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Your ref: Docket No. 52-006
Our ref: DCP/NRC2487

May 20, 2009

Subject: AP1000 Response to Request for Additional Information (SRP 12)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on SRP Section 12. This RAI response is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in this response 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 RAI(s):

RAI-SRP12.3-CHPB-03

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,

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

/Enclosure

1. Response to Request for Additional Information on SRP Section 12

D063
NRO

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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 12

# AP1000 TECHNICAL REPORT REVIEW

## Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP12.3-CHPB-03
Revision: 0

***Question:***

In AP1000 DCA, Revision 17, Tier 2 DCD Section 12.3.2.2.9, Spent Fuel Transfer Canal and Tube Shielding, the applicant decreased the assumed overall concrete density for shielding design purposes from 147 lb/ft$^3$ to 140 lb/ft$^3$. The applicant provided no discussion of the effect of an approximate five percent decrease (in Revision 17) in the assumed shielding density of the transfer tube on area radiation levels during fuel movement. With the reduction in the concrete density, the applicant did not identify the basis of its parameters included in Section 12.3.2.2.9 or why the change occurred.

Provide a complete description of the potential radiological effects and dose estimates associated with the reduction of the concrete density in the spent fuel transfer canal and tube shielding. Include this information in the DCD and provide a markup in your response.

**Westinghouse Response:**

Interaction with construction experts raised a question as to whether the use of 147 lb/ft$^3$ assumed concrete density in DCD Revision 16 was appropriately conservative with respect to shielding. The density of concrete has some variability; for example ACI 349 cites a density for "normal weight" concrete of 145 lb/ft$^3$. This value neglects reinforcement, which would increase the gross density.

Since shielding effectiveness is generally a function of density, Westinghouse determined that a conservatively bounding value of 140 lb/ft$^3$ should be used for AP1000 shielding calculations. No change to the concrete itself is indicated by this change in values; the change only represents an increase in conservatism in our calculations.

With respect to the DCD, because of various conservatisms in previous shielding calculations, and because there is significant separation between the plant radiation zone definitions, it was not anticipated radiation zones would be redefined as a result of this change. Nevertheless, all AP1000 shielding calculations have been reviewed and are being updated to incorporate the reduced concrete density value.

Reducing the assumed concrete density will result in increased calculated dose rates. This effect varies according to the wall thickness of interest, the source energy distribution, and the source-shield geometry. For typical sources, a first-order approximation of the impact of the change from 147 lb/ft$^3$ to 140 lb/ft$^3$ is:

% increase in dose rate = One to two times wall thickness in inches

For example, changing the concrete assumed density of a 36" wall from 147 lb/ft$^3$ to 140 lb/ft$^3$ increases the calculated dose rate between 36% and 72%.

There is particular interest in the area of the fuel transfer canal and transfer tube shielding. Substantial portions of the fuel transfer canal area are shielded by water, which of course is unaffected by the assumed concrete density.

In the area above the fuel transfer tube outside containment (between the containment and the shield building), the shielding concrete is 4' 10" thick. The revised shielding calculations, assuming a concrete density of 140 lb/ft$^3$, predict a dose rate during fuel transfer of 5.6 mRem/hr. Since the definition of Radiation Zone III ranges from 2.5 to mRem/hr to less than 15 mRem/hr, this area remains Zone III, as indicated on DCD Figure 12.3-1 (Sheet 7 of 16). Therefore, no change to the DCD is required.

**Design Control Document (DCD) Revision:**
None

**PRA Revision:**
None

**Technical Report (TR) Revision:**
None