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Your ref: Project Number 740
Our ref: DCP/NRC2039

November 9, 2007

Subject: AP1000 COL Responses to Requests for Additional Information (TR 103)

In support of Combined License application pre-application activities, Westinghouse is submitting responses to the NRC requests for additional information (RAIs) on AP1000 Standard Combined License Technical Report 103, APP-GW-GLN-019, "Fluid System Changes". These RAI responses are submitted as part of the NuStart Bellefonte COL Project (NRC Project Number 740). The information included in the responses is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification.

Responses are provided for RAI-TR103-SBPA-01 and -02, and RAI-TR103-SPCV-01 as finalized in a phone call between Don Lindgren, John Segala and Chris Jackson on October 29, 2007. These responses complete all requests received to date for Technical Report 103.

Pursuant to 10 CFR 50.30(b), the responses to the requests for additional information on Technical Report 103, are submitted as Enclosure 1 under the attached Oath of Affirmation.

Questions or requests for additional information related to the content and preparation of these responses 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,

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

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D063
D079
NRO

/Attachment

1. "Oath of Affirmation," dated November 9, 2007

/Enclosure

1. Responses to Requests for Additional Information on Technical Report No. 103

cc:	D. Jaffe	- U.S. NRC		1E	1A
	E. McKenna	- U.S. NRC		1E	1A
	G. Curtis	- TVA		1E	1A
	P. Hastings	- Duke Power		1E	1A
	C. Ionescu	- Progress Energy		1E	1A
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	C. Pierce	- Southern Company		1E	1A
	E. Schmiech	- Westinghouse		1E	1A
	G. Zinke	- NuStart/Entergy		1E	1A
	R. Grumbir	- NuStart		1E	1A
	A. Pfister	- Westinghouse		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 9th day
of November 2007.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Patricia S. Aston, Notary Public
Murrysville Boro, Westmoreland County
My Commission Expires July 11, 2011
Member, Pennsylvania Association of Notaries

Notary Public

ENCLOSURE 1

Responses to Requests for Additional Information on Technical Report No. 103

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR103-SBPA-01
Revision: 0

Question:

During a teleconference on September 23 2007, the staff informed Westinghouse that for TR 103 a technical justification was needed in order to review the proposed change to the spent fuel pool (SFP) capacity increase. Westinghouse acknowledged and committed to update TR 103 to provide the assumptions and results of their analysis. The TR was re-submitted on October 4, 2007. The structural and criticality aspects of the proposed change are covered by TR 54 and TR 65.

The justification provided for the proposed change to B.17 of the TR 103 states that the increase in SFP capacity is covered in TR-33. However, TR-33 covers Reactor Coolant Boundary materials, not the SFP increase. TR 103 also makes reference to TR 105 and TR 108. TR 105 covers building and structure configuration, layout and general arrangement design updates. TR 108 covers the site interface temperature limits. Neither of these two TRs covers the thermal considerations of the SFP capacity increase. The discussion of the proposed SFP capacity increase states that a thermal analyses was performed and the DCD was updated to reflect these changes. The staff can not determine that these changes are acceptable without receiving information regarding the revised analysis assumption, inputs and results.

Westinghouse Response:

The reference to TR-33 should have been APP-GW-GLR-033 (TR-54). This report focuses on the structural and mechanical design changes in the spent fuel and does not provide significant information on the spent fuel pool cooling issues. We have discussed the spent fuel pool cooling in phone calls with the NRC review staff and placed a copy of the supporting calc. note in our Rockville office. The following discussion provides more information on spent fuel pool cooling.

The spent fuel pool (SFP) contains adequate storage for 889 spent fuel assemblies which is an increase of 270 assemblies from the previous design of 619. Passive sources of makeup water are required to maintain spent fuel pool cooling for 72 hours following a station blackout coupled with a seismic event. Table 9.1-4 of the AP1000 DCD presents the time required for boiling to begin in the SFP following the loss of cooling, the height of water above fuel 72 hours after the loss of cooling, and the height of water above fuel 7 days after the loss of cooling. DCD Table 9.1-4, as documented in revision 2 of TR 103, is based on the SFP containing 663 spent fuel assemblies that have resided in the SFP between 1.5 and 15.0 years plus one recent offload. The first two cases assume the loss of cooling occurs after a 44% core offload, 69 assemblies, has been completed. The first event assumes the loss of cooling occurs 399 hours after the plant has been shutdown for refueling, and the second event assumes the loss of cooling occurs 150 hours after the plant has been shutdown for refueling. The third event assumes an emergency core offload has to be performed immediately following a normal refueling and a loss of cooling occurs 150 after the plant shutdown for the emergency core offload. In this event all 889 storage spaces are occupied by spent fuel assemblies. In the first two events 157 storage spaces are not occupied because the spent fuel racks must have storage spaces for an entire core in order for the plant to resume operation. The total decay heat produced by the fuel assemblies that have been offloaded for between 1.5 and 15 years is conservatively assumed to be constant throughout each evolution. The decay heat is calculated based on ANSI/ANS 5.1 with a 2 sigma deviation. This is the same methodology that was previously used to calculate the values in DCD Table 9.1-4. This calculation was updated to account for the increase in SFP capacity.

Following a loss SFP cooling, the heat capacity of the water in the SFP is such that cooling of the fuel assemblies is initially maintained. The water inventory in the SFP and connected volumes in the fuel transfer canal and gate area will cool the spent fuel for some time following the event. Additional makeup water from the cask washdown pit is aligned to provide makeup during the first 72 hours following refueling.

The values in DCD Table 9.1-4 are calculated using the following assumptions:

- The calculation assumes the core power is 102% of full core power.
- The Fuel Transfer Canal, Spent Fuel Pool, and Cask Washdown Pit are all assumed to drain down to an elevation of 129.25 feet immediately following the loss of SFP cooling.
- The top of the fuel in the Spent Fuel Pool is assumed to be 109.50 feet.
- The volume of water in the Fuel Transfer Canal below the bottom of the gate is not credited for makeup or boiloff.
- The initial temperature of the Spent Fuel Pool is assumed to be 120F.

The information found in the table below are the results for the loss of cooling calculation that appear in Revision 2 of TR 103. Revised Table 9.1-4 is also in TR 134. The information in Table 9.1-4 justifies that the design of the spent fuel pool cooling system is adequate to provide cooling of the SFP by passive means following the loss of normal cooling.

Table 9.1-4

STATION BLACKOUT/SEISMIC EVENT TIMES(1)

Event	Time to Saturation(1) (hours)	Height of Water Above Fuel at 72 Hours(4) (feet)	Height of Water Above Fuel at 7 Days(4) (feet)
Seismic Event(2) – Power Operation Immediately Following a Refueling(7)	6.50	1.6	1.6(6)
Seismic Event(8) – Refueling, Immediately Following Spent Fuel Region Offload(3)(7)	4.68	8.3(5)	8.3(5)
Seismic Event(8) – Refueling, Emergency Full Core Off-Load(3) Immediately Following Refueling(7)	1.37	8.3(5)	8.3(6)

Notes:

1. Times calculated neglect heat losses to the passive heat sinks in the fuel area of the auxiliary building.
2. Seismic event assumes water in the pool is initially drained to the level of the spent fuel pool cooling system connection simultaneous with a station blackout. Fuel cooling water sources are spent fuel pool, fuel transfer canal (including gate), and cask washdown pit for 72 hours. Between 72 hours and 7 days fuel cooling water is provided from passive containment cooling system ancillary water storage tank.
3. Fuel movement complete, 150 hours after shutdown.
4. See subsection 9.1.3.5 for minimum water level.
5. Alignment of PCS water storage for supply of makeup water permits maintaining pool level at this elevation. Decay heat in reactor vessel is less that 9 MW, thus no PCS water is required for containment cooling.
6. Alignment of the PCS ancillary water storage tank and initiation of PCS recirculation pumps provide a makeup water supply to maintain this pool level or higher above the top of the fuel.
7. The number of fuel assemblies refueled has been conservatively established to include the worst case between an 18-month fuel cycle plus 5 defective fuel assemblies (69 total assemblies or 44% of the core) and a 24-month fuel cycle plus 5 defective fuel assemblies (77 total assemblies or 49% of the core).
8. Seismic event assumes water in the pool is initially drained to the level of the spent fuel pool cooling system connection simultaneous with a station blackout. Fuel cooling water sources are spent fuel pool, fuel transfer canal (including gate), cask washdown pit, and passive containment cooling system water storage tank for 7 days.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:

The following revision will be made to Section II.B.17:

The updated storage capacity of the Spent Fuel Storage Racks, covered under ~~TR 33~~ *APP-GW-GLR-033 (TR54)*, is 889 locations which is an increase from 619 locations. The Spent Fuel Pool Cooling System (SFS) has the capability to cool a fully loaded spent fuel pool under the design basis conditions.

RAI Number: RAI-TR103-SBPA-02
Revision: 0

Question:

On Page 4 of Technical Report 103 it states that the RNS relief valve size has been modified from a 4 inch inlet and a 6 inch outlet to a 3 inch inlet and a 4 inch outlet. To satisfy this modification, has the correct RNS relief valve relief capacity changed? If so, what was the impact of the relief capacity change on each of the affected analyses (i.e., low temperature overpressure protection [LTOP])?

Westinghouse Response:

As part of the continuing detailed AP1000 design activities, the LTOP analysis was updated and the LTOP flow increased. Therefore, the RNS relief valve inlet / outlet piping sizes were increased from 3 inches / 4 inches to 4 inches / 6 inches to accommodate this flow increase.

As the AP1000 valve design activities continued, additional detailed process flow conditions were provided to the valve vendor and it was determined by them that a smaller RNS relief valve size (with a 3-inch inlet and 4-inch outlet) would provide sufficient design capacity to accommodate the required LTOP flow (850 gpm) specified in the latest LTOP analysis.

As part of the valve design discussions, the valve vendor performed a sizing evaluation and identified a potential concern with the use of an over-sized 4-inch inlet valve design.

The vendor was concerned that the 4-inch inlet relief valve design, even with the minimum valve flow trim package, could potentially lead to valve operational instability, caused by the valve being fluid starved during relief conditions, thereby causing valve cycling / chattering during relieving conditions.

Therefore, to enhance the AP1000 valve operational performance, the RNS relief valve design was changed to specify a 3-inch inlet diameter and a 4-inch outlet diameter, as specified in TR103 and DCD Revision 16.

This updated RNS relief valve sizing reflects the current LTOP analysis relief capacity and also addresses the appropriate vendor sizing and performance considerations, which were the basis for the reduction in the relief valve sizing change.

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 Number: RAI-TR103-SPCV-01
Revision: 0

Question:

In TR 103 there is a change regarding the Passive Containment Cooling Water Storage Tank (PCCWST) Narrow Range Level instrumentation. An NRC concern was raised regarding this change as shown below:

"...For example there is a change to the safety-related level instrumentation from a differential pressure technology to ultrasonic technology. There was no description of the potential for different failure modes using the different technology or the effects of the different failure modes..."

Westinghouse Response:

As discussed in the Design Control Document (DCD) 6.2.2.2.3, the Passive Containment Cooling System (PCS) water storage tank includes four channels of instrumentation to monitor tank level, with two safety-related instrumentation channels and two non safety-related channels.

The change identified in TR103 for the PCS water storage tank level instrumentation was to replace the two non safety-related level instruments with more accurate non safety-related ultrasonic level instruments to perform the same non safety-related monitoring function. This change was made in order to improve the accuracy of the non safety-related monitoring of the PCS water storage tank level for Technical Specifications surveillance requirements prior to an event.

As discussed in DCD 7.5 Table 7.5-1, the safety-related wide range PCS water storage tank level is a B1 variable that provides an indication of the heat sink maintenance and, therefore, this safety-related function is performed by Class 1E instrumentation. This instrument uses a wide range differential pressure sensor with a large span to cover the entire PCS water storage tank level range. The post-accident monitoring capabilities and design of the SAFETY instrumentation are NOT affected by this change.

The monitoring of initial (pre-event) PCCWST level for Technical Specification operability is a non safety-related monitoring function. The original sensor employed a non safety-related wide range differential pressure instrument that is not able to achieve the necessary accuracy for Technical Specification measurement. Due to the relatively large tank surface area, a correspondingly small elevation change represents the Technical Specification operability limit, and compared to the wide range instrumentation error tolerance, additional accuracy is needed for alerting operators of water level changes. Therefore, this change was made to use a non safety-related ultrasonic water level instrumentation to improve the alarm set point accuracy.

This change does NOT impact the safety design basis for the PCS or adversely impact the capability of the PCS to provide safety-related accident mitigation and safe shutdown functions following an event. The failure modes of the safety-related instrumentation functions are NOT affected by the replacement of the non safety-related ultrasonic level instrumentation. The change to this type of instrument does NOT affect the minimum initial water volume specified for safety analysis.

The two ultrasonic level instrumentation channels are powered from non-Class 1E power supply, as were the two differential pressure instruments which were replaced.

The channels that are being changed to ultrasonic instrumentation are PCS level instrument Channels 15 and 16. Channels 15 and 16 are used to verify that the tank level is within Technical Specification boundaries. PCS level instrument Channels 10 and 11 will continue to perform their safety-related function of wide range tank monitoring.

Failure of the non safety-related ultrasonic instrumentation causes no change in the capability of the safety-related differential pressure instrumentation channels to fulfill their safety function.

The use of the ultrasonic instrumentation also provides diversity in the measurement of PCCWST level since the non safety-related level instrumentation now differs from the safety-related level instrumentation. It is likely that the ultrasonic level instrumentation will function following various events and provide diverse backup indication for the operators since this instrumentation is located outside of containment and, therefore, does NOT experience adverse conditions following an event.

Design Control Document (DCD) Revision:
None

PRA Revision:
None

Technical Report (TR) Revision:
None