



Westinghouse Electric Company
Nuclear Power Plants
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

Direct tel: 43-374-6206
Direct fax: 724-940-8505
e-mail: sisk1rb@westinghouse.com

Your ref: Docket No. 52-006
Our ref: DCP_NRC_002770

February 10, 2010

Subject: AP1000 Response to Proposed Open Item (Chapter 9)

Westinghouse is submitting the following responses to the NRC open item (OI) on Chapter 9. These proposed open item response are submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in these responses is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

Enclosure 1 provides the response for the following proposed Open Item(s):

OI-SRP9.1.3-SBPA-13

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,

A handwritten signature in cursive script that reads 'Robert Sisk'.

Robert Sisk, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Enclosure

1. Response to Proposed Open Item (Chapter 9)

DO63
KRO

cc: D. Jaffe - U.S. NRC 1E
E. McKenna - U.S. NRC 1E
P. Buckberg - U.S. NRC 1E
T. Spink - TVA 1E
P. Hastings - Duke Power 1E
R. Kitchen - Progress Energy 1E
A. Monroe - SCANA 1E
P. Jacobs - Florida Power & Light 1E
C. Pierce - Southern Company 1E
E. Schmiech - Westinghouse 1E
G. Zinke - NuStart/Entergy 1E
R. Grumbir - NuStart 1E
P. Loza - Westinghouse 1E

ENCLOSURE 1

AP1000 Response to Proposed Open Item (Chapter 9)

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: OI-SRP9.1.3-SBPA-13
Revision: 0

Question:

In its response [to RAI-SRP9.1.3-SBPA-13] dated August 25, 2009, the applicant described the operator actions required to makeup to the SFP, and that makeup water would be required approximately 15 hours after boiling has begun in order to prevent fuel in the SFP from being uncovered. The applicant further identified that detailed information concerning operator action time will be contained in [a revision] to calculation APP-SFS-M3C-012. The staff finds that an audit of [this revised calculation] should be performed and the corresponding DCD markup [of Table 9.1-4, "Station Blackout/Seismic Event Times"] to confirm adequate response to RAI-SRP9.1.3-SBPA-13 should be provided by the applicant. The staff has identified this as OI-SRP9.1.3-SBPA-13.

Westinghouse Response:

- This response supersedes the response to RAI-SRP9.1.3-SBPA-13 (DCP NRC 002600, August 25, 2009).
- The markup of DCD Tier 2 Table 9.1-4, "Station Blackout/Seismic Event Times" below supersedes the markup in the response to RAI-SRP9.1.3-SBPA-08 R1 (DCP NRC 002694, November 18, 2009).
- The markup of DCD Section 9.1.3.4.3, "Abnormal Conditions," below supersedes the markup in the response to RAI-SRP 9.1.3-SBPA-04 R1 (DCP NRC 002476, May 14, 2009)

Assuming that a seismic event and a loss of site power occur after a full core is transferred from the reactor to the SFP (following a resumption of power after a typical core refueling), and that the pool is occupied by a whole fresh irradiated core plus the fuel from the recent offload plus 15.0 years worth of spent fuel, the operator will need to align makeup water within 18 hours after boiling has begun in order for fuel not to be uncovered. Reference 1, Case 6 details the amount of time within which a proper valve alignment must occur to a makeup source before fuel is uncovered.

Note: In all cases in the AP1000 boiloff calculation (Ref.1) in which the cask washdown pit is used as a makeup source, it is assumed that the initial water elevation of the cask washdown pit is the same as the initial spent fuel pool water elevation. If makeup to the pool is added so that water from the cask washdown pit does not spill out of the postulated SFS suction piping break, the time for the spent fuel pool to reach the top of fuel increases.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

Values recalculated in Reference 1 are provided in markups of DCD Tier 2 Table 9.1-4, "Station Blackout/Seismic Event Times," and DCD Section 9.1.3.4.3, "Abnormal Conditions" below.

Reference(s):

1. "AP1000 Spent Fuel Pool Heatup, Boiloff, and Emergency Makeup on Loss of Cooling," APP-SFS-M3C-012, Rev.3

Design Control Document (DCD) Revision:

Revise DCD Tier 2 Table 9.1-4 as follows:

Table 9.1-4			
STATION BLACKOUT/SEISMIC EVENT TIMES ⁽¹⁾⁽⁹⁾			
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⁾	6.386.50	1.0 1.6 ⁽⁶⁾	1.0 1.6 ⁽⁶⁾
Seismic Event ⁽⁸⁾ – Refueling, Immediately Following Spent Fuel Region Offload ⁽³⁾⁽⁷⁾	4.584.68	8.0 8.3 ⁽⁵⁾	8.0 8.3 ⁽⁵⁾
Seismic Event ⁽⁸⁾ – Refueling, Emergency Full Core Off-Load ⁽³⁾ Immediately Following Refueling ⁽⁷⁾	1.331.37	8.0 8.3 ⁽⁵⁾	8.0 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 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.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

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 than 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.
9. Operator action to align makeup water to the spent fuel pool must occur within 18 hours of the seismic event.

DCD Section 9.1.3.4.3, "Abnormal Conditions," is revised as follows:

(two paragraphs unchanged)

- When the calculated decay heat level in the spent fuel pool is less than ~~4.6~~ 4.7 MWt, no makeup is needed to achieve spent fuel pool cooling for at least 72 hours.
- When the calculated decay heat level in the spent fuel pool is greater than or equal to ~~4.6~~ 4.7 MWt and less than or equal to ~~5.4~~ 5.6 MWt, safety related makeup from the cask washdown pit is sufficient to achieve spent fuel pool cooling for at least 72 hours. A minimum level of 13.75 feet in the cask washdown pit is provided for this purpose. Availability of the makeup source is controlled by technical specifications.
- When calculated decay heat level in the spent fuel pool is greater than ~~5.4~~ 5.6 MWt makeup from the passive containment cooling water storage tank or passive containment cooling ancillary water storage tank, or combination of the two tanks, is sufficient to achieve spent fuel pool cooling for at least 7 days.

PRA Revision: None

Technical Report (TR) Revision: None