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Your ref: Project Number 740
Our ref: DCP/NRC1800

November 15, 2006

Subject: AP1000 COL Standard Technical Report Submittal of APP-GW-GLN-013, Revision 0

In support of Combined License application pre-application activities Westinghouse is submitting AP1000 Standard Combined License Technical Report Number 30. This report identifies and justifies standard changes to the AP1000 Design Control Document (DCD). These changes are in DCD sections 3.5, 3.9, and 4.1 and are related to changes to the hydrostatic test pressure for the control rod drive mechanism housings. The changes to the DCD identified in Technical Report 30 are intended to be incorporated into FSARs referencing the AP1000 Design Certification or incorporated into the design certification by an amendment to 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 NRC.

Pursuant to 10 CFR 50.30(b), APP-GW-GLN-013, Revision 0, "AP1000 CRDM Design," (Technical Report Number 30), is submitted as Enclosure 1 under the attached Oath of Affirmation.

It is expected that when the NRC review of Technical Report Number 30 is complete, the changes to the DCD identified in Technical Report 30, will be considered approved generically for COL applicants referencing the AP1000 Design Certification.

Westinghouse is hereby requesting review and approval of the design changes associated with the CRDM Design completion.

Questions or requests for additional information related to content and preparation of this report should be directed to Westinghouse. Please send copies of such questions or requests for additional information 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.

D079

Very truly yours,

Monte D Bartley FOR

A. Sterdis, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Attachment

1. "Oath of Affirmation," dated November 15, 2006

/Enclosures

1. APP-GW-GLN-013, Revision 0, "AP1000 CRDM Design," Technical Report Number 30

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
	D. Lindgren	-	Westinghouse	1E	1A
	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 15th day
of November 2006.

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

Notary

ENCLOSURE 1

APP-GW-GLN-013, Revision 0

"AP1000 CRDM Design"

Technical Report 30

AP1000 DOCUMENT COVER SHEET

TDC: _____ Permanent File: _____ APY: _____

RFS#: _____ RFS ITEM #: _____

AP1000 DOCUMENT NO.	REVISION NO.		ASSIGNED TO
APP-GW-GLN-013	0	Page 1 of 9	W-A. Sterdis

ALTERNATE DOCUMENT NUMBER: WORK BREAKDOWN #:

ORIGINATING ORGANIZATION: Westinghouse Electric Company

TITLE: **AP1000 CRDM Design**

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

ELECTRONIC FILENAME	ELECTRONIC FILE FORMAT	ELECTRONIC FILE DESCRIPTION
APP-GW-GLN-013.doc	Microsoft Word	Text

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LEGAL REVIEW T.J. WHITE	SIGNATURE/DATE T.J. White	11-13-06
PATENT REVIEW M.M. Corletti	SIGNATURE/DATE M.M. Corletti	11-14-06

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REVIEWERS D. Wiseman	SIGNATURE/DATE D. A. Wiseman	11/9/06

VERIFIER D. Lindgren	SIGNATURE/DATE Donald Lindgren	VERIFICATION METHOD PAGE-BY-PAGE REVIEW
AP1000 RESPONSIBLE MANAGER K. Quinn	SIGNATURE* K. Quinn	APPROVAL DATE 11/16/06

* 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.

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The hydrostatic test pressure for the control rod drive mechanism housings is being changed from 150% of design pressure to 125% of design pressure. The applicable section of the ASME Code requires a test pressure of 125% of design pressure and is consistent with the code stress analysis.

The description of the control rod drive mechanism (CRDM) attachment to the reactor vessel head is incorrect for the CRDM configuration and attachment. The CRDM is welded to the Alloy 690 nozzle by a bi-metallic weld at the CRDM manufacturers. The latch housing with the nozzle is shipped to the head supplier where the nozzle is attached to the head by a shrink fit and partial penetration weld.

The description of the material of the gray rods is referencing the appropriate section of the design control document due to potential changes to the rodlet design as the design progresses.

I. APPLICABILITY DETERMINATION

This evaluation is prepared to document that the change described above is a departure from Tier 2 information of the AP1000 Design Control Document (DCD) that may be included in plant specific FSARs without prior NRC approval.

A.	Does the proposed change include a change to:		
	1. Tier 1 of the AP1000 Design Control Document APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare a report for NRC review of the changes)
	2. Tier 2* of the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare a report for NRC review of the changes)
	3. Technical Specification in Chapter 16 of the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare a report for NRC review of the changes)
B.	Does the proposed change involve:		
	1. Closure of a Combined License Information Item identified in the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare a COL item closure report for NRC review.)
	2. Completion of an ITAAC item identified in Tier 1 of the AP1000 Design Control Document, APP-GW-GL-700	☒ NO ☐ YES	(If YES prepare an ITAAC completion report for NRC review.)

☒ The questions above are answered no, therefore the departure from the DCD in a COL application does not require prior NRC review unless review is required by the criteria of 10 CFR Part 52 Appendix D Section VIII B.5.b. or B.5c

II. TECHNICAL DESCRIPTION AND JUSTIFICATION

The control rod drive mechanism pressure vessel consists of two housings, the drive rod housing and latch assembly housing, that are connected by a threaded, seal-welded, maintenance joint that facilitates latch assembly replacement. The pressure vessel assembly also provides mechanical support for the latch assembly, the operating coil stack assembly, and rod position indicator.

The control rod drive mechanisms are assembled by the manufacturer and hydrotested. The DCD currently states the hydrostatic test pressure will be 150% of design pressure. However, Subsection NB-6221 of ASME Section III requires a hydrotest pressure of 125% of design pressure. Also, the pressure boundary stress analysis is conducted with a hydrostatic test pressure of 125% of design. Therefore, the hydrotest pressure by the manufacturer will be changed from 150% of design pressure to 125% of design pressure.

The control rod drive mechanism latch assembly housings will be welded to the Alloy 690 nozzle with a bi-metallic weld by the manufacturer of the CRDM. The latch assembly housing with the nozzle are shipped to the head manufacturer and attached to the head by a shrink-fit and partial penetration weld. In Section 3.9.4.1.1 of the DCD, the attachment to the reactor vessel head is described as a shrink-fit and partial penetration weld of the latch assembly housing. However, the latch assembly housing will be welded to the control rod drive mechanism nozzle by a bi-metallic weld. The nozzle will then be attached to the head by a shrink-fit and partial penetration weld. Also, Section 3.5.1.2.1.1 incorrectly describes the attachment of the latch assembly housings to a head adapter. Therefore, Section 3.5.1.2.1.1 and 3.9.4.1.1 of the DCD was corrected to describe the correct fabrication sequence and the correct terminology.

Section 3.9.4.1.1 of the DCD states the rodlets are constructed of stainless steel material. Due to potential changes to the material of these rodlets as the design progresses, the description was changed to reference the section of the DCD which describes rod material.

This report covers all of the changes to the DCD necessary to incorporate the corrections to the DCD.

III. REFERENCES

1. APP-GW-GL-700, Revision 15, AP1000 Design Control Document
2. NUREG-1793, Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design, September 2004
3. ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components, 1998 Edition, 2000 Addenda

IV. DCD MARK-UP

Sections 4.5 and 4.6 of the DCD were not impacted by the changes outlined in this document.

The following mark ups of AP1000 DCD Revision 15 Tier 2 identify how COL application FSARs should be prepared to incorporate the subject changes.

- **Section 3.5.1.2.1.1, Page 3.5-8:**

  - Gross failure of a control rod drive mechanism housing, sufficient to create a missile from a piece of the housing or to allow a control rod to be ejected rapidly from the core, is not considered credible. This is because of the same reasons listed above for the reactor vessel and other components and is based on the following:

    – The control rod drive mechanisms are shop hydrotested ~~in excess of 150~~**to 125** percent of system design pressure.

    – The housings are ~~individually~~ hydrotested to 125 percent of system design pressure after they are installed on the reactor vessel **head** ~~to the head adapters~~. They are checked again during the hydrotest of the completed reactor coolant system.

    – The housings are made of Type 304 stainless steel, which exhibits excellent notch toughness.

    – Stress levels in the mechanism are not affected by system thermal transients at power or by thermal movement of the coolant loops.

    – The welds in the pressure boundary of the control rod drive mechanism meet the same design, procedure, examination, and inspection requirements as the welds on other ASME Code, Section III, Class 1 components.

    – A nonmechanistic control rod ejection is considered in the safety analyses in Chapter 15 and the design transients in subsection 3.9.1.1. The integrated head package and control rod drive mechanisms are not designed for the dynamic effects of a missile generated by a rupture of the control rod housing.

  - Valves, valve stems, nuts and bolts, and thermowells in high-energy fluid systems and missiles originating in non-high-energy fluid systems are not considered credible missiles as discussed previously in subsection 3.5.1.1.1.

- **Section 3.9.4.1.1, Page 3.9-66:**

  Control rod drive mechanisms are located on the head of the reactor vessel. They are coupled to rod cluster control assemblies (RCCAs) that have neutron absorber material over the active length of the control rods. The control rod drive mechanisms are also attached to gray rod control assemblies (GRCAs) that are used for load follow. The gray rod control assemblies are geometrically identical to the rod cluster control assemblies except that most of the rodlets are fabricated ~~of stainless steel instead of containing absorber material.~~**from a material specified in Section 4.2.2.**

- **Section 3.9.4.1.1, Page 3.9-66:**

  The pressure vessel includes a latch housing and a rod travel housing that are connected by a threaded, seal-welded, maintenance joint that facilitates removal of the latch assembly. The ~~closure at the~~ top of the rod travel housing ~~is a solid, one-piece construction providing~~**provides** seismic support by an interface with the integrated head package. The latch housing is the lower portion of the vessel and contains the latch assembly. **The latch housing is welded to the mechanism nozzle by a bi-metallic weld.** The ~~latch housing portion~~ **nozzle** of the control rod drive mechanism is attached to the vessel head by a shrink-fit and a partial penetration weld. The rod travel housing is the upper portion of the vessel and provides space for the drive rod during its upward movement as the control rods are withdrawn from the core.

- **Section 3.9.4.1.1, Page 3.9-68:**

  - The control rod drive mechanisms are hydrotested after manufacture at a minimum of ~~150~~**125** percent of system design pressure.

  - The housings are hydrotested at a minimum of 125 percent of system design pressure after installation to the reactor vessel head ~~individually~~ and during the hydro test of the completed reactor coolant system.

- **Section 3.9.4.3, Page 3.9-74:**

  Hydrostatic tests according to the requirements of the ASME Code verify the pressure boundary integrity of the pressure housing prior to operation. The ~~latch assembly housing~~ **nozzle** is ~~assembled~~ **attached** to the reactor vessel head by the ~~vessel~~ **head** supplier and is hydro tested ~~as part of the vessel hydro test~~**as required**. The rod travel housing seal weld is performed prior to final assembly following the assembly of the travel housing to the latch assembly housing. The hydrostatic test of the connection of the rod travel housing to the latch assembly is done as part of the system hydrostatic test.

- **Section 4.1.1, Page 4.1-5:**

  - *The control rod drive mechanisms are hydrotested after manufacture at a minimum of ~~150 percent~~**125 percent** of system design pressure.*

V. REGULATORY IMPACT

A. FSER IMPACT

The design of the control rod drive system is addressed in subsection 3.9.4 of the NRC Final Safety Evaluation Report (FSER, Reference 2) write-up. The changes detailed in this document do not impact the FSER.

B. SCREENING QUESTIONS (Check correct response and provide justification for that determination under each response)

1. Does the proposed change involve a change to an SSC that adversely affects a DCD described design function? ☐ YES ☒ NO

   The design function of the control rod drive mechanisms is not altered by changing the fabrication sequence or the hydrostatic test pressure.

2. Does the proposed change involve a change to a procedure that adversely affects how DCD described SSC design functions are performed or controlled? ☐ YES ☒ NO

   The change in the fabrication sequence and the hydrostatic test pressure to the ASME required pressure will not affect the reactor coolant system pressure boundary design function or how the reactor coolant system operates.

3. Does the proposed activity involve revising or replacing a DCD described evaluation methodology that is used in establishing the design bases or used in the safety analyses? ☐ YES ☒ NO

   The change in the fabrication sequence and the hydrostatic test pressure to the ASME required pressure will not change the structural analysis methodology used to ensure the integrity of the reactor coolant system boundary.

4. Does the proposed activity involve a test or experiment not described in the DCD, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the DCD? ☐ YES ☒ NO

   The change in the fabrication sequence and the hydrostatic test pressure to the ASME required pressure will not require an additional test or experiment or changes to completed testing.

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C. EVALUATION OF DEPARTURE FROM TIER 2 INFORMATION (Check correct response and provide justification for that determination under each response)

10 CFR Part 52, Appendix D, Section VIII. B.5.a. provides that an applicant for a combined licensee who references the AP1000 design certification may depart from Tier 2 information, without prior NRC approval, if it does not require a license amendment under paragraph B.5.b. The questions below address the criteria of B.5.b.

1. Does the proposed departure result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

   The changes to the fabrication sequence and the hydrostatic test pressure will not increase the frequency of occurrence of an accident because there is no significant increase in the probability of failure of the pressure boundary because the ASME Code requirements are met.

2. Does the proposed departure result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety and previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

   The hydrostatic test pressure of 125% meets the ASME code requirements and is used for current designs; therefore there is no increase in the probability of failure of the pressure boundary as a result of the change in hydrostatic test pressure and the changes in the fabrication sequence.

3. Does the proposed departure Result in more than a minimal increase in the consequences of an accident previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

   The change in the hydrostatic test pressure and fabrication sequence will have no impact on the consequences of an accident.

4. Does the proposed departure result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the plant-specific DCD? ☐ YES ☒ NO

   The change in the fabrication sequence and the hydrostatic test pressure will not impact the integrity of the reactor coolant system pressure boundary because the hydrostatic test pressure meets the ASME requirements and therefore will not increase the consequences of a malfunction of an SSC important to safety.

5. Does the proposed departure create a possibility for an accident of a different type than any evaluated previously in the plant-specific DCD? ☐ YES ☒ NO

   The change in the fabrication sequence and the hydrostatic test pressure will not impact the response of the reactor coolant system to postulated accident conditions. The changes also do not introduce any additional failure modes. Therefore, these changes will not result in an accident of a type different than what has already been evaluated in the DCD.

6. Does the proposed departure create a possibility for a malfunction of an SSC important to safety with a different result than any evaluated previously in the plant-specific DCD? ☐ YES ☒ NO

   The change to the fabrication sequence and the hydrostatic test pressure will not result in any impact to the reactor coolant pressure boundary integrity because the hydrostatic test pressure meets ASME requirements,

The change to the fabrication sequence and the hydrostatic test pressure will not result in any impact to the reactor coolant pressure boundary integrity because the hydrostatic test pressure meets ASME requirements, and therefore they will not impact a malfunction of an SSC to cause a different result than what has been previously evaluated.

7. Does the proposed departure result in a design basis limit for a fission product barrier as described in the plant-specific DCD being exceeded or altered? ☐ YES ☒ NO

   The change in the fabrication sequence and the hydrostatic test pressure will not result in any impact to the reactor coolant system pressure boundary integrity because the hydrostatic test pressure still meets the ASME requirements and thus will not result in a design basis limit for a fission product barrier being exceeded.

8. Does the proposed departure result in a departure from a method of evaluation described in the plant-specific DCD used in establishing the design bases or in the safety analyses? ☐ YES ☒ NO

   The change in the fabrication sequence and the hydrostatic test pressure will not alter the methodology used in verifying the structural integrity of the reactor coolant system pressure boundary or in the performing of the safety analyses.

☒ The answers to the evaluation questions above are "NO" and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific FSARs as provided in 10 CFR Part 52, Appendix D, Section VIII. B.5.b

☐ One or more of the answers to the evaluation questions above are "YES" and the proposed change requires NRC review.

D. IMPACT ON RESOLUTION OF A SEVERE ACCIDENT ISSUE

10 CFR Part 52, Appendix D, Section VIII. B.5.a. provides that an applicant for a combined licensee who references the AP1000 design certification may depart from Tier 2 information, without prior NRC approval, if it does not require a license amendment under paragraph B.5.c. The questions below address the criteria of B.5.c.

1. Does the proposed activity result in an impact to features that mitigate severe accidents. If the answer is Yes answer Questions 2 and 3 below. ☐ YES ☒ NO

   The change in the fabrication sequence and the hydrostatic test pressure will not have an impact on the reactor coolant system pressure boundary integrity or any features that mitigate severe accidents.

2. Is there is a substantial increase in the probability of a severe accident such that a particular severe accident previously reviewed and determined to be not credible could become credible? ☐ YES ☐ NO ☒ N/A

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3. Is there is a substantial increase in the consequences to the public of a particular severe accident previously reviewed? ☐ YES ☐ NO ☒ N/A

☒ The answers to the evaluation questions above are "NO" or are not applicable and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific FSARs as provided in 10 CFR Part 52, Appendix D, Section VIII. B.5.c

☐ One or more of the answers to the evaluation questions above are "YES" and the proposed change requires NRC review.

E. SECURITY ASSESSMENT

1. Does the proposed change have an adverse impact on the security assessment of the AP1000. ☐ YES ☒ NO

The change in the fabrication sequence and the hydrostatic test pressure will not alter barriers or alarms that control access to protected areas of the plant. The changes will not alter requirements for security personnel.