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Your ref: Project Number 740
Our ref: DCP/NRC1829

February 12, 2007

Subject: AP1000 COL Standard Technical Report Submittal

In support of Combined License application pre-application activities, Westinghouse is submitting Revision 0 of AP1000 Standard Combined License Technical Report Number 13. This report completes and documents, on a generic basis, activities required for partial closure of COL Information Item 3.9-2 in the AP1000 Design Control Document. Changes to the Design Control Document identified in Technical Report Number 13 are intended to be incorporated into FSARs referencing the AP1000 design certification or incorporated into the design certification using supplemental rulemaking if Part 52 is revised to permit revision of the design certification. This report is submitted as part of the NuStart Bellefonte COL Project (NRC Project Number 740). The information included in this report is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification.

The purpose for submittal of this report was explained in a March 8, 2006 letter from NuStart to the U.S. Nuclear Regulatory Commission.

Pursuant to 10 CFR 50.30(b), APP-GW-GLR-013, Revision 0, "Safety Class Piping Design Specifications and Design Reports Summary," Technical Report Number 13, is submitted as Enclosure 1 under the attached Oath of Affirmation.

It is expected that when the NRC review of Technical Report Number 13 is complete, COL Information Item 3.9-2 will be considered partially complete for COL applicants referencing the AP1000 Design Certification.

This report also documents the completion of activities that support completion of the Piping Design Acceptance Criteria (DAC). The report includes the removal of the Piping DAC from the Introduction of the Design Control Document.

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Questions or requests for additional information related to the content and preparation of this report 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. Sterdis, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Attachment

1. "Oath of Affirmation," dated February 9, 2007

/Enclosure

1. APP-GW-GLR-013, Revision 0, "Safety Class Piping Design Specifications and Design Reports Summary," Technical Report Number 13, dated February 2007.

cc:	S. Bloom	-	U.S. NRC	1E	1A
	S. Coffin	-	U.S. NRC	1E	1A
	G. Curtis	-	TVA	1E	1A
	P. Grendys	-	Westinghouse	1E	1A
	P. Hastings	-	Duke Power	1E	1A
	C. Ionescu	-	Progress Energy	1E	1A
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	A. Monroe	-	SCANA	1E	1A
	M. Moran	-	Florida Power & Light	1E	1A
	C. Pierce	-	Southern Company	1E	1A
	E. Schmiech	-	Westinghouse	1E	1A
	G. Zinke	-	NuStart/Entergy	1E	1A

ATTACHMENT 1

"Oath of Affirmation"

ATTACHMENT 1

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of:	)
NuStart Bellefonte COL Project	)
NRC Project Number 740	)

APPLICATION FOR REVIEW OF
"AP1000 GENERAL COMBINED LICENSE INFORMATION"
FOR COL APPLICATION PRE-APPLICATION REVIEW

W. E. Cummins, being duly sworn, states that he is Vice President, Regulatory Affairs & Standardization, for Westinghouse Electric Company; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission this document; that all statements made and matters set forth therein are true and correct to the best of his knowledge, information and belief.

W. E. Cummins
Vice President
Regulatory Affairs & Standardization

Subscribed and sworn to
before me this 12th day
of February 2007.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Debra McCarthy, Notary Public
Monroeville Boro, Allegheny County
My Commission Expires Aug. 31, 2009
Member, Pennsylvania Association of Notaries

Debra McCarthy
Notary Public

ENCLOSURE 1

APP-GW-GLR-013, Revision 0

Safety Class Piping Design Specifications and Design Reports Summary

Technical Report Number 13

F-AP-3.2-1 Rev. 0

AP1000 DOCUMENT COVER SHEET

TDC: _____ Permanent File: _____ APY: _____

RFS#: _____ RFS ITEM #: _____

AP1000 DOCUMENT NO.	REVISION NO.		ASSIGNED TO
APP-GW-GLR-013	0	Page 1 of 7	W-Sterdis

ALTERNATE DOCUMENT NUMBER: WORK BREAKDOWN #:

ORIGINATING ORGANIZATION: Westinghouse

TITLE: **AP1000 Standard Combined License Technical Report**
Safety Class Piping Design Specifications and Design Reports Summary

ATTACHMENTS:	DCP #/REV. INCORPORATED IN THIS DOCUMENT REVISION:
None	
CALCULATION/ANALYSIS REFERENCE: N/A	

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APP-GW-GLR-013.doc	Microsoft Word	AP1000 Technical Report APP-GW-GLR-013

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Class 3 Documents being transmitted to the NRC require the following two review signatures in lieu of a Form 36.

LEGAL REVIEW Eric S. Gillen	SIGNATURE/DATE 2/9/07
PATENT REVIEW M. CORLETTI	SIGNATURE/DATE 2/9/07

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REVIEWERS Philip J. Kotwicki	SIGNATURE/DATE PJ Kotwicki 2/8/2007

VERIFIER Philip J. Kotwicki	SIGNATURE/DATE PJ Kotwicki 2/8/2007	VERIFICATION METHOD Independent Review
AP1000 RESPONSIBLE MANAGER Lee Tunon-Sanjur	SIGNATURE* L. Tunon-Sanjur	APPROVAL DATE 2/8/2007

* Approval of the responsible manager signifies that document is complete, all required reviews are complete, electronic file is attached and document is released for use.

Westinghouse Non-Proprietary Class 3

APP-GW-GLR-013
Revision 0

February 2007

AP1000 Standard Combined License Technical Report

Safety Class Piping Design Specifications and Design Reports Summary

Revision 0

Westinghouse Electric Company LLC
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INTRODUCTION

The purpose of this report is to provide information to facilitate partial closure of Combined Operating License (COL) Information Item 3.9-2. A representative and significant subset of the safety class piping design reports and associated design specifications, sufficient to establish the AP1000 licensing basis, are available for NRC audit.

The completion of the safety class piping design specifications and design reports for audit is identified as COL Information Item 3.9-2 in the AP1000 Design Control Document (DCD, Reference 1) Subsection 3.9.8.2 as endorsed by NUREG-1793, the AP1000 Final Safety Evaluation Report (FSER, Reference 2) and is to be completed by the Combined License applicant.

The COL item from the DCD pertinent to the safety class piping reads as follows:

> Combined License applicants referencing the AP1000 design will have available for NRC audit the design specifications and design reports prepared for ASME Section III components. [*The design report for the ASME Class 1, 2, and 3 piping will include the reconciliation of the as-built piping as outlined in subsection 3.9.3. This reconciliation includes verification of the thermal cycling and stratification loadings considered in the stress analysis discussed in subsection 3.9.3.1.2.*]

Reference 3 included a statement to address the COL information item above that reads:

> "The final design reports including the reconciliation of the as-built piping are completed by the COL holder after the construction of the piping systems and prior to fuel load."

There are several ASME Section III safety class piping systems. The design reports and design specification for several analysis packages are being made available for audit. These safety class packages are a sufficient subset to establish the licensing basis. The final as-built design reports will be completed by the COL holder prior to fuel load and will represent the as-built configuration. Because final design reports, including reconciliation of the as-built piping will be completed and available for NRC inspection (ITAAC) prior to fuel load, the completion of the safety class piping analysis identified in Table 2 provides the basis for NRC closure of the audit portion of this COL Information Item. The review of these packages also provides the basis for the removal of the piping design acceptance criteria (DAC) from the Design Control Document.

With the completion of the audit of the design specifications and design reports that are outlined in this report, the NRC should consider the piping design portion of COL Information Item 3.9-2 to be closed relative to the safety class piping systems, and the design applicable to all COL applications referencing the AP1000 design certification. Of course, the requirement for the COL holder to provide the reconciliation of as-built ASME Class 1, 2 and 3 piping remains.

TECHNICAL BACKGROUND

The ASME Section III Class 1 piping in the AP1000 design includes portions of the reactor coolant system (RCS), chemical and volume control system (CVS), normal residual heat removal system (RNS) and passive core cooling system (PXS), as shown in Table 1. The ASME Section III Classes 2 and 3 piping in the AP1000 design includes the additional systems shown in Table 1.

The safety class piping is considered to be AP1000 Equipment Class A, B and C, which is designed to meet seismic Category I requirements and is analyzed to meet the applicable criteria of the ASME Boiler and Pressure Vessel Code, Section III, 1989 Edition through the 1989 Addenda. The criteria of Subsections NB, NC and ND of the Code are used for the piping verification.

Detailed stress analyses are performed for the safety class piping. The results of the analyses show compliance with the structural requirements of the design specifications and the allowable stresses as given in the appropriate ASME Code subsections. The analytical work documented in the design reports is sufficient to conclude that the final margins of safety will comply with the applicable requirements of the ASME Code, as well as the additional structural requirements of the design specifications. A compilation of safety class analyses that have been issued to date is provided in Table 2, and the current analysis status is provided in Table 3. The results of the analyses showing compliance with the structural requirements of the design specifications demonstrates that the commitments in the piping design acceptance criteria are satisfied. Removal of the piping DAC from the DCD will not alter the requirements in the design specifications and will not alter the Tier 2* information on piping design requirements and criteria in the DCD.

The final, complete ASME Code stress reports will be provided to the NRC for audit as required by Tier 1 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) item 2b in Table 2.1.2-4, after the fabrication and installation of the piping is completed. ITAAC Design Commitment 2b states "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 acceptance criteria states "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."

REGULATORY IMPACT

The completion of ASME Section III safety class piping design specifications and design reports for audit is discussed in Subsections 3.9 and 3.12 of NUREG-1793 (Reference 2). COL Action Item 3.9.2.4-1 notes that the COL applicant will complete the final stress analysis of the ASME components and piping systems as part of the COL application, including the evaluation of thermal stratification, cycling and striping (TASCS) loadings, and additional calculations, if necessary, will be performed as part of the COL application. The piping DAC is also discussed in FSER Section 3.12. The completion of the safety class piping design specification and design reports for audit and removal of the piping DAC does not alter the conclusions in the Reference 2 FSER.

Completing the safety class piping design specifications and design reports has no effect on design function. Completing the safety class piping design specifications and design reports has no effect on analysis or analysis method. Completing the safety class piping design specifications and design reports has no effect on procedures that control how DCD-described SSC design functions are performed or controlled. Completing the safety class piping design specifications and design reports has no effect on Tier 1 information.

Completing the safety class piping design specifications and design reports does not require changes to the evaluation of the response to postulated accident conditions. Completing the safety class piping design specifications and design reports does not require changes to the analysis of safety related components. Completing the safety class piping design specifications and design reports does not require an additional test or experiment or changes to testing. Completing the safety class piping design specifications and design reports does not affect resolution of a severe accident issue and does not require a license amendment based on the criteria of VIII.B.5.c of Appendix D to 10 CFR Part 52.

Completing the safety class piping design specifications and design reports will not alter barriers or alarms that control access to protected areas of the plant. Completing the safety class piping design specifications and design reports will not alter requirements for security personnel. Therefore, the proposed change does not have an adverse impact on the security assessment of the AP1000.

DCD MARK-UP

Reference 3, which amplifies the COL information item to indicate that the final design reports including the reconciliation of the as-built piping are completed by the COL holder after the construction of the piping systems and prior to fuel load. No DCD Tier 2 changes result from the completion of the safety class piping design specifications and design report. Changes to the DCD to address completion of the COL information item will be presented in a separate technical report, which will document completion of the design specifications and design reports for additional components.

The piping DAC is itemized in the introduction of the DCD. The changes to the last Page of Table 1-1 in the DCD Introduction to support removal of the DAC are as follows:

Item	Expiration at First Full Power	Tier 2 Reference
WCAP-14651, "Integration of Human Reliability Analysis with Human Factors Engineering Design Implementation Plan," Rev 2 WCAP-15860, "Programmatic Level Description of the AP1000 Human Factors Verification and Validation Plan," Rev 2 WCAP-14695, "Description of the Westinghouse Operator Decision Making Model and Function Based Task Analysis Methodology," Rev 0 10 CFR 50.34(f)(2)(iv) NUREG-0737, Supplement 1, "Requirements for Emergency Response Capability" NUREG-0711, "Human Factors Engineering Program Review Model," July 1994 NUREG-1342, "A Status Report Regarding Industry Implementation of Safety Parameter Display Systems" WCAP-14396, "Man-in-the-Loop Test Plan Description," Rev 3	No	18.8.6
Human Performance Issues to be Addressed by HSI Design	No	Table 18.8-1
Human Factors Engineering Verification and Validation WCAP-15860, "Programmatic Level Description of the AP1000 Human Factors Verification and Validation Plan," Rev 2	No	18.11.2
Inventory of Displays, Alarms, and Controls	No	18.12.1
Implementation Process for Identification of Critical PRA Operator Actions WCAP-14651, "Integration of Human Reliability Analysis with Human Factors Engineering Design Implementation Plan," Rev 2	No	18.12.2
Remote Shutdown Workstation Displays, Alarms, and Controls	No	18.12.3
WCAP-14651, "Integration of Human Reliability Analysis with Human Factors Engineering Design Implementation Plan," Rev 2	No	18.12.5
Piping Design Analysis Criteria (DAC)	~~Yes~~ Completed	~~See DCD Intro, Table 1-2~~

Delete Table 1-2 of the DCD Introduction as follows:

Table 1-2
Piping Design Acceptance Criteria

Completed

~~Commitment~~	~~Tier 2 Reference~~
~~ASME Code and Code Cases for AP1000 piping and pipe support design~~	~~Table 3.9-9, Table 3.9-10, 5.2.1.1, 5.2.1.2, Table 5.2-3~~
~~Analysis Methods; experimental stress analysis, independent support motion, inelastic analysis, non-seismic/seismic interaction, buried piping~~	~~3.7.3.9, 3.7.3.12, 3.7.3.13, 3.9.1.3, 3.9.3.1.5~~
~~Piping Modeling; piping benchmark program, decoupling criteria~~	~~3.6.2.1.1.1, 3.6.2.1.1.2, 3.6.2.1.1.3, 3.7.3.8.2.1, 3.9.1.2~~
~~Pipe stress analysis criteria; loading and load combinations, damping values, combination of modal responses, high frequency modes, thermal oscillations in piping connected to the reactor coolant system, thermal stratification, safety-related valve design, installation and testing, functional capability, combination of inertial and seismic motion effects, welded attachments, modal damping for composite structures, minimum temperature for thermal analysis~~	~~3.6.2.2, 3.6.3.3, 3.7.2.14, 3.7.3.2, 3.7.3.7, 3.7.3.8.2.1, 3.7.3.9, Table 3.7.1-1, 3.9.3.1.2, 3.9.3.1.5, 3.9.3.3, Table 3.9-5, Table 3.9-6, Table 3.9-7, Table 3.9-8, Table 3.9-9, Table 3.9-10, Table 3.9-11~~
~~Pipe support criteria; applicable codes, jurisdictional boundaries, pipe support baseplate and anchor bolt design, use of energy absorbers and limit stops, pipe support stiffnesses, seismic self-weight excitation, design of supplementary steel, considerations of friction forces, pipe support gaps and clearances, instrument line support criteria~~	~~3.9.1.2, 3.9.3.4, 3.9.3.5~~
~~Equivalent Static Load Method of Analysis~~	~~3.7.3.5, 3.7.3.5.1, 3.7.3.5.2~~
~~Three Components of Earthquake Motion~~	~~3.7.3.6~~
~~Left-Out-Force Method Used in PIPESTRESS Program~~	~~3.7.3.7.1.1~~
~~SRP 3.7.2 Method for High Frequency Modes~~	~~3.7.3.7.1.2~~
~~Combination of Low Frequency Modes~~	~~3.7.3.7.2~~
~~Modeling Methods and Analytical Procedures for Piping Systems~~	~~3.7.3.8, 3.7.3.8.1, 3.7.3.8.2.2, 3.7.3.8.3, 3.7.3.8.4~~
~~Seismic Anchor Motions~~	~~3.7.3.9~~
~~Methods Used to Account for Torsional Effects of Eccentric Masses~~	~~3.7.3.11~~
~~Design Methods of Piping to Prevent Adverse Spatial Interactions~~	~~3.7.3.13.4, 3.7.3.13.4.1, 3.7.3.13.4.2, 3.7.3.13.4.3~~
~~Analysis Procedure for Damping~~	~~3.7.3.15~~
~~Time History Analysis of Piping Systems~~	~~3.7.3.17~~
~~Design Transients~~ ~~Use of NRC Bulletins 88-08 and 88-11~~	~~3.9.1.1~~

Table 1-2 (Cont.)
Piping Design Acceptance Criteria

Completed

~~Commitment~~	~~Tier 2 Reference~~
~~Loads for Class 1 Components and Core/Component Supports~~	~~3.9.3.1.2~~
~~Use of Square-Root-Sum-of-the-Squares Method for SSE plus Pipe Rupture~~	~~3.9.3.1.3~~
~~Analysis of Reactor Coolant Loop Piping~~	~~3.9.3.1.4~~
~~ASME Classes 1, 2, and 3 Piping~~ ~~Use of ASME Code, Section III~~	~~3.9.3.1.5~~
~~Design of Spring-Loaded Safety Valves~~	~~3.9.3.3.1~~
~~Design and Analysis Requirement for Open and Closed Discharge Systems~~	~~3.9.3.3.3~~
~~Component and Piping Supports for Dynamic Loading~~	~~3.9.3.4~~
~~Class 2 and 3 Component Supports~~ ~~Use of ASME Section III~~	~~3.9.3.4.2~~
~~Piping System Seismic Stress Analysis~~	~~3.9.3.4.3~~
~~Design Report for ASME Class 1, 2, and 3 Piping~~	~~3.9.8.2~~
~~Integrity of Nonsafety-Related CVS Piping Inside Containment~~ ~~Compliance with 10 CFR 50.55a and ASME B31.1 Code~~	~~5.2.1.1~~

Table 1: AP1000 Safety Class Systems and ASME Code Classification

System Description	System Designator	Class 1	Class 2	Class 3
Compressed and Instrument Air System	CAS		X	X
Component Cooling Water System	CCS		X	
Chemical and Volume Control System	CVS	X	X	X
Demineralized Water Transfer and Storage System	DWS		X	
Fire Protection System	FPS		X	
Passive Containment Cooling System	PCS			X
Primary Sampling System	PSS		X	X
Potable Water System	PWS		X	
Passive Core Cooling System	PXS	X	X	X
Reactor Coolant System	RCS	X	X	X
Normal Residual Heat Removal System	RNS	X	X	X
Spent Fuel Pool Cooling System	SFS		X	X
Steam Generator System	SGS		X	X
Main Control Room Emergency Habitability System	VES			X
Containment Air Filtration System	VFS		X	X
Central Chilled Water System	VWS		X	
Liquid Radwaste System	WLS		X	X

Table 2: AP1000 Analyses Issued (as of February 2007)

Analysis Package Description	System Designator	Analysis Report	Class
Direct Vessel Injection Line A	PXS	APP-PXS-PLR-010	1
Direct Vessel Injection Line B	PXS	APP-PXS-PLR-020	1
ADS 4th Stage West and PRHR Supply	PXS	APP-PXS-PLR-030	1
Passive RHR Return Line	PXS	APP-PXS-PLR-040	1
CMT 2A Supply Line	PXS	APP-PXS-PLR-050	1
CMT 2B Supply Line	PXS	APP-PXS-PLR-060	1
PSADS System (Lower Tier/Upper Tier)	RCS	APP-RCS-PLR-010	1
ADS 4th Stage East	RCS	APP-RCS-PLR-030	1
Pressurizer Surge Line	RCS	APP-RCS-PLR-040	1
Reactor Coolant Loop Piping	RCS	APP-RCS-PLR-050	1
Normal RHR Suction Line	RNS	APP-RNS-PLR-010	1
Spent Resin from Cont. Pen.	CVS	APP-CVS-PLR-520	2
From SCV Pen. to CVS-12A0007	CVS	APP-CVS-PLR-530	2
Hydrogen Supply from CVS-12A0022	CVS	APP-CVS-PLR-700	2
HX Inlet and Outlet between P19 & P20	RNS	APP-RNS-PLR-170	2
Main Steam Line A	SGS	APP-SGS-PLR-030	2
Main Steam Line B	SGS	APP-SGS-PLR-040	2
Blowdown Line B from Cont. Pen. to TB	SGS	APP-SGS-PLR-090	2
Blowdown Line A from Cont. Pen. to TB	SGS	APP-SGS-PLR-100	2
From SCV Pen. to VFS-12A2004	VFS	APP-VFS-PLR-010	2
From Cont. Pen. to past Valve V010	VFS	APP-VFS-PLR-030	2
From Cont. Pen. to past Valve V024	WLS	APP-WLS-PLR-520	2
Supply to Distribution Bucket (Embed)	PCS	APP-PCS-PLR-050	3
Recirculation Line inside PCS Tank	PCS	APP-PCS-PLR-060	3
Recirculation Line inside PCS Tank	PCS	APP-PCS-PLR-070	3
PCS Room 12306 (Auxiliary Building)	PCS	APP-PCS-PLR-100	3
Overflow inside PCS Tank	PCS	APP-PCS-PLR-200	3
Vent Line inside PCS Tank	PCS	APP-PCS-PLR-210	3
Room 12701 PCS Tank Vent	PCS	APP-PCS-PLR-220	3
Vent Line inside PCS Tank	PCS	APP-PCS-PLR-230	3
Room 12701 PCS Tank Vent	PCS	APP-PCS-PLR-240	3
Discharge Line inside PCS Tank	PCS	APP-PCS-PLR-250	3
Discharge Line inside PCS Tank	PCS	APP-PCS-PLR-270	3
Discharge Line inside PCS Tank	PCS	APP-PCS-PLR-290	3
Instrumentation Line	PCS	APP-PCS-PLR-300	3
Instrumentation Line	PCS	APP-PCS-PLR-310	3
Overflow Line from PCS Tank	PCS	APP-PCS-PLR-410	3
Supply to Distribution Bucket	PCS	APP-PCS-PLR-420	3
Auxiliary Supply to Distribution Bucket	PCS	APP-PCS-PLR-430	3
From RNS-12A2037 to Spent Fuel Pool	RNS	APP-RNS-PLR-100	3

Table 3: AP1000 Safety Class Systems Piping Analysis Status (as of February 2007)

Analysis Safety Class	Analyses Issued	Analyses Not Issued	% Analyses Issued
Class 1	11	12*	48%
Class 2	12	89	12%
Class 3	17	28	38%
Totals	40	129	24%

* Note: Eight of the 12 Class 1 analyses not issued are small 1-inch connections to the RCPs for temporary flushing. The 4 significant Class 1 lines that have not been issued include the pressurizer spray, reactor vessel head vent, CVS purification supply and CVS purification return lines.

REFERENCES

1. Westinghouse AP1000 document no. APP-GW-GL-700, Revision 15, "AP1000 Design Control Document."

2. NUREG-1793, September 2004, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design."

3. APP-GW-GLR-021, Revision 0, "AP1000 As-Built COL Information Items," June 2006.