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Your ref: Docket No. 52-006  
Our ref: DCP/NRC2247

September 5, 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 response is provided for RAI-SRP19.0-SPLA-05 as sent in an email from Mike Miernicki to Sam Adams dated May 30, 2008. This response completes all requests received to date for SRP Section 19.0. A response for RAI-SRP19.0-SPLA-03, -06 through -11, -12 and -13, and -14 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,

A handwritten signature in black ink, appearing to read 'Robert Sisk'.

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

/Enclosure

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

cc: D. Jaffe - U.S. NRC 1E  
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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)

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RAI Response Number: RAI-SRP19.0-SPLA-05  
Revision: 0

### **Question:**

In TR135, the process for evaluating each design change proposal (DCP) for impact on the PRA is described. It focuses on each SSC that the DCP adds, deletes, or modifies. The staff's understanding is that if the DCP deals with an SSC that is modeled in the PRA, it was further evaluated for potential impact on the PRA.

The staff considers other changes to be impacts: changes to assumptions or PRA insights as well as changes to model logic or probability data. Any of these may be caused by design changes, and this impact may not be direct. DCPs may have an impact on the PRA, for example, by altering the **operation** of SSCs that are modeled.

Analysts might choose not to model an SSC or its supporting systems because it is normally in the required state to prevent or mitigate an event. A new or revised operating procedure might alter, for some MODE, the alignment of such an SSC. Documented insights or assumptions may be affected. The equipment would then require realignment to prevent or mitigate consequences of an event applicable to the MODE in question. It may be necessary to add it (and/or supporting SSCs) to the PRA model for that MODE.

For example, DCD Table 19.59-18, "AP1000 PRA-Based Insights," includes the following information (item 1b):

- ADS has four stages.
- Each stage is arranged into two separate groups of valves and lines.
- Stages 1, 2, and 3, connected to the top of the pressurizer, provides a vent path to preclude pressurization of the RCS during shutdown conditions if decay heat removal is lost.

The modification described in APP-GW-GEE-101 alters this configuration during RCS vacuum refill, and therefore has an impact on the PRA.

Please identify and briefly describe each DCP incorporated in the amended design and assess its potential to have such an impact on the PRA. For each DCP that that may have an impact upon the PRA or other risk studies (e.g., seismic and internal fire) please evaluate and report its potential significance.

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### Westinghouse Response:

Changes to the AP1000 design require use of the Design Change Proposal (DCP) process which includes a review of impact to the AP1000 PRA. The DCP process is defined in the APP Program Operating Procedure, Change Control for the AP1000 Program. PRA is an area of impact reviewed as part of the DCP process. The review for PRA impact begins with the author's questions on the DCP initiation form as follows:

- Will the change require modification to the input data for PRA?
- Will the change require modification of PRA insights (when issued)?
- Will the change result in a substantial increase in the probability of a severe accident such that a particular severe accident previously reviewed?
- Will the change result in a substantial increase in the consequences to the public of a particular severe accident previously reviewed?

A PRA cognizant engineer reviews each design change proposal as part of the DCP design change departure evaluation process by answering the questions shown below specific to impact to the PRA:

- Will the change require modifications to input data for PRA?
- Will the change require modification to Emergency Response Guidelines or other AP1000 related WCAP?
- Will the change require modifications to the DCD/COL/COLA, including technical specifications?
- Will the change require modification of PRA insights (when issued)?
- Will the change require modification of an issued TIER 1 (ITAAC) section?

The DCPs process identified no DCPs with PRA impact that are included in DCD Revision 16. TR135, Reference 1 was prepared using an evaluation documented for DCD revision 16 in Westinghouse Calculation Note APP-PRA-GER-002, Reference 2. The Reference 2 analysis includes a review of a complete list of DCPs for Revision 16. A two step process applied in the analysis screens out DCPs that involved SSCs not modeled in the PRA. The remaining DCPs were included in the list presented in TR135. The list presented in reference 2 includes all DCPs for Revision 16.

A change has been made in the process used for future revisions of TR135, Reference 1, for DCPs going forward. Each design change proposal (DCP) is reviewed for impact on the PRA with no initial screening for PRA modeled SSCs. This review includes a documented review of the PRA assumptions and PRA insights affected, potential changes to model logic and probability data, the effect of operational changes on component modeling, and the impact on other risk studies (e.g., seismic and internal fire). The documentation of the review identifies and briefly describes every DCP and provides the rationale used to determine impact on the plant risk and changes to the PRA or other risk studies (e.g., seismic and internal fire).

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APP-GW-GEE-101, Design Changes for Vacuum Refill Operation, Reference 3, was re-evaluated in response to this RAI. Operation of vacuum refill is expected to take place for approximately 2-hours during each refueling. The changes made to facilitate vacuum refill operation result in reduced availability of ADS Stages 1, 2, and 3 during vacuum refill operation; however, this condition exists for only a small amount of time. Thus the probability of an initiating event during this period is low.

The AP1000 low power and shutdown PRA model considers depressurization from ADS Stages 1, 2, and 3 in parallel with depressurization from ADS stage 4. Due to the redundancy in ADS stage 4, the decrease in ability to depressurize without ADS Stages 1, 2, and 3 available in this scenario is very small. There is no significant impact to the PRA. In addition, the changes have no significant impact on the design basis capability of the plant to mitigate the consequences of an event during vacuum refill operations.

During shutdown conditions, vacuum refill operations are conducted following the completion of reduced RCS inventory (mid-loop) conditions and steam generator tube inspections. There are two basic categories of shutdown initiating events considered in the PRA, loss of heat removal and loss of inventory events, which can occur during refill.

The automatic design basis protection for either type of event during vacuum refill operations in Mode 5 with the RCS intact is provided by a combination of IRWST injection and ADS actuation, and both are automatically actuated during Mode 5 operations on low hot leg level, independent of whether vacuum refill is in operation or not, as shown in Items 10.c and 22.c in Table 3.3.2-1 of Technical Specification 3.3.2.

As discussed in the Technical Specifications Bases for LCOs 3.0.8, 3.5.7, and 3.4.13 of DCD Chapter 16, these two passive safeguards subsystems are required for shutdown accident mitigation and must be operable in the event of an event during any shutdown condition in Modes 5 and 6, with or without vacuum refill operations.

During vacuum refill conditions, active decay heat removal is provided by the normal residual heat removal system (RNS). While subcooled reactor coolant is typically maintained with shutdown cooling in operation during vacuum refill, as discussed in DCD 5.4.7.2.1, the RNS is designed to operate during saturation conditions and the system is relatively simple to recover following a sustained loss of decay heat removal (i.e., recovery of electrical power or inventory following initiation of an event) to mitigate an event.

The saturated fluid conditions that can result as the RCS begins to heat up following a loss of shutdown cooling or RCS inventory, with or without vacuum refill operations in Mode 5, also have no impact on the automatic design basis protection provided by the IRWST injection and ADS venting.

# AP1000 TECHNICAL REPORT REVIEW

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Therefore, the plant mitigation response modeled in the PRA adequately addresses events that can occur during vacuum refill operations and vacuum refill operations have no significant impact on the PRA.

### References:

1. APP-PRA-GER-001 (TR135), Revision 0, "AP1000 Design Change Proposal Review for PRA and Severe Accident Impact"),
2. APP-PRA-GER-002, Revision 0, "AP1000 Design Change Proposal Review for PRA and Severe Accident Impact - Supplemental Document."
3. APP-GW-GEE-101, Revision 2, "Design Changes for Vacuum Refill Operation."

### Design Control Document (DCD) Revision:

None

### PRA Revision:

None

### Technical Report (TR) Revision:

None.

The addition of DCPs to TR135 going forward will include documentation of the review to identify and briefly describe each DCP incorporated in the amended design and provides the rationale to determine impact on the plant risk and changes to the PRA or other risk studies using a revised process described above.