December 30, 2008

Mr. Rob Sisk
Manager AP1000 Licensing and Customer Interface
Westinghouse Nuclear Power Plants
Energy Center
4350 Northern Pike
Monroeville, PA 15146

SUBJECT: SUMMARY OF THE OCTOBER 20 – 24, 2008, ON–SITE REVIEW OF AP1000 PIPING AND SUPPORT DESIGN

Dear Mr. Sisk:

During October 20-24, 2008, the NRC staff performed an on-site review of AP1000 American Society of Mechanical Engineers (ASME) Class 1 piping and support design with the intent to resolve piping design acceptance criteria (DAC) for ASME Class I piping as requested by Westinghouse in letter dated February 8, 2008. During this review, the staff found that Westinghouse had not completed risk significant ASME Class 1 piping analysis packages. The summary of the on-site review is found in Enclosure 1.

Based on the level of completion of the piping design, the staff cannot resolve the DAC at this time. In the letter dated November 20, 2008, Westinghouse provided a revised schedule for completing the risk significant piping analysis. The staff expects Westinghouse to inform the NRC upon completion of the AP1000 Class 1, 2, and 3 piping analysis packages. At that time, the NRC staff will promptly schedule another on-site review for Class 1, 2, and 3 risk significant piping analysis in support of resolving the piping DAC.

If you have any questions regarding this matter, I may be reached at 301-415-5848.

Sincerely,

/RA/

William C. Gleaves, Sr. Project Manager
AP1000 Projects Branch 2
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-006

Enclosure:
As stated

cc w/encl: See next page

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SUMMARY OF THE OCTOBER 20 – 24, 2008, ON–SITE REVIEW OF AP1000 PIPING AND SUPPORT DESIGN

During October 20-24, 2008, the NRC staff performed an on-site review of AP1000 ASME Class 1 piping and support design with the intent to resolve piping design acceptance criteria (DAC) for ASME Class I piping as requested by Westinghouse in letter dated February 8, 2008. During this review, the staff found that Westinghouse had not completed risk significant ASME Class 1 piping analysis packages. The status provided by the applicant during the review is listed in Attachment A and the documents reviewed by the staff are listed in Attachment B. On the basis that the risk significant pipe analyses had not been completed, the staff cannot resolve piping DAC at this time.

The staff reviewed applicant's design basis documents, as listed in the Attachment B, to confirm the applicant's design is consistent with the method described in AP1000 design control document (DCD) for piping and support design. The staff reviewed the applicant's surge line piping analysis to confirm that the applicant included the effect of thermal stratification in its calculation notes to comply with the description in Subsection 3.9.1.1 of the DCD. The staff reviewed the seismic analysis and found that the amplified response spectra at the reactor coolant loop (RCL) connection point to the surge line pipe was used in the seismic analysis which was consistent with the description in Subsection 3.7.3.8.2 of the DCD. The staff reviewed the surge line piping computer model and concluded that the surge line piping computer model included the effect of piping support mass and met the description in Subsection 3.7.3.8 of DCD.

During the review of the piping analysis package, the staff noted that the RCL analysis which decoupled the surge line (SL) from the RCL piping did not meet the decoupling criteria as stated in DCD Subsection 3.7.3.8.1. Subsection 3.7.3.8.1 stated, "The supported piping system may be excluded from the analysis of the supporting piping system when the ratio of the supported piping to supporting piping moment of inertia is less than or equal to 0.04." The ratio of the SL pipe (18 inch) to RCL pipe (31 inch) moment of inertia exceeds 0.04. Therefore, the staff determined that SL should not have been excluded from the analysis of the RCL piping system. The staff issued a request for additional information (RAI) to have Westinghouse address this issue.

The staff reviewed the applicant's fatigue evaluation calculation and noted that the ASME Class 1 piping fatigue analyses were evaluated using the WESTEMS computer code. However, the staff found that the only code listed in the DCD for fatigue evaluation was a code called FATCON. The staff issued an RAI requesting Westinghouse to modify the AP1000 DCD to reflect that WESTEMS was generally used for AP1000 fatigue evaluation and ready for staff review.

The staff reviewed the pipe support calculation Support 11R2010, the support design specification, and the pipe support criteria guidance. The support design specification recommended that seismic load due to the mass of the support and any insulation weight be evaluated by using the equivalent static seismic load for the direction of excitation. The staff confirmed that the applicant addressed the seismic self-excitation of the pipe support in its calculation note and that the method met the intent described in Subsection 3.7.3.5.1 of the DCD. The staff also reviewed the friction forces induced by the pipe on the support and concluded that the applicant's calculation met the description in Subsection 3.9.3.4 of the DCD. The staff also confirmed that the minimum pipe support design stiffness of $200EI/L^3$ met the industrial acceptance criteria. The staff reviewed the design loading combinations for the

support and confirmed that the design loading combinations were performed as stated in Table 3.9-8 of the DCD. In addition, this calculation also applied an initial design phase increase factor of 1.2 for support design load. Therefore, the staff found that the applicant's pipe support design method was consistent with the method described in the DCD.

Based on the level of completion of the piping design, the staff cannot resolve the DAC at this time. In the letter dated November 20, 2008, Westinghouse provided a revised schedule for completing the risk significant piping analysis. The staff expects Westinghouse to inform the NRC upon completion of the AP1000 Class 1, 2, and 3 piping analysis packages. At that time, the NRC staff will promptly schedule another on-site review for Class 1, 2, and 3 risk significant piping analysis in support of resolving the piping DAC.

DESIGN REPORT SECTION	PIPE STRESS ANALYSIS REPORT	STATUS			
		PLR package		Fatigue Package	
		Complete	Results	Complete	Results
6	APP-RCS-PLR-050	Yes OPEN ITEM 144	Section 6.0	Yes OPEN ITEM 133	Section 6.0
7	APP-RNS-PLR-010	Yes OPEN ITEM 151	Section 7.0 OPEN ITEM 151	Yes OPEN ITEM 151	Section 7.0 OPEN ITEM 151
8	APP-RCS-PLR-040	Yes OPEN ITEM 74	Section 8.0	No OPEN ITEM 136	OPEN ITEM 136
9	APP-PXS-PLR-030	Yes OPEN ITEM 75	Section 9.0	No OPEN ITEM 137	OPEN ITEM 137
10	APP-RCS-PLR-030	Yes OPEN ITEM 76, 124, 125	Section 10.0	Yes OPEN ITEM 160	Section 10.0
11	APP-RCS-PLR-010	No	In process	No	In process
12	APP-PXS-PLR-040	Yes OPEN ITEM 78	Section 12.0	No OPEN ITEM 161	OPEN ITEM 161
13	APP-PXS-PLR-050	Yes OPEN ITEM 79	Section 13.0	Yes OPEN ITEM 162	Section 13.0
	APP-PXS-PLR-060	Yes OPEN ITEM 80	Section 13.0	Yes OPEN ITEM 162	Section 13.0
14	APP-PXS-PLR-010	Yes OPEN ITEM 152	OPEN ITEM 152	Yes OPEN ITEM 152	OPEN ITEM 152
14	APP-PXS-PLR-020	Yes OPEN ITEM 163	In process	No OPEN ITEM 163	In process
15	APP-RCS-PLR-020	No	In process	No	In process
16	APP-RCS-PLR-230	No	In process	No	In process

Attachment A

APP-PL02-Z0-101, “AP1000 Class 1 Piping and Non-Class 1 extensions Design Specification”, Revision B.

APP-PH-02-Z0-001, “AP1000 ASME Class 1, 2, 3 and Seismic Category II piping Supports/Tube Supports Design Specification”, Revision A, 4/25/08.

APP-GW-P1-007, “AP1000 Pipe Support Criteria Guidance“, Revision 1.

APP-RCS-M3C-052, “RCS Process Flow Information”, Revision 1, October 10, 2008.

APP-RCS-PLR-040, “Piping Analysis Report for Pressurizer Surge Line”, Revision 1, October 17, 2008.

APP-SFS-PHC-11R2010, “Pipe Support Calculation note for 11R2010”, Revision A.

APP-RCS-PLC-060, “AP1000 ADS4-East piping Component Fatigue Evaluation”, Revision A, October 16, 2008.

APP-GW-P1-020 RB Rev B, “AP1000 ASME Class 1, 2, 3 and B31.1 Piping Analysis Guidelines.”

APP-GW-PLR-002 RD Rev D, “AP1000 ASME Class 2, 3 and B31.1 Piping Report Template.”

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