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Your ref: Project Number 740
Our ref: DCP/NRC2059

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Subject: AP1000 Design Specification Amendment Piping Licensing Proposal

Westinghouse has had several discussions with the NRC related to the AP1000 piping design, piping design acceptance criteria (DAC), and piping related COL Information Items. In Westinghouse Letter DCP/NRC11979, dated August 21, 2007 Westinghouse proposed resolving questions about the piping review and deletion of the piping design acceptance criteria (DAC) for the AP1000 by providing sufficient piping design information for the staff to make an assessment that the AP1000 Design Certification amendment including the piping design provides reasonable assurance that the design will conform to the design bases with an adequate margin of safety. This piping design information was based on an intelligent sample of completed piping analysis packages. Based on the NRC staff response to this proposal, provided in a meeting on the piping review on October 11, 2007, Westinghouse is providing this amended proposal.

Westinghouse proposes to have one completed analysis package selected from the sample list ready for NRC audit on or after 31 March 2008. This line is identified in the Westinghouse sample list in Table 2.1.2-5. Westinghouse plans to have the analysis of six (6) additional samples packages available for NRC audit by Mid-June 2008 and the analysis of six (6) more sample package by mid-August 2008.

Westinghouse would appreciate prompt comments, adjustments or revisions to our proposal on piping review and DAC.

Very truly yours,

W. E. Cummins
Vice President
Regulatory Affairs and Standardization

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D079
NRO

00303psa.doc

/Attachment

1. Westinghouse Proposal to the NRC on Piping Review and DAC

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ATTACHMENT 1

Westinghouse Proposal to the NRC on Piping Review and DAC

Westinghouse Proposal to the NRC on Piping Review and DAC

In Westinghouse Letter DCP/NRC11979, dated August 21, 2007 Westinghouse proposed resolving questions about the piping review and deletion of the piping design acceptance criteria (DAC) for the AP1000 by providing sufficient piping design information for the staff to make an assessment that the AP1000 Design Certification amendment including the piping design provides reasonable assurance that the design will conform to the design bases with an adequate margin of safety. This piping design information was based on an intelligent sample of completed piping analysis packages. Based on the NRC staff response to this proposal, provided in a meeting on the piping review on October 11, 2007, Westinghouse is providing this amended proposal.

Westinghouse is proposing that a restructured piping DAC be included in Tier 1 of the DCD. The piping DAC would be closed by an NRC review of the piping design from a sample of the total scope of piping design activities. The sample will include analysis packages identified as risk significant by the NRC in the October 11 meeting and all of the reactor coolant system analysis packages. The sample packages are identified in tables following this proposal. For the selected packages included in the piping DAC sample, Westinghouse will make available analysis packages. In this letter Westinghouse has identified what is included in a complete analysis package for the as-designed stage of completion.

The DAC sample packages include a substantial number of analysis packages. All DAC analysis packages may not be completed during the review of the AP1000 Design Certification amendment. To address these packages Westinghouse will propose piping design ITAAC to supplement the existing as-built piping ITAAC. The piping DAC that was included in the AP1000 Design Certification (DCD Revision 15) was a listing of methodology to be used in the piping design. This listing of methodology was not formulated like the other DAC or ITAAC and was not conducive to partial closure. In Revision 16 of the DCD this piping DAC was removed by Westinghouse from the Introduction to the Design Control Document (DCD). Westinghouse is now proposing to replace the previous piping DAC with completed analysis packages and system based design ITAAC in Tier 1 of the DCD as described in the following. The proposed piping design ITAAC are expected to apply to separate systems and to be written with several subparts. Those portions of the analysis packages completed for one or more systems during the Design Certification amendment review would ultimately not require design ITAAC. Should Westinghouse complete the entire set of sample packages during the design certification review then there would be no piping design ITAAC for AP1000.

The NRC has approved the AP1000 DCD piping design methodology as part of the design certification. Remaining for the NRC is review of specifications, analyses, calculations and reports to verify that the criteria and commitments are being implemented in the AP1000 standard piping design. The activities that Westinghouse has completed and is planning to complete will provide verification that the design and analysis of the ASME piping are in compliance with DCD commitments. Review and inspection of design specifications, design reports and supporting drawings, documents, and calculations provide assurance that the design and analysis of ASME Code piping is being performed in accordance with the DCD commitments.

Piping analysis packages will be listed with the appropriate Tier 1 system design description. These analysis packages may include piping from multiple systems. The definition of the information that will be included in the piping design packages will be included in the Introduction section of Tier 1.

The information in the piping DAC sample design packages for the as-designed piping will include design specifications, stress analyses, seismic analysis, support design, applicable fatigue analysis, applicable thermal analyses, and postulated pipe break locations. The as-designed piping includes material, pipe size, layout and equipment location, and support and hanger location and design. The spectra used in the seismic analysis includes multiple soil conditions included in the extension to soil sites and the building enhancements described in Revision 16 of the AP1000 DCD. These spectra are developed in Technical Report APP-GW-S2R-010 (TR-03), Revision 1 and shown in the DCD Appendix 3G markups in Technical Report APP-GW-GLR-134 (TR-134).

The design specifications include the requirements for methods, criteria, and codes from the design control document, design transients, material requirements, seismic requirements, and other requirements. The design specifications will be complete, except for as-procured information, and include the information required for design, analysis and fabrication of the piping and include the appropriate professional engineer certification. As part of the design packages Westinghouse will prepare design reports that summarize the analysis results that meet the various stress equations in the ASME Code and the piping design specification. The design report will provide results for the highest stress location. Results at other locations will be available in the back-up calculations. The design reports will include fatigue analysis results when required by the ASME Code. As-procured information for items like valves will not be included in the design reports prepared to close the design ITAAC. Representative (bounding) information will be used for valves and other items to be procured. The P.E. stamp on the design reports generated in the near term ("as-designed" reports) will be a confirmation that the design meets the

requirements of the design specification, except that the design does not include deviations due to construction or due to as procured equipment variations.

Westinghouse proposes to have an NRC audit of one completed Class 1 piping analysis package (APP-PXS-PLR-010) by 31 March 2008. The audit will confirm our mutual understanding of the scope of review and the analysis process. Subsequent NRC audits will be scheduled as packages are available that meet the completion criteria established by the review of the initial package. Westinghouse plans to have six additional Class 1 piping analysis packages available for NRC audit by mid-June 2008 and another six by mid-August 2008. Schedules for additional NRC reviews and audits during design certification amendment review and COL application will be determined by the results of the initial review and the overall schedule for Design Certification amendment and COL reviews.

This proposal is in line with one of the options presented in the October 11, 2007 meeting. Westinghouse has proposed draft language attached as part of this proposal to support the meeting. Westinghouse will complete and submit the draft ITAAC and Tier 1 information for all affected systems for NRC review once agreement on the approach is reached. For the purposes of the piping design ITAAC we are using the list of analysis packages identified by the staff as risk significant.

Requirements for design and analyses of ASME Code Class 1, 2, and 3 piping are included in DCD Subsection 3.9.3. COL Information item 3.9-2 requiring completion of design documents for ASME Code Class 1, 2, and 3 piping and components is described in DCD Subsection 3.9.8.2. This COL Information Item will be revised to be consistent with the piping review and piping DAC restructuring. The COL item will not need to address piping design activities since these are addressed by either the piping DAC or the portions of the design that have completed the NRC review. The inclusion of a limited number of piping analysis packages in the DAC sample does not alter the design and analysis requirements included in Subsection 3.9.3 for the piping not included in the sample.

An evaluation of the dynamic effects of pipe breaks is described in DCD Subsection 3.6.2.5. COL Information item 3.6-1 associated with the pipe break hazard evaluation is described in DCD Subsection 3.6.4.1. Pipe break hazard evaluations are typically performed on an area or room basis and may include evaluations of multiple systems for an area or room. The determination of intermediate breaks for consideration in the pipe break hazard evaluation is based on stress levels and fatigue usage factors in the pipe. These intermediate break locations are identified as part of the piping analysis. Protection devices including whip restraints or jet shield identified as needed by this process are designed in support of the

pipe break hazard evaluation. The pipe break hazard evaluation is prepared on an area basis when there is a sufficient number of piping analysis packages available to complete the evaluation in several rooms.

An evaluation of the leak-before-break piping is described in DCD Subsection 3.6.3. COL Information item 3.6-2 associated with the leak-before-break piping evaluation is described in DCD Subsection 3.6.4.2. Evaluation of the stresses in the piping packages is required to complete the leak-before-break evaluation. COL Information Item 3.6-2 will be revised to be consistent with completion of piping analyses in support of leak-before-break lines.

Westinghouse requests that the NRC endorse this proposed process (assuming satisfactory audit results of completed analyses) as a means to result in a reasonable assurance conclusion for the AP1000 piping design. Westinghouse recognizes that the ultimate piping design acceptability by the NRC is achieved when the as-built piping items in the system ITAAC are satisfied.

A Tier 1 ITAAC example mark-up follows. This includes a table of the RCS analysis packages, sample ITAAC for the RCS, and the definition of complete analysis package for Chapter 1 of Tier 1.

In addition to the Tier 1 changes that follow, conforming revisions will be made to the DCD Tier 2 and to Technical Reports APP-GW-GLR-021 (TR-06), APP-GW-GLR-074 (TR-07), and APP-GW-GLR-22 (TR-08) to implement this proposal and present revised COL information items and other DCD changes. These revisions will be scheduled after the general agreement is reached on this proposal. Technical Report APP-GW-GLR-013 (TR-13) will also be revised to describe and support the changes in the ITAAC. We expect that the changes in Tier 1 and Tier 2 of the DCD will be developed in consultation with the NRC staff reviewing the piping analyses and evaluations.

Tier 1 DCD Changes

In Tier 1 Section 1.2 under Implementation of ITAAC add the following before the final paragraph.

> In systems that include ASME Code Section III piping the following words are found under Acceptance Criteria "A design report exists for the as-designed piping". When these words are used, a complete as-designed piping analysis package has been produced to support the design report. The documents, analyses, and drawing included as part of the package are listed in Table 1.2-1.

In Tier 1 add the following table to Chapter 1.

Table 1.2-1
Documents included in Piping Analysis of Sample Piping Analysis Packages.
Class 1 ASME Piping Design Specification (420A06)
Class 2/3 ASME Piping Design Specification
ASME Safety Class Pipe Support Design Specification
ASME Class 1 Piping As-Designed Design Report (summary results for selected lines)
Fatigue Analysis where required
ASME Class 2/3 Piping As-Designed Design Report (summary results for selected lines)
ASME Safety Class Pipe Support As-Designed Design Report (summary report for pipe supports in each of the defined analysis packages)
Safety Class Pipe Support Fabrication Drawing (for each pipe support in the defined analysis packages)
P&IDs and isometric drawings for the defined analysis packages
Supporting calculation notes for the piping analysis and pipe support analysis
Identification of intermediate breaks for the evaluation of pipe break hazard

Example of ITAAC Changes

Table 2.1.2-4 Inspections, Tests, Analyses, and Acceptance Criteria		
Design Commitment	**Inspections, Tests, Analyses**	**Acceptance Criteria**
1. The functional arrangement of the RCS is as described in the Design Description of this Section 2.1.2.	Inspection of the as-built system will be performed.	The as-built RCS conforms with the functional arrangement described in the Design Description of this Section 2.1.2.
2.a) The components identified in Table 2.1.2-1 as ASME Code Section III are designed and constructed in accordance with ASME Code Section III requirements.	Inspection will be conducted of the as-built components as documented in the ASME design reports.	The ASME Code Section III design reports exist for the as-built components identified in Table 2.1.2-1 as ASME Code Section III.
2.b) The piping identified in Table 2.1.2-2 as ASME Code Section III is designed and constructed in accordance with ASME Code Section III requirements.	Inspection will be conducted of the as-built components as documented in the ASME design reports.	The ASME code Section III design reports exist for the as-built piping identified in Table 2.1.2-2 as ASME Code Section III.
2.c) The piping identified in Table 2.1.2-2 as ASME Code Section III is designed and documented in accordance with ASME Code Section III requirements.	i) Inspection will be conducted of as-designed analyses as documented in design reports. ii) Inspection will be conducted of as-designed leak-before-break evaluation for the piping analysis packages containing leak-before-break lines as documented in a leak-before-break evaluation report. iii) Inspection will be conducted of the design specifications for the ASME Code Class 1, 2 and 3 lines	i) A design report exists for the as-designed piping analysis packages identified in Table 2.1.2-5 ii) An as-designed leak-before-break report exists for the leak-before break piping identified in Table 2.1.2-2 iii) Design specifications exist for the ASME Code Class 1, 2, and 3 lines.
3.a) Pressure boundary welds in components identified in Table 2.1.2-1 as ASME Code Section III meet ASME Code Section III requirements.	Inspection of the as-built pressure boundary welds will be performed in accordance with the ASME Code Section III.	A report exists and concludes that the ASME Code Section III requirements are met for non-destructive examination of pressure boundary welds.

Example of tables in Tier 1 identifying analysis packages *

Table 2.1.2-5	
Analysis Package	**Description**
APP-RCS-PLR-010	ADS Stage 1, 2, and 3 and Pressurizer Safety Valve Inlets
APP-RCS-PLR-020	Pressurizer Spray, Auxiliary Spray, CVS Letdown, CVS Charging
APP-RCS-PLR-030	ADS Stage 4 Loop 2
APP-RCS-PLR-040	Pressurizer Surge line Loop 1
APP-RCS-PLR-050	Primary Loop
APP-RCS-PLR-210	I&C Lines to Hot Leg B
APP-RCS-PLR-230	Reactor Vessel Head Vent
APP-RCS-PLR-260	I&C Lines to Hot Leg A
APP-RCS-PLR-460	Hot Leg 1A Sample Lines
APP-RCS-PLR-470	Hot Leg 1B Sample Lines
APP-RCS-PLR-480	Pressurizer Sample Lines
APP-RCS-PLR-510	I&C Lines to Pressurizer
APP-RCS-PLR-***	I&C Lines to Cold Legs
APP-RCS-PLR-210	I&C Lines to Hot Leg B

* The RCS analysis includes all lines not only the lines identified by the NRC as risk significant

"Selected Sample" Lines Divided by System

RCS			
Pipe Stress Analysis Report	Description	Diameter (in)	IN/Out*
##APP-RCS-PLR-010	ADS Stage 1, 2, and 3 and Pressurizer Safety Valve Inlets	14, 8, 6, 4, 3, 1	IN
##APP-RCS-PLR-020	Pressurizer Spray, Auxiliary Spray, CVS Letdown, CVS Charging	4, 3, 2	IN
##APP-RCS-PLR-030	ADS Stage 4 Loop 2	18, 14	IN
##APP-RCS-PLR-040	Pressurizer Surge line Loop 1	18	IN
##APP-RCS-PLR-050	Primary Loop	22, 31	IN
RCS lines Added to Complete RCS System			
##APP-RCS-PLR-230	Reactor Vessel Head Vent	1	IN
APP-RCS-PLR-210	I&C Lines to Hot Leg B	1	IN
APP-RCS-PLR-230	Reactor Vessel Head Vent	2, 1	IN
APP-RCS-PLR-260	I&C Lines to Hot Leg A	1	IN
APP-RCS-PLR-460	Hot Leg 1A Sample Lines	1, 0.25	IN
APP-RCS-PLR-470	Hot Leg 1B Sample Lines	1	IN
APP-RCS-PLR-480	Pressurizer Sample Lines	1, 0.25	IN
APP-RCS-PLR-510	I&C Lines to Pressurizer	1	IN
APP-RCS-PLR-***	I&C Lines to Cold Legs	1	IN

* Inside or Outside Containment.

PXS			
Pipe Stress Analysis Report	Description	Diameter (in)	IN/Out
#APP-PXS-PLR-010	Direct Vessel Injection, Core Makeup Tank Discharge, Normal Residual Heat Removal Discharge, In-Containment Refueling Water Storage Tank Gravity Injection, and Containment Recirculation Lines Train A	8, 6, 1	IN
##APP-PXS-PLR-020	Direct Vessel Injection, Core Makeup Tank Discharge, Normal Residual Heat Removal Discharge, In-Containment Refueling Water Storage Tank Gravity Injection, and Containment Recirculation Lines Train B	8, 6, 1	IN
##APP-PXS-PLR-030	ADS Stage 4 Loop 1 and PRHR HX Inlet Isolation	18, 14, 12	IN
##APP-PXS-PLR-040	PRHR HX Return Loop 1	14	IN
##APP-PXS-PLR-050	Core Makeup Tank Supply Train A	8, 1	IN
##APP-PXS-PLR-060	Core Makeup Tank Supply Train B	8, 1	IN
APP-PXS-PLR-620	ACC-A/B Makeup	1	IN

CCS			
Pipe Stress Analysis Report	Description	Diameter (in)	In/Out
APP-CCS-PLR-040	Component Cooling from Penetration C01 IRC	10	IN
APP-CCS-PLR-050	Component Cooling from Penetration C02 IRC	10, 1	IN
APP-CCS-PLR-810	Component Cooling from Penetration C01 ORC	10, 1	OUT
APP-CCS-PLR-820	Component Cooling from Penetration C02 ORC	10	OUT

CVS			
Pipe Stress Analysis Report	Description	Diameter (in)	In/Out
APP-CVS-PLR-090	CVS Makeup from Penetration C03 IRC	3, 1	IN
APP-CVS-PLR-100	CVS Letdown from Penetration C02 IRC	2	IN
APP-CVS-PLR-530	CVS Makeup from Penetration C03 ORC	3	OUT

RNS			
Pipe Stress Analysis Report	Description	Diameter (in)	In/Out
##APP-RNS-PLR-010	Normal Residual Heat Removal Suction Loop 2	10, 3, 1	IN
APP-RNS-PLR-100	From Spent Fuel to RNS and PCCWST Drain	8, 2, 1	OUT
APP-RNS-PLR-170	Normal RHR to Heat Exchangers and Pumps from Containment Penetrations C01 and C02	10, 8, 6, 4, 3, 1	OUT

SFS			
Pipe Stress Analysis Report	Description	Diameter (in)	In/Out
APP-SFS-PLR-350	Spent Fuel Cooling Module R3-65	6, 4, 2, 1	OUT
APP-SFS-PLR-600	SFS from Penetration C01	4	IN

SGS			
Pipe Stress Analysis Report	Description	Diameter (in)	In/Out
APP-SGS-PLR-010	Feedwater to SG 01	20, 1	IN
APP-SGS-PLR-020	Feedwater to SG 02	20, 1	IN
APP-SGS-PLR-030	Main Steam to SG 01	38, 24, 12, 10, 8, 6, 3, 2, 1	IN
APP-SGS-PLR-040	Main Steam to SG 02	38, 138, 24, 12, 10, 8, 6, 3, 2, 1	IN
APP-SGS-PLR-070	SG 01 Blowdown to Penetration C03A	4, 1	IN
APP-SGS-PLR-080	SG 02 Blowdown to Penetration C03B	4, 1	IN
APP-SGS-PLR-110	SG 01 Startup Feed Water to Penetration C05A	6	OUT
APP-SGS-PLR-120	SG 02 Startup Feed Water to Penetration C05B	6	OUT
APP-SGS-PLR-310	SG 01 Startup Feed Water from Penetration C05A	6	IN
APP-SGS-PLR-320	SG 02 Startup Feed Water from Penetration C05B	6	IN

VBS			
Pipe Stress Analysis Report	Description	Diameter (in)	In/Out
APP-VBS-PLR-***	Nonradioactive Vent Return from Main Control Room	28, 1	OUT
APP-VBS-PLR-***	Nonradioactive Vent Supply to Main Control Room	28, 16, 1	OUT

VWS			
Pipe Stress Analysis Report	Description	Diameter (in)	In/Out
APP-VWS-PLR-500	VWS Supply from Containment Penetration C02	8, 1	IN
APP-VWS-PLR-530	VWS Return to Containment Penetration C01	8	IN
APP-VWS-PLR-910	VWS Supply to Containment Penetration C02	8	OUT
APP-VWS-PLR-920	VWS Return from Containment Penetration C01	8, 1	OUT

PCS			
Pipe Stress Analysis Report	Description	Diameter (in)	In/Out
APP-PCS-PLR-100	PCS Recirculation, DWS Supply, and FPS Supply	6, 4, 3, 2, 1	OUT
APP-PCS-PLR-***	Recirculation Line Embedded Pipe	4	OUT

Defines the Class 1 DVI-A piping report that will be ready for NRC audit by 31 March 2008.

Define the twelve Class 1 piping reports that plan on being ready for NRC audit (6) mid-June 2000 and (6) mid-August 2008.