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Your ref: Docket Number 52-006
Our ref: DCP/NRC2185

June 27, 2008

Subject: AP1000 DCD Impact Document Submittal of APP-GW-GLE-036, Revision 0

Westinghouse is submitting Revision 0 of APP-GW-GLE-036, "Impact of a revision to the current Wet Bulb Temperature identified in Table 5.0-1 (Tier 1) and Table 2-1 (Sheet 1 of 3) of the DCD (Revision 16)." The purpose of this report is to identify the Wet Bulb Temperature for both the coincident and non coincident changes to the AP1000 Design Control Document (DCD).

This report is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information provided in this report is generic and is expected to apply to all Combined Operating License (COL) applicants referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

Pursuant to 10 CFR 50.30(b), APP-GW-GLE-036, Revision 0, " Impact of a revision to the current Wet Bulb Temperature identified in Table 5.0-1 (Tier 1) and Table 2-1 (Sheet 1 of 3) of the DCD (Revision 16)," is submitted as Enclosure 1.

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,

Robert Sisk, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

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/Enclosure

1. APP-GW-GLE-036, Revision 0, "Impact of a revision to the current Wet Bulb Temperature identified in Table 5.0-1 (Tier 1) and Table 2-1 (Sheet 1 of 3) of the DCD (Revision 16)"

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ENCLOSURE 1

APP-GW-GLE-036

Revision 0

"Impact of a revision to the current Wet Bulb Temperature identified in Table 5.0-1 (Tier 1) and Table 2-1 (Sheet 1 of 3) of the DCD (Revision 16)"

F-AP-3.2-1 Rev 4

AP1000 DOCUMENT COVER SHEET

TDC: ________ Permanent File: ________

AP1000 DOCUMENT NO.	REVISION	PAGE	ASSIGNED TO	OPEN ITEMS (Y/N)
APP-GW-GLE-036	0	1 of 16	J. J. DeBlasio	N

ALTERNATE DOCUMENT NUMBER: WORK BREAKDOWN #:

ORIGINATING ORGANIZATION: AP1000 Licensing & Cust. Interface

TITLE: **Impact of a revision to the current Wet Bulb Temperature identified in Table 5.0-1 (Tier 1) and Table 2-1 (Sheet 1 of 3) of the DCD (Revision 16).**

ATTACHMENTS:	DCP #/REV. INCORPORATED IN THIS DOCUMENT REVISION:
Markups to Table 5.0-1 of DCD Tier 1 document and Table 2-1 (Sheet 1 of 3) of Tier 2 document	DCP-445, R1
CALCULATION/ANALYSIS REFERENCE: Calculation Note XXXXXXXXXXX	

ELECTRONIC FILENAME	ELECTRONIC FILE FORMAT	ELECTRONIC FILE DESCRIPTION
APP-GW-GLE-036_R0	Microsoft Word	.doc

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LEGAL REVIEW ~~J. J. White~~ Lisa A Cozzone	SIGNATURE / DATE Lisa A Cozzone 6/27/08
PATENT REVIEW Doug Ekeroth	SIGNATURE / DATE M.M. Corletti 6/26/08

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ORIGINATOR(S) J.J. DeBlasio	SIGNATURE / DATE John J. DeBlasio 6/26/08	
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VERIFIER(S) Dan McDermott/M. Stella	SIGNATURE / DATE DJ McDermott 6/27/08	Verification Method: Independent Review

**Plant Applicability: ☒ All AP1000 plants except: No Exceptions
☐ Only the following plants:

APPLICABILITY REVIEWER** J. A. Speer	SIGNATURE / DATE J Speer 6/27/08
RESPONSIBLE MANAGER* Rob Sisk	SIGNATURE / DATE Rob Sisk 6/27/08

* Approval of the responsible manager signifies that the document and all required reviews are complete, the appropriate proprietary class has been assigned, electronic file has been provided to the EDMS, and the document is released for use.

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Document Number: APP-GW-GLE-036 **Revision Number:** 0

Title: Impact of a revision to the current Wet Bulb Temperature identified in Table 5.0-1 and Table 2-1 (Sheet 1 of 3) of the DCD (Revision 16)

Brief Description of the Impact (what is being changed and why):

Impact of changing the current maximum wet bulb non-coincident temperature from 85.5°F to 86.1°F and the maximum wet bulb coincident temperature from 80°F to 86.1°F to encompass more sites in the eastern United States (i.e. LEVY and Turkey Point 6 and 7).

SRP Section Impacted:
Impacts Tier 1 Chapter 5, Table 5.0-1 / Chapter 2 Table 2-1 (Sheet 1 of 3) (Tier 2) and 2.3.5 of the Standard Review Plan (SRP). Other sections are 5.4.7.1.2.3, 6.2.2.3, 9.2.2.1.2.1 and Table 6.2.1.1-2

This evaluation is prepared to document the Design Control Document (DCD) changes to Table 5.0-1 Tier 1 and Table 2-1 (sheet 1of 3) Tier 2. Other sections that are impacted from this change are sections 5.4.7.1.2.3, 6.2.2.3, 9.2.2.1.2.1 and Table 6.2.1.1-2. The AP1000 DCD changes are to encompass more sites in the eastern United States (i.e. LEVY and Turkey Point 6 and 7). The LEVY site performed studies that indicated that the current values in both of the referenced tables and appropriate sections identified above would not support the "Maximum Safety" air temperature as in the DCD wet bulb temperature of 86.1°F. Based on the information contained in the AP1000 DCD Revision 16, these changes would be required to support the Levy COLA and avoid taking any departures. These changes are intended to be included in TR 134, Rev 5 which will revise the current DCD.

I. TECHNICAL DESCRIPTION

The revised DCD Table 5.0-1 Tier 1 and Table 2-1 (sheet 1of 3) Tier 2 provides a listing of updated values for the site parameters. The particular parameter that is being revised is the "Air Temperature" Maximum Safety for wet bulb (noncoincident) and (coincident). The air temperature is being revised to support the Progress Energy Levy site COLA submittal. The current wet bulb temperature is 85.5 and needs to be changed to 86.1°F (noncoincident) and the 80°F to 86.1°F (coincident). These changes are supported by DCP-445 Rev. 1 which provides the justification that reflects the revised values. This required an evaluation be performed for the various areas that are impacted to ensure the acceptability of these changes to the DCD. Table 2-1 (Sheet 1 of 3) and Table 5.0-1 which have site parameters specified as 85.5°F are acceptable to be increased to 86.1°F (noncoincident) and 80°F to 86.1°F (coincident). The following areas have been reviewed and determined to have sufficient margin to accommodate a 6.1 °F change and a .6°F for both coincident and noncoincident. The sections that have been reviewed are the following:

- DCD Section 6.2.2, Passive Containment Cooling System
- DCD Section 5.4.7.1.2.3, Normal Residual Heat Removal System – In-Containment Refueling Water Storage Tank Cooling
- DCD Section 9.1.3.1.3.1, Spent Fuel Pool Cooling-Partial Core Shuffle
- DCD Section 9.1.3.1.3.2, Spent Fuel Pool Cooling – Full Core Off-Load
- DCD Section 9.2.1.2.3.4, Service Water System – Plant Cooldown/Shutdown
- DCD Section 9.2.2.1.2.1, Component Cooling Water – Normal Operation
- DCD Section 9.2.2.1.2.2, Component Cooling Water – Normal Plant Cooldown

- DCD Section 9.2.2.1.2.3, Component Cooling Water – Refueling
- DCD Section 9.2.7.2.4, Central Chilled Water System – Normal Operation

The basis for the change is Design Change Proposal "AP1000 Site Interface Temperature Limits," APP-GW-GEE-445, Revision 1. The air temperature for wet bulb will be revised to address the Levy site as part of the DCD. This change would preclude the need for a departure in the COLA submittal.

II. CHANGE JUSTIFICATION

Design Assessment

The effort focused on evaluating the impact of the new maximum coincident and non-coincident wet bulb temperature on a system by system basis. The same analyses were performed previously in DCP-204. Several of the areas of concern were not affected by the change to the maximum wet bulb temperature. Since, they are affected only by the dry bulb temperature and/or plant performance which is based on the 1% exceedance wet bulb temperature limit of 80.1°F, which is not being changed by this DCP.

The areas specifically affected by the increased maximum wet bulb temperature include:

- Safety system design basis – additional cases for containment analysis were included in the safety analysis to support the revised coincident and noncoincident wet bulb temperature
- Normal, Decay and spent fuel pool heat removal (cases relying on use of the 0% exceedance wet bulb temperature only)
- Component cooling and service water design

The areas previously investigated in DCP-204 which originally changed the wet bulb temperature to the current value for noncoincident to 85.5°F but which are not affected by the change proposed in this DCP include:

- HVAC design (except for VBS, as described below)
- Chilled water system design
- Steam and Power Conversion system design
- Circulating water system design and turbine building closed cooling water system

Safety System Design Basis

There are no changes to the AP1000 design required to accommodate any safety issues. Evaluations have demonstrated that the current AP1000 accident analysis cases of record will bound the revised wet bulb temperature (115°F /86.1°F) coincident and (86.1°F) noncoincident.

1. The performance of the Passive Containment Cooling System (PCS) at the higher wet bulb temperature is such that the maximum containment peak pressure is bounded by the current analysis. The bounding sensitivity was performed and documented in the Nuclear Safety Containment Analysis for AP1000.

2. The passive heat sinks associated with the Main Control Room Habitability System (VES) control the auxiliary building safety related room temperatures post accident. The temperature profiles of these rooms are impacted by ambient dry bulb temperature only, which is enveloped by the current baseline and thus the analysis of record remains valid.

Normal, Decay and Spent Fuel Pool Heat Removal

Numerous performance commitments from the DCD and design documents related to normal and decay heat removal were evaluated based on the performance of the Normal Residual Heat Removal (RNS), Spent Fuel Pool Cooling System (SFS), Component Cooling Water (CCS) and Service Water Systems (SWS). The evaluations considered normal operating modes, the ability to meet post shutdown cooldown times, full core offloads, loss of all ac power, and heat up of the in-containment refueling water storage tank (IRWST). For these scenarios the design criteria were met including cooldown times and temperature limits with the exception of normal plant power operation with maximum heat loads, with one CCS train in service and at the maximum safety temperature limits (86.1°F wet bulb). For this short period of time (less than 30 hours per year) and additionally coincident with operation of only one train of CCS, the CCS temperature would rise above 95°F and then return to less than 95°F by the time the 1% exceedance temperature was reached. The most limiting component, the RCP motor cooling system, has been designed to operate for at least 6 hours duration with temperatures up to 100°F as a result of the increase in CCS temperature associated with the acceptance of DCP-204, for which the maximum wet bulb temperature (coincident) from 80°F and (noncoincident) was increased to 85.5°F.

Since DCP-204 has been approved, more detailed information on the performance of the SWS cooling towers has been obtained from two cooling tower vendors. This information was used to determine that the maximum CCS temperature attained with an 86.1°F wet bulb temperature will be 97°F. CCS temperature will drop below 95°F with an ambient wet bulb temperature of between 83°F and 84°F assuming nominal performance of both the CCS and SWS. The maximum CCS temperature of 97°F is bounded by the maximum allowable cooling water temperature for RCPs (the most limiting component) and the change is therefore acceptable on this basis. The sole remaining heat removal performance case that uses the 0% exceedance temperature to determine acceptability is limiting spent fuel pool temperature immediately following plant restart after a normal refueling. This case was again investigated; the SFS pool temperature remains below 120°F with both SFS cooling trains in operation and the maximum spent fuel decay heat load assumed, with the plant at full power.

HVAC design

Performance commitments from the DCD and other design documents were evaluated for HVAC systems in the analysis performed for DCP-204. The Nuclear Island Non-radioactive Ventilation System (VBS) is the only HVAC system that is designed to accommodate the maximum safety temperature limits. The remainder of the HVAC systems are designed to accommodate the maximum normal temperature limits (1% exceedance values).

The VBS maintains the safety related heat sink temperatures and is currently designed with a ~35% margin and two 100% capacity subsystems. The increased heat load based on the higher wet bulb temperature of 86.1°F can be accommodated within the available capacity margin without impacting the system or supporting systems design or plant operation. Minor changes to chilled water flow to the cooling coils in VBS air handling equipment may be necessary.

Chilled Water System design

The chilled water system provides cooling service to the HVAC systems. The design basis for the high capacity chilled water system utilizes the maximum normmal temperature and therefore is not affected by this change. The low capacity chilled water subsystem is air cooled and provides cooling water to the VBS. There may be small changes to the VBS heat loads, which will require additional chilled water flow to the affected air handling unit (AHU) cooling coils. The low capacity chillers are air cooled and thus not sensitive to wet bulb conditions; this subsystem remains unchanged. These changes required by the VBS cooling coils described earlier are estimated to require a 4% increase in Low Capacity Chilled Water system pump flow and at most a 10% increase in pump motor power requirements. No increase in Central Chilled Water System (VWS) pipe sizes will be needed to accommodate this change.

Component cooling (CCS) and service water system (SWS) design

The CCS and SWS system provide heat removal from numerous plant loads for normal and abnormal modes of operation. These loads include the HVAC systems via the VWS, decay heat from the Residual Heat Removal (RNS) and Spent Fuel Cooling System (SFS). Operating equipment loads from the Reactor Coolant Pumps (RCPs), RNS pump and compressed air system components and Chemical and Volume Control System (CVS) heat exchangers. During power operation, the systems are designed to accommodate the maximum safety temperature conditions (0% exceedance) with a single train in service whereas during shutdown operations the system is designed for the maximum normal conditions (1% exceedance) with both trains in service. As discussed above the CCS will accommodate the heat loads from normal, shutdown and abnormal operations without impacting the performance or sizing of the system.

The SWS cooling tower is not expected to require changes to accommodate the higher wet bulb temperature since the actual sizing case is plant cooldown at 4 hours after reactor shutdown, and is based on the unchanged 1% exceedance value of 80.1°F. The SWS cooling water supply temperature for the maximum safety case will be 91.6°F, resulting in a maximum CCS supply temperature of 97.0°F.

Steam and Power Conversion (not affected by this change)

Westinghouse has undertaken, with the NuStart utilities, an effort to optimize the turbine generator condenser and evaluate the performance of the condenser and turbine generator (TG) with various Circulating Water System (CWS) flow rates and temperatures. Therefore the optimized standard condenser that has been developed for the AP1000 will adequately accommodate the Progress Florida site conditions. Therefore no changes to the standard AP1000 steam and power conversion systems are anticipated for the increased meteorological conditions

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Circulating Water System (CWS) Design And Turbine Building Closed Cooling Water System (TCS) Design

The CWS is a site specific design, and is not part of the standard AP1000 design. However the CWS does interface with the condenser as well as TCS heat exchangers, and condenser vacuum pump seal water heat exchangers and these are part of the AP1000 standard design.

If TCS cooling is provided by the CWS at the revised maximum wet bulb temperature of 86.1°F, the cooling water to the heat loads serviced by the TCS may exceed the original 95°F design basis, depending upon the plant-specific design of the CWS cooling towers. It has been confirmed that the resultant elevated temperatures for cooling all turbine generators auxiliaries is acceptable.

Conclusions

Very few(minor) design changes are necessary to accommodate the increased meteorological conditions proposed in this DCP. The evaluation demonstrates the following factors in the proposed siting.

- No changes are necessary for any safety related functions
- The only HVAC system affected will be the VBS, which may require additional chilled water flow to the AHU and pump coolers to accommodate the increased wet bulb temperature .
- Normal and abnormal cooling loads can be accommodated by the chilled water system and component cooling water system and systems meet design criteria. Minor changes to VWS low capacity system pump flow and power may be necessary.
- The service water cooling tower will not change and its performance as predicted by preliminary data supplied by prospective manufacturers will be acceptable at the higher wet bulb temperature.

Licensing Documentation

As described above, the design basis safety analysis cases continue to be the bounding analysis for containment pressure and auxiliary building safety related room temperature profiles. Therefore, no formal reanalysis of containment performance is required and changes in section 6.2 are required to these portions of the DCD. A revised containment analysis will be performed at a later date to the DCP and others impacted sections (5.4.7.1.2.3, 6.2.3, 9.2.2.1.2.1 and Table 6.2.1.1-2). However, there are several places within the DCD, both Tier 1 and 2, where there are design commitments as well as descriptions of system design capabilities which do require changes. The following is a summary of those instances and the revised pages are attached.

Within Tier 1 it is necessary to modify Table 5.0-1 to reflect the higher coincident and non-coincident wet bulb temperature of 86.1°F. This change will also be reflect in Tier 2 Table 2-1. Within Tier 2 of the DCD it will be necessary to revise Table 2-1 to redefine the Maximum Safety Conditions to accommodate the broader meteorological conditions required at the Progress Florida site. The maximum normal coincident dry bulb air temperature shown in this table in DCD Revision 16 reads as 100°F. This should have been changed to 101°F as a result of the implementation of DCP 204.

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Additionally, sections 5.4.7.1.2.3, 6.2.3, 9.2.2.1.2.1 and Table 6.2.1.1-2 of the DCD is being revised to reflect these wet bulb temperature changes.

Table 8.3.1-1 & -2 were previously modified to reflect the revised load on the diesel generator from the SWS cooling tower fans imposed by the changes proposed in DCP-204.

III. REGULATORY IMPACT

A. 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

   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 associated with this change in wet bulb temperature.

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

   No, the change in the site interface design temperatures does not increase the likelihood of a malfunction of a structure, system, or component (SSC) important to safety and previously evaluated with this change in wet bulb temperature.

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

   No, the change in the site interface design wet bulb temperature does not alter the design function or increase the consequences of an accident previously evaluated in the plant-specific DCD.

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

   No, the change in the site interface design wet bulb temperature does not increase the consequences of a malfunction of an SSC important to safety previously evaluated in the plant-specific DCD.

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

   No, the change in the site interface design wet bulb temperature does not alter the design function of the condenser stack. The changes to the stack do not add or modify accident precursors.

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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

   No, the change in the site interface design wet bulb temperature does not alter operating conditions or design functions of SSCs important to safety. Therefore there is no new malfunction associated with this change in wet bulb temperature.

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

   No, the change in the site interface design wet bulb temperature does not alter the pressure boundary integrity design function of the reactor coolant system or other SSCs important to safety.

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

   No, the site interface design wet bulb temperature does not alter the methodology used in evaluating of the impact on safety analysis.

B. 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

   There is no change to the response of safety systems used to mitigate severe accidents due to the change in the site interface design wet bulb temperature.

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

   There is no change to the response of safety systems used to mitigate accidents due to the addition of the change in the site interface design wet bulb temperature.

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

   There is no change to the response of safety systems used to mitigate accidents due to the change in the site interface design wet bulb temperature.

C. SECURITY ASSESSMENT

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

AP1000.

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.

D. OTHER REGULATORY CRITERIA

N/A

IV. DCD MARK-UP

Table 5.0-1
Site Parameters

Maximum Ground Water Level	Plant elevation 98 ft
Maximum Flood Level	Plant elevation 100 ft (design grade elevation)
Precipitation	
Rain	19.4 in./hr (6.3 in./5 min)
Snow/Ice	Ground snow load of 75 lb/ft^2 with exposure factor of 1.0 and importance factor of 1.2
Air Temperature	Limits based on historical data excluding peaks of less than 2 hours duration Maximum temperature of 115° dry bulb/86.1°F coincident wet bulb Maximum wet bulb 86.1°F (noncoincident) Minimum temperature of -40°F
Tornado	
Wind Speed	Maximum wind speed of 300 mph
Maximum Pressure Differential	Maximum pressure differential of 2.0 lb/in^2

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Table 5.0-1 Site Parameters	
Tornado Missile Spectra	4000-lb automobile at 105 mph horizontal, 74 mph vertical 275-lb, 8-in. shell at 105 mph horizontal, 74 mph vertical 1-in.-diameter steel ball at 105 mph in the most damaging direction

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Table 2-1 (Sheet 1 of 4)

SITE PARAMETERS

Air Temperature	
Maximum Safety [(a)]	115°F dry bulb/86.1°F coincident wet bulb 86.1°F wet bulb (noncoincident)[(g)]
Minimum Safety [(a)]	-40°F
Maximum Normal [(b)]	101°F dry bulb/80.1°F coincident wet bulb 80.1°F wet bulb (noncoincident) [(d)]
Minimum Normal [(b)]	-10°F
Wind Speed	
Operating Basis	145 mph (3 second gust); importance factor 1.15 (safety), 1.0 (nonsafety); exposure C; topographic factor 1.0
Tornado	300 mph
Seismic	
SSE	0.30g peak ground acceleration [(c)(f)]
Fault Displacement Potential	Negligible
Soil	
Average Allowable Static Bearing Capacity	Greater than or equal to 8,600 lb/ft^2 over the footprint of the nuclear island at its excavation depth
Maximum Allowable Dynamic Bearing Capacity for Normal Plus SSE	Greater than or equal to 35,000 lb/ft^2 at the edge of the nuclear island at its excavation depth
Shear Wave Velocity	Greater than or equal to 1,000 ft/sec based on low-strain best-estimate soil properties over the footprint of the nuclear island at its excavation depth

Table 2-1 (Sheet 3 of 4)

SITE PARAMETERS

Missiles	
Tornado	4000 - lb automobile at 105 mph horizontal, 74 mph vertical 275 - lb, 8 in. shell at 105 mph horizontal, 74 mph vertical 1 inch diameter steel ball at 105 mph horizontal and vertical
Flood Level	Less than plant elevation 100′
Ground Water Level	Less than plant elevation 98′
Plant Grade Elevation	Less than plant elevation 100′ except for portion at a higher elevation adjacent to the annex building
Precipitation	
Rain	19.4 in./hr (6.3 in./5 min)
Snow/Ice	75 pounds per square foot on ground with exposure factor of 1.0 and importance factors of 1.2 (safety) and 1.0 (non-safety)
Atmospheric Dispersion Values - $\chi/Q^{(e)}$	
Site boundary (0-2 hr)	$\leq 1.0 \times 10^{-3}$ sec/m^3
Site boundary (annual average)	$\leq 2.0 \times 10^{-5}$ sec/m^3
Low population zone boundary	
0 - 8 hr	$\leq 5.0 \times 10^{-4}$ sec/m^3
8 - 24 hr	$\leq 3.0 \times 10^{-4}$ sec/m^3
24 - 96 hr	$\leq 1.5 \times 10^{-4}$ sec/m^3
96 - 720 hr	$\leq 8.0 \times 10^{-5}$ sec/m^3
Population Distribution	
Exclusion area (site)	0.5 mi

Notes:
(a) Maximum and minimum safety values are based on historical data and exclude peaks of less than 2 hours duration.
(b) Maximum and minimum normal values are the 1 percent exceedance magnitudes.
(c) With ground response spectra as given in Figures 3.7.1-1 and 3.7.1-2. Seismic input is defined at finished grade except for sites where the nuclear island is founded on hard rock.
(d) The noncoincident wet bulb temperature is applicable to the cooling tower only.
(e) For AP1000, the terms "site boundary" and "exclusion area boundary" are used interchangeably. Thus, the χ/Q specified for the site boundary applies whenever a discussion refers to the exclusion area boundary.
(f) Sites that fall within the hard rock high frequency GMRS given in Figure 3I.1-1 and Figure 3I.1-2 are acceptable.
(g) The containment pressure response analysis is based on a conservative set of dry-bulb and wet-bulb temperatures. These results envelop any conditions where the dry-bulb temperature is 115°F or less and wet-bulb temperature of less than or equal to 86.1°F.

Core decay heat generation is based on the decay heat curve for a three-region core having burnups consistent with a 24-month or 18-month refueling schedule and based on the ANSI/ANS-5.1-1994 decay heat curve (Reference 5).

- A failure of an active component during normal cooldown does not preclude the ability to cool down, but lengthens the time required to reach 125°F. Furthermore, if such a single failure occurs while the reactor vessel head is removed, the reactor coolant temperature remains below boiling temperature.

- The system operates at a constant normal residual heat removal flow rate throughout refueling operations. This includes the time when the level in the reactor coolant system is reduced to a midloop level to facilitate draining of the steam generators or removal of a reactor coolant pump. Operation of the system at the minimum level that the reactor coolant system can attain using the normal reactor coolant system draining connections and procedures results in no incipient vortex formation which would cause air entrainment into the pump suction.

- The pump suction line is self-venting with continually upward sloped pipe from the pump suction to the hot leg. This arrangement prevents entrapment of air and minimizes system venting efforts for startup.

- Features are included that permit mid-loop operations to be performed from the main control room.

5.4.7.1.2.2 Shutdown Purification

The normal residual heat removal system provides reactor coolant system flow to the chemical and volume control system during refueling operations. The purification flow rate is consistent with the purification flow rate specified in Table 9.3.6-1.

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 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 86.1°F (0 percent exceedance). The 86.1°F value is assumed for normal conditions and transients that start at normal conditions.

9.2.2.1 Design Bases

9.2.2.1.1 Safety Design Basis

Failure of the component cooling water system or its components will not affect the ability of safety-related systems to perform their intended safety functions. The component cooling water system serves no safety-related function except for containment isolation and therefore has no nuclear safety design basis except for containment isolation (see subsection 6.2.3).

9.2.2.1.2 Power Generation Basis

The component cooling water system is designed to perform its operational functions in a reliable and failure tolerant manner. This reliability is achieved with the use of reliable and redundant equipment and with a simplified system design.

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 100°F assuming a 0 percent exceedance ambient design wet bulb temperature of 86.1°F for service water cooling at normal operations (maximum normal temperature per Table 2.1-1 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

Table 6.2.2-3 presents a failure modes and effects analysis of the passive containment cooling system. Capability is provided to periodically test actuation of the passive containment cooling system. Active components can be tested periodically during plant operation to verify operability. The system can be inspected during unit shutdown. Additional information is contained in subsections 3.9.6 and 6.2.2.4, as well as in the Technical Specifications.

The passive containment cooling system components located inside containment, the containment pressure sensors, are tested and qualified to perform in a simulated design basis accident environment. These components are protected from effects of postulated jet impingement and pipe whip in case of a high-energy line break. The containment pressure analyses are based on an ambient air temperature of 115°F dry bulb and 86.1°F coincident wet bulb. The passive containment cooling water storage tank water temperature basis is 120°F. Results of the analyses are provided in subsection 6.2.1.

6.2.2.4 Testing and Inspection

6.2.2.4.1 Inspections

The passive containment cooling system is designed to permit periodic testing of system readiness as specified in the Technical Specifications.

The portions of the passive containment cooling system from the isolation valves to the passive containment cooling water storage tank are accessible and can be inspected during power operation or shutdown for leak tightness. Examination and inspection of the pressure retaining piping welds is performed in accordance with ASME Code, Section XI. The design of the containment vessel and air baffle retains provisions for the inspection of the vessel during plant shutdowns.

6.2.2.4.2 Preoperational Testing

Preoperational testing of the passive containment cooling system is verified to provide adequate cooling of the containment. The flow rates are confirmed at the minimum initial tank level, an intermediate step with all but one standpipe delivering flow and at a final step with all but two standpipes delivering to the containment shell. The flow rates are measured utilizing the differential pressure across the orifices within each standpipe and will be consistent with the flow rates specified in Table 6.2.2-1.

The containment coverage will be measured at the base of the upper annulus in addition to the coverage at the spring line for the full flow case using the PCS water storage tank delivering to the containment shell and a lower flow case with both PCS recirculation pumps delivering to the containment shell. For the low flow case, a throttle valve is used to obtain a low flow rate less than the full capacity of the PCS recirculation pumps. This flow rate is then re-established for subsequent tests using the throttle valve. These benchmark values will be used to develop acceptance criteria for the Technical Specifications. The full flow condition is selected since it is

Table 6.2.1.1-2

INITIAL CONDITIONS

Internal Temperature (°F)	120
Pressure (psia)	15.7
Relative Humidity (%)	0
Net Free Volume (ft^3)	2.06E+06
External Temperature (°F)	115 dry bulb 86.1 wet bulb