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Your ref: Docket No. 52-006
Our ref: DCP/NRC2284

November 6, 2008

Subject: AP1000 Response to Request for Additional Information (SRP19.0)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on SRP Section 19.0. This RAI response is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in the response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

A revised response is provided for RAI-SRP19.0-SPLA-07 as agreed upon in a teleconference between Dave Jaffe and Sam Adams on October 2, 2008. This response completes all requests received to date for SRP Section 19.0. A response for RAI-SRP19.0-SPLA-05 was submitted under letter DCP/NRC2247 dated September 5, 2008. A response for RAI-SRP19.0-SPLA-03 and -06 through -16 was submitted under letter DCP/NRC2233 dated August 21, 2008. A response for RAI-SRP19.0-SPLA-01, -02 and -04 was submitted under letter DCP/NRC2211 dated July 22, 2008.

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,

Donald H. Wahle for

Robert Sisk, Manager
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/Enclosure

1. Response to Request for Additional Information on SRP Section 19.0

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MRO

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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 19.0

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP19.0-SPLA-07
Revision: 1

Question:

At the Westinghouse on-site technical review in May 2008, the staff reviewed the CAFTA fault tree for safety-related recirculation squib valve (V-118) failing to open in manual and automatic (gate identifier IWF0013). On the CAFTA fault tree for squib valve 118 failing to open, common cause failure (CCF) probability of the component interface modules (CIMs) is listed as 2.97E-8. The staff then compared this with the common cause failure data for digital I&C components as documented in Westinghouse Calculation Note APP-PRA-GSC-222, "AP1000 PRA Protection and Safety Monitoring System," dated February 20, 2007. On page 11 of 65 of this calculation note, CCF probability of the CIMs is listed as 1.23E-5. The staff then noted that the RAW value for CCF of the CIMs as listed in the Shutdown PRA is >250. In addition, CCF failure of the CIMs impacts every safety-related valve actuated by the safety-related protection and safety monitoring system (PMS). Given the potential risk significance of this type of discrepancy, please provide the following information:
(a) Confirmation that the CCF failure of digital I&C components as listed on page 11 of Westinghouse Calculation Note APP-PRA-GSC-222, "AP1000 PRA Protection and Safety Monitoring System," dated February 20, 2007, was reviewed and documented in the CAFTA PRA database (AP1000.rr).
(b) Updated DCD information, including (i) the results of re-solving and re-quantifying the baseline and RTNSS full power PRA, the shutdown PRA, and the external events PRA, (ii) any new risk insights identified during re-quantification of the previously mentioned PRAs, and (iii) the results of the revised importance analyses.

Westinghouse Response:

(a) In response to the NRC finding at the on-site technical review of the AP1000 PRA, a Westinghouse CAPs (IR 08-129-M008) was issued the day of the finding. It has been verified that the common cause failure probability used for the component interface modules (CIMs) used in the database (AP1000.rr) from Westinghouse Calculation Note APP-PRA-GSC-236 Revision 0, "AP1000 PRA Quantification", Reference 1 and APP-GW-GLR- 102 (TR102), "AP1000 Probabilistic Risk Assessment Update Report", Reference 2 was incorrect and did not match the value used in the database (PMS.rr) used for initial quantification of the PMS fault trees in Westinghouse Calculation Note APP-PRA-GSC-222 Revision 0, "AP1000 PRA Protection and Safety Monitoring System", Reference 3.

As the result of an Apparent Cause Analysis performed as part of IR 08-129-M008, errors in the AP1000 PRA basic event database were identified for additional PMS components, namely, Contact Input Modules, Digital Input Modules, and Digital Output Modules. The failure probabilities in the database were higher than the values listed in Reference 3 for Contact Input Modules and Digital Input Modules by 7.6% and 0.83% respectively. The probabilities in the

database for Digital Output Modules were lower than those listed in Reference 3 by roughly an order of magnitude, 3.63E-04 instead of 3.60E-03 (Reference 3). The corrections were made to the database to match values in Reference 3 and the AP1000 PRA model was requantified.

(b) As part of the resolution of this issue (discussed above in (a)), the quantification of the fault trees for the AP1000 PMS and PLS systems with the revised failure probabilities has pointed out over-conservatism in the values selected for PMS/ PLS component common cause beta factors. The AP1000 PRA models documented in References 1 and 2 reflect changes in the PMS and PLS systems as documented in References 3 and 5. As specific components of the system were modeled, corresponding common cause basic events were modeled to consider failures across trains. Non-component specific beta factors were used for the common cause modeling. Quantification of the model discussed above in (a), pointed out that these beta factors were overly conservative.

The resulting model has been revised to reflect component specific common cause beta factors for the PMS and PLS system components that are modeled in the PRA. In addition, another~~other~~ modeling issue has~~e have~~ been addressed as a result of top cutset review for the modified model. This issue is the modeling of manual DAS as a means of opening squib valves V-118A and V-118B to provide coolant to the outside of the lower reactor vessel to support reactor lower vessel cooling and resulting in-vessel retention (IVR). Credit for this action is taken in the PRA documentation, Reference 4. The AP1000 PRA model did not include manual DAS actuation of V-118A and V-118B.

Results of the quantification (PRA AP1000R3A) are summarized in the table below which compares these results to those documented in the AP1000 PRA chapters, Reference 4. The RAW value for CCF of the CIMs from this quantification remains >250 (254), again indicating the safety significance of these components.

~~Results~~	~~APP-GW-GL-022 Revision 8~~	~~PRA AP1000R3A~~
~~CDF~~	-	-
~~At Power CDF (events/year)~~	~~2.41E-07~~	~~2.41E-07~~
~~Shutdown CDF (events/year)~~	~~1.23E-07~~	~~1.03E-07~~
~~Total CDF (events/year)~~	~~3.64E-07~~	~~3.44E-07~~
~~LRF~~	-	-

~~At Power LRF (events/year)~~	~~1.95E-08~~	~~1.98E-08~~
~~Shutdown LRF (using CCFP) (events/year)~~	~~9.95E-09~~	~~8.46E-09~~
~~Total LRF (events/year)~~	~~2.95E-08~~	~~2.83E-08~~

~~The changes reflected by the model changes result in revisions to References 1, 2 and 3. These changes will include (i) the results of re-solving and re-quantifying the baseline and RTNSS full power PRA, the shutdown PRA, and the external events PRA, (ii) any new risk insights identified during re-quantification of the previously mentioned PRAs, and (iii) the results of the revised importance analyses.~~

It should be noted that the requantification of the at power PRA indicate that the CDF and LRF values and top cutsets closely compare with these items documented in the DCD PRA documented in the AP1000 PRA, APP-GW-GL-022 Revision 8, Reference 4.

Results	APP-GW-GL-022 Revision 8	PRA AP1000R3A
CDF	-	-
At Power CDF (events/year)	2.41E-07	2.41E-07
Shutdown CDF (events/year)	1.23E-07	1.03E-07
Total CDF (events/year)	3.64E-07	3.44E-07
CDF RTNSS Sensitivity (events/year)	2.12E-06	2.10E-06
LRF	-	-
At Power LRF (events/year)	1.95E-08	1.98E-08

References:

1. APP-PRA-GSC-236 Revision 0, "AP1000 PRA Quantification"
2. APP-GW-GLR- 102 (TR102), "AP1000 Probabilistic Risk Assessment Update Report"
3. APP-PRA-GSC-222 Revision 0, "AP1000 PRA Protection and Safety Monitoring System"
4. APP-GW-GL-022, Revision 8, "AP1000 Probabilistic Risk Assessment"
5. APP-PRA-GSC-228, Revision 0, "AP1000 PRA Plant Control System Model"

Design Control Document (DCD) Revision:
None

Reference 2 states for the model changes represented by TR102 Revision 0 that "the internal events, evaluations, conclusions, and insights in the AP1000 DCD Chapter 19 remain representative of the AP1000 design and will not be revised." Requantification of the AP1000 PRA model shows that the changes represented by this model revision will be in the same category. ~~The PRA model changes discussed in this RAI will be included in the next revision of TR102. Applicability of the above referenced statement to the model changes represented by TR102, Revision 1, will be evaluated as part of that revision.~~

PRA Revision:
None

Technical Report (TR) Revision:

~~The PRA model changes discussed in this RAI will be included in the next revision of TR102.~~
None