a division can be bypassed for testing or maintenance without a loss of system function. In addition, the bypass logic created certain conditions that could lead to a single equipment failure causing an unnecessary division trip if a bypass were present. This is not true with the Common Q architecture. For these reasons the division bypass logic provides no safety or operational benefits in Common Q based protection applications and has, therefore, been removed from the AP1000 PMS design.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-003
Revision: 0

Question:

The second logic string in Original of Figure 7.2-1 Sheet 3 of 20 has the label BORON DILUTION BLOCK CONTROL, but the Revised Version of Figure 7.2-1 Sheet 3 of 20 with the same logic pattern has label FLUX DOUBLING BLOCK CONTROL while a new reset logic string was inserted to the left labeled BORON DILUTION BLOCK CONTROL. The bullet for Sheet 3 on Page 3 did not identify this change sufficiently. Explain the reason and meaning of this change in detail. Also, provide cross reference session number in Design Control Document related to this function.

Westinghouse Response:

The two controls are different and therefore have different names. The function is Boron Dilution, of which Flux Doubling is part. The box on the right can be used to block the Flux Doubling portion of Boron Dilution, while the box on the left was added so the operator could reset the boron dilution latch. The reason the latch was added was to prevent the CVS from continuing to dilute the Reactor Coolant System and so the operators would be assured the valves were commanded to their isolated state. Please see section 7.3.1.2.14 of the AP1000 Design Control Document (APP-GW-GLR-700, Rev. 15) and the changes to that section that were included in Control Design Changes Document (APP-GW-GLN-004, Rev. 0).

Reference:

1. APP-GW-GLR-700, AP100 Design Control Document, Revision 15
2. APP-GW-GLN-004, Instrumentation and Control Design Changes, Revision 0

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-004
Revision: 0

Question:

The bullet on Page 3 for Sheet 8 of Figure 7.2-1 says, "A latch was added to maintain the momentary manual system level Passive Residual Heat Removal (PRHR) actuation signal until no longer needed and prevent the operator from inadvertently changing the affected components' state. The safety significance of the PRHR function necessitated the addition of an automatic system level latch as well." The Revised Version of Figure 7.2-1 Sheet 8 of 20 shows that a set of symbols, which is formed with a S/R "Memory" symbol and a L/R "Memory with Actuation Block" symbol, were added similar to other latch applications with required automatic system level latching. What is the detailed logic operation for the two symbol latch set (R/S and R/L) combination?

Westinghouse Response:

Refer to the response to Question 1 for the transition table associated with L/R MEMORY WITH ACTUATION BLOCK device. Refer to Sheet 1 of 20 [REVISED VERSION] for the transition table associated with the S/R SET/RESET MEMORY device.

Where applicable, the automatic actuation signals (e.g., PRHS system level actuation) are latched using the L/R MEMORY WITH ACTUATION BLOCK device. The reason for using the L/R Memory device is to latch the system level output signal upon receipt of a system level automatic input signal. If the operator decides to assume administrative control of the plant based upon emergency operating procedure instructions, they manually activate the manual system level reset signal (momentary signal that generates a software pulse with time duration equivalent to at least two processor cycle times) which removes the system level output signal. The output signal can then only become a logical 1 again if

(a) the process conditions that resulted in an input signal return to normal AND
(b) the process conditions then reoccur (or a different set of process conditions occur that results in an automatic signal)

OR

(a) The operator manually actuates a system level signal

The R/S SET/RESET MEMORY device (with RESET priority) is used for latching all manual system level signals. If the operator manually actuates the system level ESF function, an input signal is generated (momentary signal) that results in the output signal of the R/S device becoming a logical 1. The output signal remains a logical 1 until the operator manually activates the system level ESF reset function (momentary signal). If process conditions degrade following manual resetting of the system level ESF function, the operator has the capability to manually actuate the system level ESF function again since the manual system level ESF reset

function is a pulsed input. If the operator inadvertently actuates both the manual system level actuation signal and the system level reset signal, the output of the R/S device would be a logic 0 because the device is assigned reset priority. If the operator inadvertently actuates the system level ESF function, the components that receive the system level ESF actuation signal will proceed to their actuated state at which time the operator can reset the system level reset signal and manually restore the associated components to their normal state.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-005
Revision: 0

Question:

Sheet 13 of Figure 7.2-1 [Revised Version] has a "P-11 (APP PMS J1 111 Note 4)" input signal from Sheet 11, but on Sheet 11 the output signal to Sheet 13 is labeled "P-11A (APP PMS J1 109 & 111)." Explain why these labels "P-11" verses "P-11A" are different. How will the labeling inconsistency be addressed?

Westinghouse Response:

The functional diagrams in general show only one, the "A" Division of logic, of the system's four fold redundant logic. However, when there are specific sensors or valves that only reside in specific divisions (other than Division "A"), they are either expressly shown with a division letter or Note designator. The P-11A signal on Sheet 11 has an "A" designation since that sheet shows the creation of the permissive in Division "A" and since there is no Note to explain otherwise, the P-11 signal is generated in all four divisions of logic. On Sheet 13, the "A" suffix was dropped and "Note 4" was added to explain that RNS Containment Isolation valves only reside in Divisions "A" & "B" and therefore are the only Divisions the function is used. By following this convention, there is no labeling inconsistency.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-006
Revision: 0

Question:

The bullet for Sheet 12 of Figure 7.2-1 on Page 5 states, "The existing unnamed bistable" was changed from a high-going (trip above set point) bistable to a low going (trip below the set point) bistable." A resulting move of the "NOT" gate to maintain the same overall function logic was performed. What is the "existing unnamed bistable" and what is its purpose? How will the lack of a label be addressed?

Westinghouse Response:

The bistable is what creates P-12. The bistable is derived off of LOW PRESSURIZER LEVEL, and that label to the left and above the Block Control and also refers to this bistable. The label "LOW PRESSURIZER LEVEL" will be added above this bistable to eliminate any ambiguity.

Reference:

1. APP-GW-GEE-067, PMS Logic Changes, Revision 1

Design Control Document (DCD) Revision:
Add label to bistable Sheet 12 of 20 of Figure 7.2-1 as described above.

PRA Revision:
None

Technical Report (TR) Revision:
See DCD Revision above

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-007
Revision: 0

Question:

The bullet on Page 5 for Sheet 12 of Figure 7.2-1 failed to mention a significant label change in the "Low Pressurizer Level CMT Block Control" logic string from "P-12A (PMS J1 116)" on the Original to "4th STAGE ADS ACTUATION (APP PMS J1 116)" on the Revised Version. Why was this change made?

Westinghouse Response:

This change is one of those that were covered under the first bullet under the General Modifications section on page 2. Where possible, page connects were changed to more easily show what function on the connecting page a signal goes to or comes from. The P-12A was also misleading as that signal generated is more than just P-12.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-008
Revision: 0

Question:

The fourth bullet under GENERAL MODIFICATIONS on Page 2 says, "Alarms, indicators, and information data points have been deleted from the functional diagrams." What is the justification for this action? At least the minimum inventory items (identified in DCD Tier 1) should be shown.

Westinghouse Response:

The information in Figure 7.2.1 presented an inconsistent use of alarms, indicators and information data points, giving the incorrect impression that these were the only such data points. In addition, these items do not convey the fundamental automatic and manual protection functions performed by the PMS.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-009
Revision: 0

Question:

Sheet 15 of Figure 7.2-1 [Revised Version] has an input from Sheet 12 in the Low-1 Core Makeup Tank Level Logic string labeled "CMT ACTUATION SIGNAL (APP PMS J1 112)," but the apparent output signal from Sheet 12 is labeled "ADS ACTUATION (APP PMS J1 115)." Explain this labeling inconsistency. How will the labeling inconsistency be addressed?

Westinghouse Response:

Where possible, page connects were changed to more easily show what function on the connecting page a signal goes to or comes from. On Sheet 12, the signal "ADS ACTUATION" is explaining where it is going and on Sheet 15, signal "CMT ACTUATION" is explaining where it came from. Therefore, there is no labeling inconsistency to be addressed.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-010
Revision: 0

Question:

The bullet on Page 5 for Sheet 13 of Figure 7.2-1 says a Note 4 was added to accommodate the P-11 signal that says for only Divisions A and B, but this is not obvious. Explain how only two divisions are involved?

Westinghouse Response:

The functional diagrams in general, show only one division (A) of the system's four fold redundant logic. However, when there are specific sensors or valves that only reside in specific divisions (other than Division A), they are either expressly shown with a division letter or note designator. The P-11 signal originates on Sheet 11 has an "A" designation since that sheet shows the creation of the permissive in Division A and since there is no note to explain otherwise, the P-11 signal is generated in all four divisions of logic. On Sheet 13, the "A" suffix was dropped and "Note 4" was added to explain that RNS containment isolation valves only reside in Divisions A & B and therefore are the only divisions the function is used.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-011
Revision: 0

Question:

In Sheet 10 of Figure 7.2-1 [Revised Version] in the "STAGE 1 STEAM DUMP COOLDOWN CONTROL" logic string, what is the reason for the time delay just before the AND gate when "2 of 4 Divisions LOW-2 RCS T(AVG) signal" is received?

Westinghouse Response:

The steam dump time delay for the designated cooldown valves is used during an intentional plant cooldown during a shutdown once the Low-2 T(Avg) value is reached (which shuts all non-cooldown steam dumps that would NOT be in use anyway), and gives the operator a short time to enable the Stage 1 Cooldown Condenser Dump Valves so that these valves do not have to trip closed and then have to be re-opened.

This prevents unnecessarily cycling the Stage 1 Cooldown Condenser Dump Valves when the operator wants to keep them open. This also allows the operators to maintain and control the cooldown process better, rather than temporarily stopping the cooldown and then having to re-establish the cooldown rate again after re-opening the valves. The time delay used will be sufficiently short so that an actual unintentional plant cooldown will be terminated prior to the occurrence of an excessive cooldown.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-012
Revision: 0

Question:

On Sheet 15 of Figure 7.2-1 [Revised Version] an element with NOTE 6 attached is not observed. What component is NOTE 6 associated with? How will the labeling inconsistency be addressed?

Westinghouse Response:

The note will be attached to the "Retentive Timer" element shown on Sheet 15 of Figure 7.2-1.

Reference:

1. APP-GW-GEE-067, PMS Logic Changes, Revision 1

Design Control Document (DCD) Revision:
Add note to Retentive Timer to Sheet 15 of 20 of Figure 7.2-1 as described above.

PRA Revision:
None

Technical Report (TR) Revision:
See DCD Revision above

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-013
Revision: 0

Question:

Sheet 12 of Figure 7.2-1 [Revised Version] has an input from Sheet 15 labeled "FIRST STAGE AUTOMATIC DEPRESSURIZATION SYSTEM ACTUATION (APP PMS J1 115)", but the output signal on Sheet 15 has the label "CMT ACTUATION LOGIC (APP PMS J1 112)." Explain this labeling inconsistency. How will the labeling inconsistency be addressed?

Westinghouse Response:

Where possible, page connects were changed to more easily show what function on the connecting page a signal goes to or comes from. On Sheet 12, the signal "FIRST STAGE AUTOMATIC DEPRESSURIZATION SYSTEM ACTUATION" is explaining where it is coming from and on Sheet 15, signal "CMT ACTUATION LOGIC" is explaining where it is going to. Therefore, there is no labeling inconsistency to be addressed

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-014
Revision: 0

Question:

The bullet on Page 5 for Sheet 16 of Figure 7.2-1 did not mention the input signal label change in Low-2 RCS Hot Leg Level logic string from "P-12A (PMS J1 112)" in the Original to "CMT CONTROL (APP PMS J1 112)" in the Revised Version. Why was this change made?

Westinghouse Response:

This change is one of those that were covered under the first bullet under the General Modifications section on page 2. Where possible, page connects were changed to more easily show what function on the connecting page a signal goes to or comes from. The P-12A was also misleading as that signal generated is more than just P-12

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-015
Revision: 0

Question:

There is no bullet for Sheet 17 of Figure 7.2-1 [Revised Version]. Several changes to the original have been explained elsewhere, but some have not been addressed. In the CMT C. L. Balance Line Isolation Valves logic string, the input labeled "PRESSURIZER LEVEL >= P-12 (PMS J1 112)" on the Original was changed to "P-12 (APP J1 112)" on the Revised Version, but does not match any output label on Sheet 12. What is the specific label on Sheet 12 for this input signal to Sheet 17? How will the labeling inconsistency be addressed?

Westinghouse Response:

There is an error with the copy of Sheet 17 of Figure 7.2-1 [Revised Version], the label for P-12 was to be changed to a NOT P-12 and this correction will be shown with a bar over P-12 on Sheet 17. The NOT P-12 input on Sheet 17 will match the output function as it is shown on Sheet 12 and therefore, there is will be no labeling inconsistency to be addressed.

Reference:

1. APP-GW-GEE-045, PMS Logic Changes, Revision 2

Design Control Document (DCD) Revision:
Verify change to P-12 was made to base drawing for Sheet 17 of 20 of Figure 7.2-1 as described above.

PRA Revision:
None

Technical Report (TR) Revision:
See DCD Revision above

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-016
Revision: 0

Question:

There is no bullet for Sheet 17 of Figure 7.2-1. Several changes to the original have been explained elsewhere, but some have not been addressed. In the CMT C. L. Balance Line Isolation Valves logic string the input labeled "CMT CONTROL CONFIRMATORY OPEN (PMS J1 112)" has a "Adjustable Time Delay Actuating" symbol that was added following the input. Explain why was this delay added?

Westinghouse Response:

The addition of the timer was initially thought to be needed to adequately control the isolation valves detailed on Sheet 17 of Figure 7.2-1. As the AP1000 design has matured, it has been determined that it will not be need and has been recently removed from the design.

Reference:

1. APP-GW-GEE-067, PMS Logic Changes, Revision 1

Design Control Document (DCD) Revision:
Remove timer on Sheet 17 of 20 of Figure 7.2-1 as described above.

PRA Revision:
None

Technical Report (TR) Revision:
See DCD Revision above

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR39-017
Revision: 0

Question:

The bullet on Page 4 for Sheet 10 of Figure 7.2-1 did not sufficiently explain the major design changes in the steam dump interlock logic. Provide a detail logic description of the steam dump interlock logic in Sheet 10 of Figure 7.2-1 [Revised Version] including the true or false (1 or 0) status expected from each of the initiating blocks (ENABLE MOMENTARY, ON, DISABLE, NORMAL, OFF).

Westinghouse Response:

There is additional information explaining how the original Steam Dump logic operated in section 7.3.1.2.16 of the AP1000 Design Control Document (APP-GW-GLR-700, Rev. 15) and the subsequent changes that have been made were explained in the corresponding section of the Instrumentation and Control Design Changes Document (APP-GW-GLN-004, Rev. 0).

As for logic states, all controls produce a logical 1 when in a particular position. The word MOMENTARY describes the action of the control and is not part of the mode. When the word MOMENTARY is not present, the control state is maintained when in that position.

If the Mode control is in the OFF state, all Steam Dump Valves will be blocked. When it is in the NORMAL state, the three groups of Steam Dump Valves will be controlled by their individual logic. When a group's control is in the DISABLE state the associated steam dump valves are blocked. When a group's control is in the ON state the associated steam dump valves are blocked based on the output of the AND gate above the OR end gate. When a Low-2 RCS T(Avg) signal exists, a group's associated steam dump valves will not be blocked if its associated control is in the ENABLE state.

Reference:

1. APP-GW-GLR-700, AP100 Design Control Document, Revision 15
2. APP-GW-GLN-004, Instrumentation and Control Design Changes, Revision 0

Design Control Document (DCD) Revision:
None

PRA Revision:
None

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Technical Report (TR) Revision:
None