Westinghouse

Westinghouse Electric Company
Nuclear Power Plants
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

Direct tel: 412-374-6306
Direct fax: 412-374-5005
e-mail: sterdia@westinghouse.com

Your ref: Project Number 740
Our ref: DCP/NRC2011

September 28, 2007

Subject: AP1000 COL Standard Technical Report Submittal of APP-GW-GLN-108, Revision 2 (TR 108)

In support of Combined License application pre-application activities, Westinghouse is submitting Revision 2 of AP1000 Standard Combined License Technical Report Number 108. This report identifies and justifies standard changes to the AP1000 Design Control Document (DCD). The changes to the DCD identified in Technical Report 108 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 purpose of this Revision to TR108 is to provide additional technical and regulatory justification for the changes proposed within as discussed and agreed upon in a teleconference between Andrea Sterdis and John Segala on September 13, 2007. 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-108, Revision 2, "AP1000 Site Interface Temperature Limits," (Technical Report Number 108), is submitted as Enclosure 1 under the attached Oath of Affirmation. Revision 0 of this report was sent on May 24, 2007 via DCP/NRC 1896. Revision 1 was sent on July 27, 2007 via DCP/NRC 1968. It is expected that when the NRC review of Technical Report Number 108 is complete, the changes to the DCD identified in Technical Report 108 will be considered approved generically for COL applicants referencing the AP 1000 Design Certification.

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 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.

Westinghouse requests the NRC to provide a schedule for review of the technical report within two weeks of its submittal.

D063
D079
NRO

Very truly yours,

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

/Attachment

1. "Oath of Affirmation," dated September 28, 2007

/Enclosure

1. APP-GW-GLN-108, Revision 2, "AP1000 Site Interface Temperature Limits," Technical Report Number 108

cc:	D. Jaffe	-	U.S. NRC	1E	1A
	E. McKenna	-	U.S. NRC	1E	1A
	G. Curtis	-	TVA	1E	1A
	P. Hastings	-	Duke Power	1E	1A
	C. Ionescu	-	Progress Energy	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
	D. McDermott	-	Westinghouse	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 and 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.

WECummins

W. E. Cummins
Vice President
Regulatory Affairs and Standardization

Subscribed and sworn to
before me this 28th day
of September 2007.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Patricia S. Aston, Notary Public
Murrysville Boro, Westmoreland County
My Commission Expires July 11, 2011
Member, Pennsylvania Association of Notaries

Patricia S. Aston
Notary

ENCLOSURE 1

APP-GW-GLN-108, Revision 2

"AP1000 Site Interface Temperature Limits"

Technical Report Number 108

AP1000 DOCUMENT COVER SHEET

TDC: Permanent File: APY

RFS#: RFS ITEM #:

AP1000 DOCUMENT NO.	REVISION NO.		ASSIGNED TO
APP-GW-GLN-108	2	Page 1 of 19	W-Sterdis

ALTERNATE DOCUMENT NUMBER: TR 108 WORK BREAKDOWN #:

ORIGINATING ORGANIZATION: Westinghouse Electric Company

TITLE: **AP1000 Site Interface Temperature Limits**

ATTACHMENTS: N/A	DCP #/REV. INCORPORATED IN THIS DOCUMENT REVISION: APP-GW-GEE-204 Rev.1
CALCULATION/ANALYSIS REFERENCE: N/A	

ELECTRONIC FILENAME	ELECTRONIC FILE FORMAT	ELECTRONIC FILE DESCRIPTION
APP-GW-GLN-108 R1	MicrosoftWord	

☒ WESTINGHOUSE CLASS 3 (NON PROPRIETARY)

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

LEGAL REVIEW	SIGNATURE/DATE
T. J. WHITE	T. J. White 9-28-07
PATENT REVIEW	SIGNATURE/DATE
D. EKEROTH	D. E. Ekeroth 9/28/07

☐ WESTINGHOUSE PROPRIETARY CLASS 2

ORIGINATOR	SIGNATURE/DATE	
D. J. McDermott	DJ McDermott 9/28/07	
REVIEWERS	SIGNATURE/DATE	
VERIFIER	SIGNATURE/DATE	VERIFICATION METHOD
S. Sinha	S. Sinha 9/28/07	
AP1000 RESPONSIBLE MANAGER	SIGNATURE*	APPROVAL DATE
C. P. Keegan	CP Keegan	9-28-07

* 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.

APP-GW-GLN-108
Revision 2

September 2007

AP1000 Standard Combined License Technical Report

AP1000 Site Interface Temperature Limits

Westinghouse Electric Company LLC
P.O. Box 355
Pittsburgh, PA 15230-0355

1.0 INTRODUCTION

Chapter 2 of the Design Control Document (DCD) Tier 2 defines the site-related parameters for which the AP1000 plant is designed. The AP1000 is designed for wet and dry bulb air temperatures, as specified in Table 2-1. Westinghouse has modified these design parameters to better accommodate a broader range of conditions to encompass the potential sites for AP1000 plants. This report summarizes changes to the design, and includes the DCD (reference 1) mark up.

The portions of the AP1000 DCD affected are Tier 1 Table 5.0-1, Tier 2 Table 2-1 Sections 9.1.3.1.3.1, 9.1.3.1.3.2, 9.2.1.2.3.4, 9.2.2.1.2.1, 9.2.2.1.2.2, 9.2.2.1.2.3, 9.2.7.2.4, 5.4.7.1.2.1, 5.4.7.1.2.3

2.0 APPLICABILITY DETERMINATION

This evaluation is prepared to document that the change described above is a departure from Tier 1 and 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.)

3.0 TECHNICAL BACKGROUND

The most significant differences between the current design and the design incorporating a change in the site interface design temperatures are identified in the list below.

<u>DCD, Tier 1, Table 5.0-1 Site Parameters</u>
This table states that site parameters....

"Limits based on historical data excluding peaks of less than 2 hours duration
Maximum temperature of 115° dry bulb/80°F coincident wet bulb
Maximum wet bulb 81°F (noncoincident)
Minimum temperature of -40°F."

In this table, the maximum wet bulb temperature (noncoincident) is revised from 81°F to 85.5°F.

DCD, Tier 2, Table 2-1:

- Revise the maximum safety wet bulb air temperature of 81°F (noncoincident) to 85.5°F (noncoincident).
- Revise the maximum normal air temperature of 100° dry bulb/77°F coincident wet bulb to 101° dry bulb/80.1°F coincident wet bulb.
- Revise the maximum normal air temperature of 80°F wet bulb (noncoincident) to 80.1°F wet bulb (noncoincident).

Westinghouse has evaluated the proposed changes relative to the following DCD commitments

DCD Section 6.2.2, Passive Containment Cooling System

The passive containment cooling system is a safety-related system which is capable of transferring heat directly from the steel containment vessel to the environment. This transfer of heat prevents the containment from exceeding the design pressure and temperature following a postulated design basis accident, as identified in DCD Chapters 6 and 15. The containment pressure analyses are based on an ambient air temperature of 115°F dry bulb and 80°F coincident wet bulb.

Although these temperatures did not change as a result of this TR, the maximum non-coinincident safety wet bulb temperature did increase from 81°F to 85.5°F. Westinghouse performed an evaluation to confirm that with a higher non-coincident wet bulb temperature there would be no impact on the containment safety analysis. The results of the evaluation demonstrated that there was no increase in peak containment pressure.

DCD Section 5.4.7.1.2.1, Normal Residual Heat Removal System - Shutdown Heat Removal

The normal residual heat removal system removes both residual and sensible heat from the core and the reactor coolant system. It reduces the temperature of the reactor coolant system during the second phase of plant cooldown. The first phase of cooldown is accomplished by transferring heat from the reactor coolant system via the steam generators to the main steam system (MSS).
Following cooldown, the normal residual heat removal system removes heat from the core and the reactor coolant system during the plant shutdown, until the plant is started up.

The normal residual heat removal system reduces the temperature of the reactor coolant system from 350° to 125°F within 96 hours after shutdown.

The effective change to the DCD in regard to shutdown heat removal was to change from an specified assumed temperature within the text to a reference to Table 2-1 and thus a change in the design basis wet bulb temperature from 80°F to 80.1°F wet bulb. Evaluation has indicated there is sufficient margin in the system design to maintain the same criteria and design basis.

DCD Section 5.4.7.1.2.3. Normal Residual Heat Removal System - In-Containment Refueling Water Storage Tank Cooling

The normal residual heat removal system provides cooling for the in-containment refueling water storage tank during operation of the passive residual heat removal heat exchanger or during normal plant operations when required. The normal residual heat removal system limits the in-containment refueling water storage tank water temperature to less than boiling temperature during extended operation of the passive residual heat removal system and to not greater than 120°F during normal operation. The system performs this function based on a zero exceedance wet bulb temperature of 85.5°F increased from the previous zero exceedance value of 81°F.

An evaluation has indicated there is sufficient margin in the systems design for the RNS, CCS and SWS to maintain the same criteria and design basis with the increased ambient wet bulb temperature. The temperature of the refueling water storage tank will be maintained below 120 °F.

DCD Section 9.1.3.1.3.1, Spent Fuel Pool Cooling - Partial Core Shuffle

The spent fuel pool cooling system is designed to remove heat from the spent fuel pool such that the spent fuel pool water temperature will be ≤ 120°F following a partial core fuel shuffle refueling. The assumed heat load is based on the decay heat generated by the accumulated fuel assemblies stored in the fuel pool for 10 years plus 44% of a core (68 assemblies) being placed into the pool beginning at 120 hours after shutdown.

The effective change to the DCD in regard to a partial core fuel shuffle was to change from an specified assumed temperature within the text to a reference to Table 2-1 and thus a change in the design basis wet bulb temperature from 80°F to 80.1°F wet bulb. Evaluation has indicated there is sufficient margin in the system design to maintain the same criteria and design basis.

DCD Section 9.1.3.1.3.2 Spent Fuel Pool Cooling - Full Core Off-Load

The AP1000 normal refueling basis heat load is from a full core off-load. The spent fuel pool cooling system is designed to remove heat from the spent fuel pool such that the spent fuel pool water temperature will be ≤ 120°F following a full core off-load based upon a service water heat sink at a maximum normal ambient wet bulb temperature.

The assumed heat load is based on the decay heat generated by the accumulated fuel assemblies stored in the fuel pool for 10 years, plus one full core placed in the pool at 120 hours after shutdown. The time during the plant operating cycle at which the full core off-load occurs is chosen to maximize the required spent fuel pool cooling system heat load.

The spent fuel pool cooling system is assumed to function with its full set of equipment available. One train of the normal residual heat removal system is also connected to the spent fuel pool and provides cooling as described in DCD subsection 5.4.7.4.5.

The effective change to the DCD in regard to a full core off-load was to change from an specified assumed temperature within the text to a reference to Table 2-1 and thus a change in the design basis wet bulb temperature from 80°F to 80.1°F wet bulb. Evaluation has indicated there is sufficient margin in the system design to maintain the same criteria and design basis.

DCD Section 9.2.1.2.3.4, Service Water System - Plant Cooldown/Shutdown

During the plant cooldown phase in which the normal residual heat removal system has been placed in service and is providing shutdown cooling, the service water cooling tower provides cooling water at a temperature of 88.5°F or less when operating at design heat load and at an ambient wet bulb temperature of no greater than the maximum normal wet bulb temperature of 80.1°F. Two service water pumps and two cooling tower cells are normally used for plant cooldown, and the cross-connection valves between trains are normally closed. During these modes of operation the normal residual heat removal system and the component cooling water system remove sensible and decay heat from the reactor coolant system. In the event of failure of a service water system pump or cooling tower fan, the cooldown time is extended.

The effective change to the DCD in regard to a plant cooldown/shutdown was to change from an specified assumed temperature within the text to a reference to Table 2-1 and thus a change in the design basis wet bulb temperature from 80°F to 80.1°F wet bulb. Evaluation has indicated there is sufficient margin in the system design to maintain the same criteria and design basis.

DCD Section 9.2.2.1.2.1, Component Cooling Water - Normal Operation

The component cooling water system transfers heat from various plant components needed to support normal power operation with a single active component failure. The component cooling water system is designed for normal operation in accordance with the following criteria:
The design basis change for the component cooling water system and cooled components is accept a higher cooling water temperature during normal operation from the previous value of 95°F to a temperature of 99°F assuming a 0 percent exceedance ambient design wet bulb temperature of 85.5°F during normal operations and maximum normal temperature of 80.1°F during shutdown operations

An evaluation has been performed and confirms sufficient margin exists within component cooling water system and subsequently within the service water system to limit the cooling water temperature to cooled components to 99°F with an increase in the maximum safety wet bulb temperature from 81°F to 85.5°F. Further, it has been confirmed that the remainder of the loads cooled by CCS can accept and increase in cooling water temperature during this time period. For shutdown operations the design basis temperature for the component cooling water system is determined by maximum normal wet bulb temperature as defined in Table 2-1 of the DCD and also limits the maximum cooling water temperature to 99°F.

DCD Section 9.2.2.1.2.2, Component Cooling Water - Normal Plant Cooldown

The first phase of plant cooldown is accomplished by transferring heat from the reactor coolant system via the steam generators to the main steam systems.

The component cooling water system, in conjunction with the normal residual heat removal system removes both residual and sensible heat from the core and the reactor coolant system and reduces the temperature of the reactor coolant system during the second phase of cooldown.

The component cooling water system reduces the temperature of the reactor coolant system from 350°F at approximately 4 hours after reactor shutdown to 125°F within 96 hours after shutdown by providing cooling to the normal residual heat removal system heat exchangers. This cooldown time is based on operation of both component cooling water system mechanical trains (one pump and one heat exchanger each), and a service water system supply temperature to the component cooling water system heat exchangers resulting from a maximum normal ambient design wet bulb temperature as defined in Table 2-1.

The effective change to the DCD in regard to a normal plant cooldown was to change from an specified assumed temperature within the text to a reference to Table 2-1 and thus a change in the design basis wet bulb temperature from 80°F to 80.1°F wet bulb. Evaluation has indicated there is sufficient margin in the system design to maintain the same criteria and design basis for this DCD section.

DCD Section 9.2.2.1.2.3, Component Cooling Water - Refueling

During fuel shuffling (partial core off-load) or a full core off-load, cooling water flow is provided to spent fuel pool heat exchangers to cool the spent fuel pool. For a full core off-load cooling water is also supplied to a normal residual heat removal heat exchanger as part of spent fuel pool cooling. The system design criteria during refueling assumes both component cooling water system mechanical trains available.

The component cooling water system maintains the spent fuel pool water temperature below 120°F based on a maximum normal ambient design wet bulb temperature as defined in Table 2-1.

The effective change to the DCD in regard to a refueling operation was to change from an specified assumed temperature within the text to a reference to Table 2-1 and thus a change in the design basis wet bulb temperature from 80°F to 80.1°F wet bulb. Evaluation has indicated there is sufficient margin in the system design to maintain the same criteria and design basis for this DCD section.

DCD Section 9.2.7.2.4, Central Chilled Water System - Normal Operation

The central chilled water system operating modes are described below.

The high capacity central chilled water subsystem capacity is based on the maximum and minimum normal ambient design temperatures as defined in Chapter 2, Table 2-1. The high capacity subsystem operates during normal modes of plant operation, supplying chilled water to plant components at a normal temperature of 40°F.

The effective change to the DCD in regard to the high capacity central chilled water subsystem was to change from specified assumed temperatures within the text to a reference to Table 2-1 and thus a change in the maximum normal design basis wet bulb temperature from 80°F to 80.1°F wet bulb and no change in the minimum temperature. Evaluation has indicated there is sufficient margin in the system design to maintain the same criteria and design basis for this DCD section.

The capacity of the low capacity subsystem is based on the maximum safety ambient design temperatures as defined in Chapter 2, Table 2-1. The low capacity subsystem is designed to operate during all normal modes of operation, supplying chilled water to the nonradioactive ventilation system components at a normal temperature of 40°F. The low capacity system also supplies chilled water to the make-up pump and normal residual heat removal pump compartment unit coolers of the radiologically controlled area ventilation system.

The change to the DCD in regard to the low capacity central chilled water subsystem was to change from specified assumed temperatures within the text to a reference to Table 2-1. There is however no change in the actual design basis temperature. The air cooled low capacity system is dependent on ambient dry bulb temperature which was not changed as a result of this TR.

Westinghouse performed a regulatory assessment of the information contained in this technical report (TR) against the regulatory basis for the original AP1000 certified design, which is described in DCD Revision 15, Sections 3.1, 1.9 and Appendix 1A. The results of the regulatory assessment appear below. Unless specifically noted, the changes described in the TR are not intended to change the regulatory basis for the design, but are instead meant to be incremental changes that are necessary to properly describe standard aspects of the AP1000 and to allow successful construction of the plant. The regulatory requirements of DCD Revision 15, Sections 3.1, 1.9 and Appendix 1A, therefore remain valid.

- Regulatory requirements and guidance are defined in AP1000 DCD Section 1.9 and Appendix 1A. This technical report does not affect the conformance to these requirements and guidance where applicable.
- Nuclear Regulatory Commission General Design Criteria (GDC) are defined in AP1000 DCD section 3.1. This technical report does not affect the conformance of the AP1000 to the GDCs, where applicable.
- The technical report was reviewed against WCAP-15799 Rev. 1 (SRP Conformance) and WCAP-15800 Rev. 3 (AP1000 Operational Assessment). This technical report does not affect the AP1000 conformance as described in these WCAPs. This includes the commitments to any applicable Branch Technical Positions.
- The report was reviewed against the AP1000 Probabilistic Risk Assessment (PRA). This technical report does not negatively impact the AP1000 PRA results as documented in Westinghouse documents APP-PRA-GER-001.
- This technical report was reviewed against the AP1000 DCD Chapter 15 Accident Analyses. It has been concluded that the safety analyses results documented in DCD Chapter 15 remain bounding..
- This technical report was reviewed against the AP1000 Technical Specifications (AP1000 DCD Chapter 16.1). This technical report does not affect the AP1000 Technical Specifications.
- This technical report was reviewed against barriers and alarms that control access to protected areas of the plant, as well as requirements for security personnel. This technical report does not have an adverse impact on the security assessment of the AP1000.
- This technical report was reviewed against design features that mitigate severe accidents. This technical report does not have an adverse affect on the AP1000's ability to mitigate severe accidents.
- This technical report was reviewed against AP1000 DCD Tier 1 Section 5.0 and Tier 2 Section 2.0, 5.4.7, 9.1.3, 9.2.1, 9.2.2, and 9.2.7, which are the applicable sections to the

changes in this report. This technical report aligns these two sections so the commitments made in these sections can be fulfilled.

This technical report was reviewed against the Tier 1 information of the DCD Rev.15. It is determined that this report does reflect a change to the Tier 1 information and therefore requires NRC approval.

4.0 DCD MARK-UP

Revise the Air Temperature portion of Tier 1 Table 5.0-1, Site Parameters as follows:

TABLE 5.0-1
SITE PARAMETERS

Air Temperature	Limits based on historical data excluding peaks of less than 2 hours duration Maximum temperature of 115° dry bulb/80°F coincident wet bulb Maximum wet bulb ~~81~~85.5°F (noncoincident) Minimum temperature of -40°F

Revise the Air Temperature portion of Tier 2 Table 2-1, Site Parameters as follows:

Table 2-1 (Sheet 1 of 3)

SITE PARAMETERS

Air Temperature	
Maximum Safety [(a)]	115°F dry bulb/80°F coincident wet bulb ~~81~~85.5°F wet bulb (noncoincident)
Minimum Safety [(a)]	-40°F
Maximum Normal [(b)]	100°F dry bulb/~~77~~80.1°F coincident wet bulb ~~80~~80.1°F wet bulb (noncoincident) [(d)]
Minimum Normal [(b)]	-10°F

5.4.7.1.2.1 Shutdown Heat Removal

The normal residual heat removal system removes both residual and sensible heat from the core and the reactor coolant system. It reduces the temperature of the reactor coolant system during the second phase of plant cooldown. The first phase of cooldown is accomplished by transferring heat from the reactor coolant system via the steam generators to the main steam system (MSS).

Following cooldown, the normal residual heat removal system removes heat from the core and the reactor coolant system during the plant shutdown, until the plant is started up.

The normal residual heat removal system reduces the temperature of the reactor coolant system from 350° to 125°F within 96 hours after shutdown. The system maintains the reactor coolant temperature at or below 125°F for the plant shutdown. The system performs this function based on the following:

- Operation of the system with both subsystems of normal residual heat removal system pumps and heat exchangers available.
- Initiation of normal residual heat removal system operation at four hours following reactor shutdown, after the first phase of cooldown by the main steam system has reduced the reactor coolant system temperature to less than or equal to 350°F and 450 psig.
- The component cooling water system supply temperature to the normal residual heat removal system heat exchangers is based on a maximum normal ambient wet bulb temperature as defined in Chapter 2, Table 2-1. ~~of no greater than 80°F (1 percent exceedance).~~ The maximum normal ambient temperature ~~80°F value~~ is assumed for shutdown cooling.
- Operation of the system is consistent with reactor coolant system cooldown rate limits and consistent with maintaining the component cooling water below design limits during cooldown.

5.4.7.1.2.3 In-Containment Refueling Water Storage Tank Cooling

The normal residual heat removal system provides cooling for the in-containment refueling water storage tank during operation of the passive residual heat removal heat exchanger or during normal plant operations when required. The system is manually initiated by the operator. The normal residual heat removal system limits the in-containment refueling water storage tank water temperature to less than boiling temperature during extended operation of the passive residual heat removal system and to not greater than 120°F during normal operation. The system performs this function based on the following:

- Operation of the system with both subsystems of normal residual heat removal system pumps and heat exchangers available.
- The component cooling water system supply temperature to the normal residual heat removal system heat exchangers is based on an ambient design wet bulb temperature of no greater than ~~81°F~~ 85.5°F (0 percent exceedance). The ~~81°F~~ 85.5°F value is assumed for normal conditions and transients that start at normal conditions.

Since the normal residual heat removal system is not a safety-related system, its operation is not credited in Chapter 15 Accident Analyses.

9.1.3.1.3.1 Partial Core

The spent fuel pool cooling system is designed to remove heat from the spent fuel pool such that the spent fuel pool water temperature will be ≤ 120°F following a partial core fuel shuffle refueling. The system is designed to perform this function based on the following:

- The assumed heat load is based on the decay heat generated by the accumulated fuel assemblies stored in the fuel pool for 10 years plus 44% of a core (68 assemblies) being placed into the pool beginning at 120 hours after shutdown.
- Both trains of the spent fuel pool cooling system are assumed to be operating.
- The component cooling water system (CCS) supply temperature to the spent fuel pool cooling system heat exchangers is based on a service water system heat sink with a maximum normal ambient design wet bulb temperature as defined in Chapter 2 Table 2-1. ~~1 percent exceedance ambient design wet bulb temperature of 80°F.~~

9.1.3.1.3.2 Full Core Off-Load

The AP1000 normal refueling basis heat load is from a full core off-load. The spent fuel pool cooling system is designed to remove heat from the spent fuel pool such that the spent fuel pool water temperature will be ≤ 120°F following a full core off-load based upon a service water heat sink at a maximum normal ambient wet bulb temperature as defined in Chapter 2, Table 2-1. ~~1 percent exceedance of 80°F ambient wet bulb temperature.~~The system is designed to perform this function based on the following:

- The assumed heat load is based on the decay heat generated by the accumulated fuel assemblies stored in the fuel pool for 10 years, plus one full core placed in the pool at 120 hours after shutdown. The time during the plant operating cycle at which the full core off-load occurs is chosen to maximize the required spent fuel pool cooling system heat load.
- The spent fuel pool cooling system is assumed to function with its full set of equipment available. One train of the normal residual heat removal system is also connected to the spent fuel pool and provides cooling as described in subsection 5.4.7.4.5.
- The component cooling water system supply temperature to the spent fuel pool cooling system heat exchangers is based on a service water system heat sink with a maximum normal ambient design wet bulb temperature as defined in Chapter 2 Table 2-1.~~1 percent exceedance ambient design wet bulb temperature of 80°F.~~

9.2.1.2.3.4 Plant Cooldown/Shutdown

During the plant cooldown phase in which the normal residual heat removal system has been placed in service and is providing shutdown cooling, the service water cooling tower provides cooling water at a temperature of 88.5°F or less when operating at design heat load and at an ambient wet bulb temperature of no greater than the maximum normal wet bulb temperature as defined in Chapter 2, Table 2-1. ~~when operating at design heat load and at an ambient wet bulb temperature of no greater than 80°F (1 percent exceedance).~~ Two service water pumps and two cooling tower cells are normally used for plant cooldown, and the cross-connection valves between trains are normally closed. The service water system heat load and flow rate are shown in Table 9.2.1-1. During these modes of operation the normal residual heat removal system and the component cooling water system remove sensible and decay heat from the reactor coolant system. In the event of failure of a service water system pump or cooling tower fan, the cooldown time is extended.

9.2.2.1.2.1 Normal Operation

The component cooling water system transfers heat from various plant components needed to support normal power operation with a single active component failure. The component cooling water system is designed for normal operation in accordance with the following criteria:

- The component cooling water supply temperature to plant components is not more than ~~95°F~~ 99°F assuming a 0 percent exceedance ambient design wet bulb temperature of ~~81°F~~ 85.5°F for service water cooling at normal operations (maximum normal temperature per Table 2-1 for normal shutdown). ~~(1 percent exceedance of 80°F for normal shutdown).~~

- The minimum component cooling water supply temperature to plant components is 60°F.

- The component cooling water system provides sufficient surge capacity to accept 50 gallons per minute leakage into or out of the system for 30 minutes before any operator action is required.

9.2.2.1.2.2 Normal Plant Cooldown

The first phase of plant cooldown is accomplished by transferring heat from the reactor coolant system via the steam generators to the main steam systems.

The component cooling water system, in conjunction with the normal residual heat removal system removes both residual and sensible heat from the core and the reactor coolant system and reduces the temperature of the reactor coolant system during the second phase of cooldown.

The component cooling water system reduces the temperature of the reactor coolant system from 350°F at approximately 4 hours after reactor shutdown to 125°F within 96 hours after shutdown by providing cooling to the normal residual heat removal system heat exchangers. This cooldown time is based on operation of both component cooling water system mechanical trains (one pump and one heat exchanger each), and a service water system supply temperature to the component cooling water system heat exchangers resulting from a maximum normal ambient design wet bulb temperature as defined in Table 2-1 ~~1 percent exceedance ambient design wet bulb temperature of 80°F~~ for service water cooling. In addition to the cooldown time requirements, other system design criteria during cooldown are:

- Operation is consistent with the established reactor coolant system cooldown rates while maintaining the component cooling water supply below 110°F.
- The system design prevents boiling in the component cooling water system during plant cooldown.
- A single failure of an active component during normal cooldown will not cause an increase in reactor coolant system temperature above 350°F. Such a single failure also will not cause the reactor coolant system to boil once the reactor vessel head has been removed and the refueling cavity flooded. The component cooling system continues to provide cooling water to the normal residual heat removal system throughout the shutdown after cooldown is complete.

9.2.2.1.2.3 Refueling

During fuel shuffling (partial core off-load) or a full core off-load, cooling water flow is provided to spent fuel pool heat exchangers to cool the spent fuel pool. For a full core off-load cooling water is also supplied to a normal residual heat removal heat exchanger as part of spent fuel pool cooling. The system design criteria during refueling are:

- System operation is with both component cooling water system mechanical trains available.
- The component cooling water system maintains the spent fuel pool water temperature below 120°F based on a maximum normal ambient design wet bulb temperature as defined in Table 2-1 ~~one percent exceedance ambient design wet bulb temperature of 80°F~~ for service water cooling.

9.2.7.2.4 System Operation

The central chilled water system operating modes are described below.

Normal Operation

The high capacity subsystem capacity is based on the maximum and minimum normal ambient design temperatures as defined in Chapter 2, Table 2-1. ~~of 100°F dry bulb/77°F coincident wet bulb maximum and -10°F minimum.~~ The high capacity subsystem operates during normal modes of plant operation, supplying chilled water to plant components at a normal temperature of 40°F. The capacity of the low capacity subsystem is based on the maximum safety ambient design temperatures as defined in Chapter 2, Table 2-1. ~~of 115°F dry bulb/80°F coincident wet bulb maximum.~~ The low capacity subsystem is designed to operate during all normal modes of operation, supplying chilled water to the nonradioactive ventilation system components at a normal temperature of 40°F. The low capacity system also supplies chilled water to the make-up pump and normal residual heat removal pump compartment unit coolers of the radiologically controlled area ventilation system. The low capacity subsystem uses anti-freeze solution in the chilled water loop to protect the chilled water from freezing.

5.0 REGULATORY IMPACT

A. FSER IMPACT

Section 9.2.7 Central Chilled Water System reports:

> The high-capacity subsystem is arranged in two parallel trains with common supply and return headers. Each train includes one pump and one chiller. A cross-connection at the discharge of each pump allows for either pump to feed either chiller. During normal operation of the subsystem, one pump/chiller train provides chilled water to plant components at a normal temperature of 4.4 °C (40 °F). The standby train would be started manually if the operating train fails. The design cooling capacity of the high-capacity subsystem is founded on the ambient design temperature of 38 °C (100 °F) dry bulb and 29 °C (77 °F) coincident wet bulb maximum and -23 °C (-10 °F) minimum.

This section should be updated to reflect the revised maximum normal temperatures of 101 °F dry bulb and 80.1 °F coincident wet bulb maximum.

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

   There is no change to a design function of any safety related equipment.

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 site interface design temperature limits does not impact the SSC functions or how they are controlled.

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 site interface design temperatures does not require changes to the evaluation methodology used for establishing either design basis or safety analysis.

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 site interface design temperatures does not require an additional test or experiment or changes to testing.

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 activity 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 change in the site interface design temperatures has no impact on the frequency of an accident evaluated in the DCD, there are no new accident initiators.	
2. Does the proposed activity 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 change in the site interface design temperatures does not increase the likelihood of a malfunction of a structure, system, or component.	
3. Does the proposed activity 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 site interface design temperatures has no deleterious effect on the operation, performance, and pressure boundary integrity of the safety related equipment. Therefore, there is no increase in the calculated consequences of an accident previously evaluated in the DCD.	

Document Number: APP-GW-GLN-108 **Revision Number:** 2
Title: **AP1000 Site Interface Temperature Limits**

4. Does the proposed activity 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 site interface design temperatures has no effect on the design functions or reliability of the safety related systems, structures or components. Therefore, there is no increase in the calculated consequences due to a malfunction of an SSC.	
5. Does the proposed activity 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 site interface design temperatures do not introduce any additional failure modes; therefore, the activity does not create the possibility of a different type of an accident than any evaluated previously in the DCD.	
6. Does the proposed activity 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 in the site interface design temperatures has no effect on the design functions of the safety related systems, structures or components. There are no additional failure modes or the possibility for a malfunction of an SSC important to safety with a different result than any evaluated previously.	
7. Does the proposed activity result in a design basis limit for a fission product barrier as described in the plant-specific DCD being exceeded or altered?	☐ YES ☒ NO
There is no change to the design function of the safety related equipment or fission product barrier.	
8. Does the proposed activity 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
There is no change to any methodologies used within the DCD.	
☒ 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 features that mitigate severe accidents. If the answer is Yes answer Questions 2 and 3 below.	☐ YES ☒ NO
The systems and components identified in the DCD Subsection 1.9.5 and Appendix 19 B that mitigate	

severe accidents are not negatively impacted by the change in the site interface design temperatures.	
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
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 he 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 site interface design temperatures will not alter barriers or alarms that control access to protected areas of the plant. The design changes will not alter requirements for security personnel; therefore, the change in the site interface design temperatures does not have an adverse impact on the security assessment of the AP1000.

6.0 REFERENCES

1. APP-GW-GL-700, AP1000 Design Control Document, Revision 15.