Section 2.8
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Chapter 3

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V-178

SOUTH CAROLINA Energy Office

South Carolina Energy Office
radioactive waste disposal program

Commercial/ Industrial Sector

Public Sector

Utility Sector

Residential Sector

Transportation Sector

K-12 Education

Public Information

Sustainable Development/ Renewable Energy

Radioactive Waste Disposal Program

Questions and Feedback About the SCEO Site

Site Search

The Barnwell Facility is the only state-owned facility currently available to most of the nation for disposal of commercially-generated low-level radioactive waste. After June 30, 2008, the site will only accept waste from organizations located in South Carolina, Connecticut and New Jersey. In accordance with Federal guidelines (10 CFR 61.59) and State law (13-7-30 S.C.C.), the State of South Carolina accepts and assumes responsibility for ongoing monitoring, maintenance and custodial care of the site after it is closed.

Reading Room | DHEC | Atlantic Compact | Nuclear Advisory Council | Links

Notices

- Notice to all South Carolina Permittees Who Shipped Radioactive Waste to the Barnwell Disposal Site July 1, 2004 - June 30, 2005 NEW
- The Governor's Nuclear Advisory Council plans to meet Thursday, September 8, 2005, at 1:30 PM. More details to come. NEW

Barnwell Access Information

- How to send waste to Barnwell: Waste broker list
- Policy on disposal rates and site availability UPDATED
- DHEC forms for disposal at Barnwell
- Defining irradiated hardware for purposes of disposal
- Special Disposal Rates: Guidelines for proprietary information

Disposal Rate Schedules, effective July 1, 2005

- Atlantic Compact Alternative Rate Schedule NEW
- Atlantic Compact Maximum Uniform Rate Schedule NEW
- Non-Atlantic Rate Schedule NEW

Budget and Control Board Radioactive Waste Disposal Program

- Contact information for SC Offices, Atlantic Compact and Chem-Nuclear
- Responsibilities of the Budget and Control Board Disposal Program
- Distribution of Disposal Dollars, FY04 (detailed table)
- Distribution of Disposal Dollars, FY03 (detailed table)
- Radioactive waste disposal data base

Links to Others

- Governor's Nuclear Advisory Council
- Atlantic Compact Commission
- SC Department of Health and Environmental Control - Bureau of Land and Waste Management
- Chem-Nuclear Systems
- Low-Level Radioactive Waste Forum
- National Center for Interstate Compacts
- National Directory of Waste Brokers and Processors
- National Conference of State Legislatures
- Conference of Radiation Control Program Directors
- Radiation Information Network
- Nuclear Regulatory Commission
- Environmental Protection Agency - Office of Air and Radiation
- Utah Division of Radiation Control, LLRW Section
- National Council on Radiation Protection and Measurements
- Sierra Club - South Carolina Chapter
- Nuclear Energy Institute
- Electric Power Research Institute
- Radwaste.org

You will need Adobe Acrobat Reader to view some links on this page.

This program is part of the:

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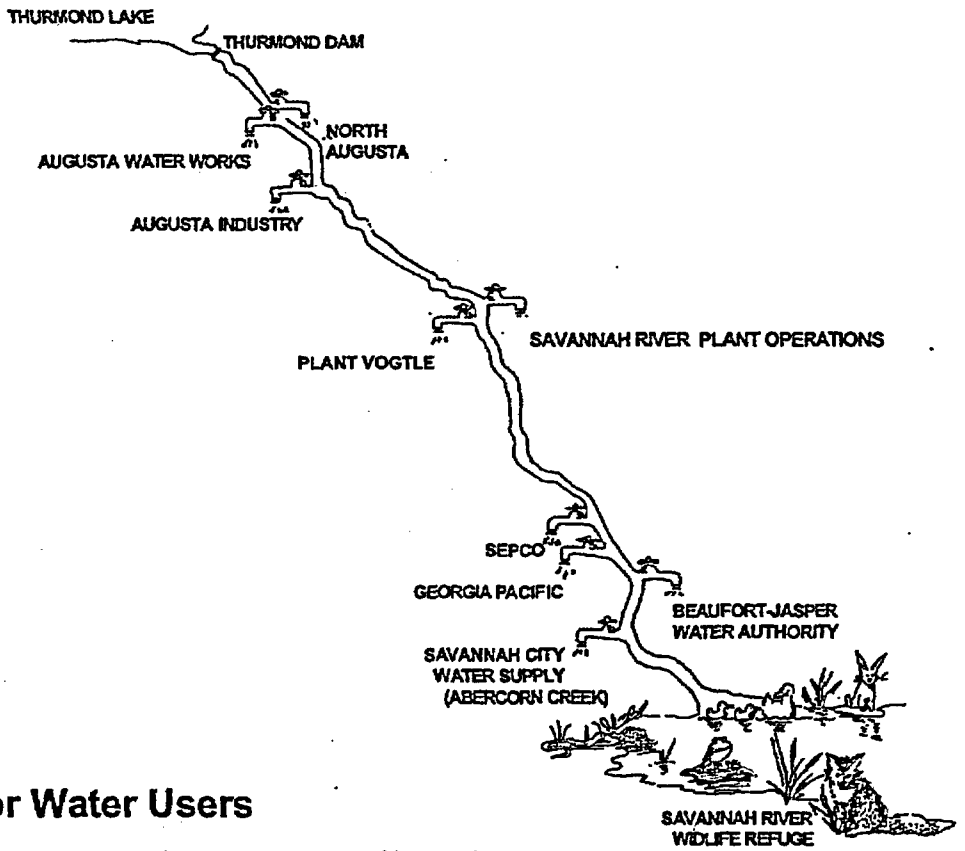
(USACE no date.)
Section 2.8

V-311

US Army Corps of Engineers
Savannah District

Water Users
Savannah River Basin Fact Sheet



Major Water Users

Providing water supply to area communities and industries is a very important function of Hartwell, Russell and Thurmond Lakes. However, many people are unaware that the lakes and dams also work together in providing water supply needs below Thurmond Dam all the way to Savannah, Georgia. In fact, the majority of major water users on the Savannah River are on the Georgia side, below Augusta. 80% of the water used is cleaned and returned to the river. The Savannah River National Wildlife Refuge also needs a steady flow of fresh water to preserve the ecological balance within its freshwater ponds, located near the mouth of the Savannah River.

Hartwell Dam & Lake
P.O. Box 278
5625 Anderson Highway
Hartwell, GA 30643-0278
706-856-0300
1-888-893-0678
www.sas.usace.army.mil/lakes/hartwell

Richard B. Russell Dam & Lake
4144 Russell Dam Drive
Elberton, GA 30635-9271
706-213-3400
1-800-944-7207
www.sas.usace.army.mil/lakes/russell

J. Strom Thurmond Dam & Lake
Rt. 1, Box 12
Highway 221
Clarks Hill, SC 29821-9703
864-333-1100
1-800-533-3478
www.sas.usace.army.mil/lakes/thurmond

(USACE 2004)
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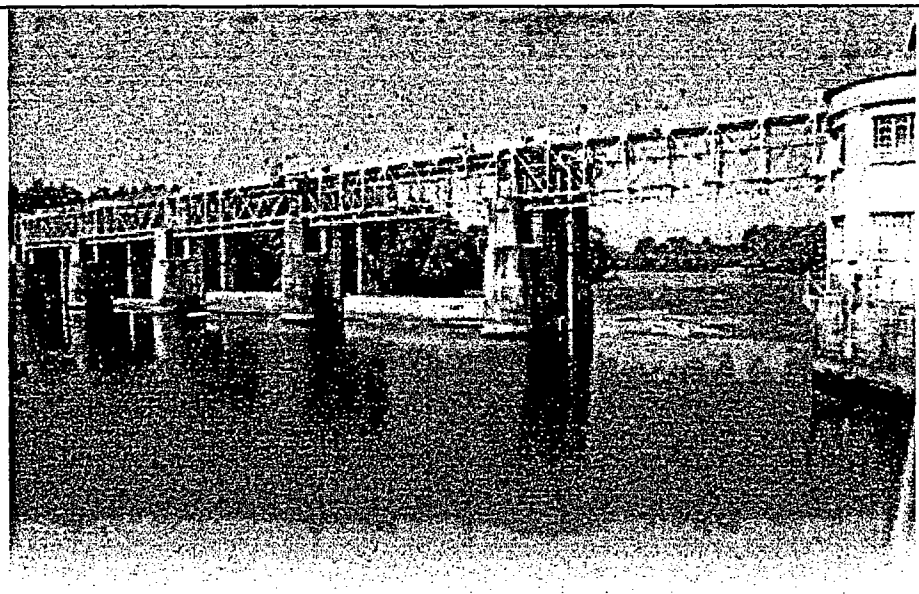
CONSTRUCTION GENERAL



NEW SAVANNAH BLUFF LOCK AND DAM, GA

AUTHORITY	Original authorization was Flood Control Act 1970, Section 216 for commercial navigation purposes. Authorization for repair and transfer in WRDA 2000, amended by Omnibus Appropriations Act.
PURPOSE	■ Structure was completed in 1937 to serve commercial navigation on the Savannah River Below Augusta Navigation project. ■ Commercial navigation ceased in 1979. ■ Structure serves critical need by maintaining constant pool elevation, which serves both municipal and industrial water supply intakes and boat races and regattas, even during periods of low flow. ■ Amend 216 study to address repair of the facility, addition of a fish-way and transfer of the facility to the City of N. Augusta and Aiken County, S.C.
POTENTIAL SPONSORS	■ Study is 100% Federally funded. Major stakeholders (City of Augusta, City of N. Augusta, Aiken Co. industries) are actively involved.
STUDY COST	PED Federal: $1,121,000 Non-Federal: 0 **Total**: $1,121,000 Section 216 Studies are 100% Federally funded.
SCHEDULE	■ Initiated Feasibility Phase July 1998 ■ Final Section 216 Feasibility Level Report - Oct. 2000 ■ Revised Section 216 Feasibility Level Report September 2002 ■ Addendum to the 216 Study consisting of 35% design and estimate ■ March 2003 ■ Completed 100% design on lock mechanical work – Sep 2003
STATUS	■ Report recommended deauthorization due to no cost sharing partners ■ Congressional action WRDA 2000 & Omnibus Appropriations Act for FY

	2001 ■ Authorize transfer of structure ■ Direct full repair of full Federal expense ■ Provide fish passage at full Federal expense ■ Complete Report with 35% design reflecting Congressional direction ■ Mar 2003 ■ Execute MOU with local interests - FY 05 ■ FY 2005 CG funds needed to initiate construction	
FEDERAL FUNDING	FY 04 (Work Allowance) $ 10,000 FY 05 (Budget) $ 0	
REMAINING SIGNIFICANT ACTIONS	Complete MOU, complete all design and construction.	
REMARKS	The refurbishing this of Lock and Dam to a serviceable level is needed to prevent failure of one or more Lock and Dam components. A failure of these components would eliminate recreational lockage through to Augusta, and would eliminate the Corps' ability to provide lockage to pass andromous fish upstream.	
MAP	Full size, high resolution (72 dpi)	Full size, higher resolution (150 dpi)
Congressional Fact Book		**March 2004**

[Return to Main Page]

DOE 2004

Volume 1

Study of Construction Technologies and Schedules, O&M Staffing and Cost, Decommissioning Costs and Funding Requirements for Advanced Reactor Designs

United States Department of Energy
Cooperative Agreement DE-FC07-03ID14492
Contract DE-AT01-020NE23476

Prepared by:

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MPR Associates

May 27, 2004

Study of Construction Technologies and Schedules, O&M Staffing and Cost, and Decommissioning Costs and Funding Requirements for Advanced Reactor Designs

Volume 1 Contents

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Volume 2 Contents

Glossary

3D CAD	Three Dimensional Computer-Aided Drafting
A&G	Administrative & General Cost
ABWR	Advanced Boiling Water Reactor
ALMR	Advanced Liquid Metal Reactor
ASCE	American Society of Civil Engineers
ACR-700	700 MWe Advanced CANDU Reactor
AECL	Atomic Energy of Canada, Limited
ALARA	As Low As Reasonably Achievable
ANO	Arkansas Nuclear One
AP1000	1200 MWe Advanced Passive Reactor
BWR	Boiling Water Reactor
BOP	Balance of Plant
BWR6	Sixth Generation Boiling Water Reactor
CANDU	Canadian Deuterium Reactor
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CII	Construction Industry Institute
CRDM	Control Rod Drive Mechanism
DECCER	A proprietary decommissioning estimating code
DECON	Soon after a nuclear facility closes, equipment, structures, and systems of the facility containing radioactive contaminants are removed or decontaminated to a level that permit release of the property and termination of the NRC license.
DOC	Decommissioning Operations Contractor
ENTOMB	Radioactive contaminants are encased in a structurally sound material such as concrete, and appropriately maintained and monitored until the radioactivity decays to a level permitting release of the site.
ESBWR	Economic Simplified Boiling Water Reactor
ESP	Engineering Support Personnel
ESP	Early Site Permit
EPA	Environmental Protection Agency
EUCG	Electric Utility Cost Group
FFD	Fitness for Duty
FFD	Friction Pendulum System
FSAR	Final Safety Analysis Report
GTCC	Greater Than Class C
HP	Health Physics
HVAC	Heating, Ventilation, Air Conditioning
I&C	Instrumentation and Control
ICI	Incore Instrumentation
INPO	Institute of Nuclear Power Operations
ISI	In-Service Inspection
IT	Information Technology
ITAAC	Inspection, Tests, Analyses, and Acceptance Criteria
'Just-in-time'	Delivery of critical components at the time of installation
LLRW	Low-Level Radwaste
LSA I, II, III	Low Specific Activity (category for transportation of radioactive waste)
LTP	License Termination Plan
LWA	Limited Work Authorization
MARSSIM	Multi-Agency Radiation Survey & Site Investigation Manual
MOU	Memorandum of Understanding
MWe	Megawatt Electric
MWt	Megawatt Thermal
'Nth'	nth unit is number 5 or more in a series production
NDE	Nondestructive Examination
NEI	Nuclear Energy Institute
NIST	National Institute of Standards and Technology

Golden et al 1980 (Section 4.3.1)

ENVIRONMENTAL IMPACT DATA BOOK

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AP1000 Siting Guide: Site Information for an Early Site Permit Application

CONTENTS

1 INTRODUCTION

Part of the EPRI Early Site Permit Demonstration Program was the development of a guide for site selection criteria and procedures. "Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application" has been issued to serve as a roadmap and tool for applicants to use in developing detailed siting plans for their specific region of the country.

This AP1000 document (APP-0000-X1-001) can be used in conjunction with the EPRI Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application for evaluating the siting of an AP1000 to a potential site. It also has sufficient information to support the plant/site interface portions of a Combined License application.

1.1 Background

In November 1990, the Nuclear Power Oversight Committee (NPOC) prepared a strategic plan for building new nuclear power facilities. An essential element in the strategy (Building Block 5) consisted of initiating a project to obtain Nuclear Regulatory Commission (NRC) approval through newly issued 10 CFR Part 52 (Early Site Permits; Standard Design Certifications and Combined Licenses for Nuclear Power Reactors). The plan was designed to be implemented either through attainment of an early site permit (ESP) or through the submission of, and NRC approval of, a combined construction and operating license (COL) application for a design certified ALWR under the NRC standardization rule. In 1990 Sandia National Laboratory issued a Request for Quotation to test the ESP process in a demonstration program. In early 1991, the Joint Contractors were formed and selected by the DOE through SNL to implement the Early Site Permit Demonstration Program. The Joint Contractors were assisted by the Electric Power Research Institute (EPRI) and the Nuclear Management and Resources Council (NUMARC) and developed a phased approach to the preparation, review, and application to NRC for acceptance of an early site permit. An output of this effort was the EPRI *Siting Guide*.

1.2 Purpose and Goals

The EPRI Siting Guide has been designed to be responsive to 10 CFR 52, 10 CFR 100, and related regulations and guidance, and form a framework or roadmap for an applicant to use in developing a detailed siting plan for a specific region of the country. The purpose and scope of this AP1000 siting information document (APP-0000-X1-001) is to provide specific AP1000 information relating directly to the Siting Guide. It is based upon providing information for a single AP1000. If siting a twin unit, values should be doubled except for the acreage required. To determine the amount of land area required for a twin station a site specific plot plan should be developed.

1.3 Report Structure

This section provides an overview of the balance of the report. Section 2.0 presents AP1000 design information in the same order and format as criteria are presented in Section 3 of the EPRI Siting Guide. The discussion of the bases for criteria and the use of design information is contained in the Siting Guide and not repeated here. Note that all data in this AP1000 document is reference in that the data is controlled in some other AP1000 design document. Section 3 of this AP1000 Siting Guide contains detailed site interface information not addressed in the EPRI Siting Guide. Section 4 contains other information identified as Plant Parameter Envelopes that are not covered in the balance of this document. Section 5 is an addition to the information presented in the EPRI siting Guide. The section contains a listing of the site related Combined License (COL) information items identified in the AP1000 Design Control Document. These COL information items are not necessarily required for an Early Site Permit, but they are required to be part of a COL for an AP1000. As such, this information will ultimately be required by NRC and should be considered in the planning for site licensing activities.

2
DETAILED DISCUSSION OF AP1000 SITING INFORMATION

This section provides detailed AP1000 siting information for each siting criterion of the EPRI Siting Guide. This information is presented so that it can be applied to an ESP or COL application anywhere in the continental United States. Accordingly, some "customization" of utility functions may be appropriate for specific regions; and some information may not be applicable for some siting applications.

Each applicant should also conduct a review of the materials in this document; the state siting, emergency planning, and environmental regulations applicable to the region of interest; and the physical characteristics of the region of interest.

Plant Parameters Envelopes (PPEs) define the envelope of the AP1000/site interface conditions that, if not satisfied by the site, may preclude locating AP1000 on the selected site. An ESP or COL applicant can utilize PPEs to represent a bound on whether an AP1000 can be considered for the site without further analysis and justification to NRC.

2.1 Health and Safety Criteria

2.1.1 Accident Cause-Related Criteria

2.1.1.1 Geology/Seismology

Current NRC regulations identify three geologic, seismologic, and soil parameters that must be evaluated to determine the suitability of prospective sites. First, the Safe Shutdown Earthquake (SSE) must be determined to establish a vibratory ground motion design basis, and detailed information regarding capable tectonic structures and sources are needed to determine the SSE. Second, the occurrence of, or potential for, surface faulting or deformation must be identified and evaluated to permit evaluation of site conditions with respect to standard facility designs. Third, other geologic conditions (e.g., geologic hazards and soil characteristics) that could affect the safety of a facility must also be evaluated.

The following site parameter criteria are intended to provide applicants with specific values included in the AP1000 Design Certification for use in ESP and COL application. The criteria discussed in the following geology/seismology sections provide a set of conditions within which an AP1000 can be sited without additional licensing.

2.1.1.1.1 *Vibratory Ground Motion*

See Section 4, Table Item 1.5.

2.1.1.1.2 *Capable Tectonic Structures or Sources*

The AP1000 Design Certification provides for no fault displacement potential within the investigative area.

2.1.1.1.3 *Surface Faulting and Deformation*

With regard to surface faulting and deformation, no absolute exclusionary criteria have been identified for AP1000 other than the fault displacement criteria addressed in 2.1.1.1.2.

2.1.1.1.4 *Geologic Hazards*

With regard to geologic hazards, no absolute exclusionary criteria have been identified for AP1000. Therefore, geologic hazards should be addressed as an avoidance criterion. The following geologic and related man-made conditions should be avoided in locating a facility:

- Areas of active (and dormant) volcanic activity;
- Subsidence areas caused by withdrawal of subsurface fluids such as oil or groundwater, including areas which may be effected by future withdrawals;
- Potential unstable slope areas, including areas demonstrating paleolandslide characteristics;
- Areas of potential collapse (e.g., karstic areas in limestone, salt, or other soluble formations);
- Mined areas, such as near-surface coal mined-out areas, as well as areas where resources are present and may be exploited in the future;
- Areas subject to seismic and other induced water waves and floods.

2.1.1.1.5 *Soil Stability*

With regard to soil stability, the AP1000 structural design is based on the AP600 design. AP600 has an average allowable static soil bearing capacity requirement of 8000 pounds per square inch or greater and a shear wave velocity requirement of 1000 ft/sec or greater. The current AP1000 Design Certification is based upon a rock foundation with the average allowable soil bearing capacity to be greater than or equal to 8400 lb/ft^2 over the footprint of the nuclear island at its excavation depth. The shear wave velocity shall be greater than or equal to 3500 ft/sec based upon low-strain, best-estimate soil properties over the footprint of the nuclear island at its excavation depth. There are no constraints on soils surrounding the nuclear island. No liquefaction potential is assumed. We expect to expand the licensed soil stability requirements for AP1000 to be at least those of AP600 at the time of Combined License application or before.

2.1.1.2 Cooling System Requirements

Since AP1000 is a passive nuclear plant, it requires no safety-related heat sink to reach safe shutdown other than the water contained in its passive cooling system tank located atop the reactor building. Thus a safety-related ultimate heat sink system similar to traditional nuclear plants is not required. The ultimate heat sink for a passive plant is air, which is motivated by natural convection over the containment vessel.

The AP1000 has two nonsafety-related systems for discharging waste heat from the plant. These are a conventional circulating water system to remove the waste heat related to power production and a smaller service water system. The service water system in AP1000 has its own cooling tower, which is separate from the circulating water system. The circulating water system pump discharge lines connect to a common header which connects to the inlet water boxes of the condenser as well as supplies cooling water to the Turbine Cooling System (TCS) and condenser vacuum pump seal water heat exchangers.

AP1000 circulating water requirements can vary greatly depending on site specific conditions and limitations. The AP1000 requires no more or no less circulating water than any other similarly sized nuclear plant. Essentially the plant needs to reject approximately 2/3 of 3415 MWt or about 2270 MWt. If the plant uses a cooling tower, site ambient air temperature and humidity conditions, and the design rise across the cooling tower / condenser are needed to estimate the required flow rate. (A very rough estimate is that the required flow rate is somewhere between 450,000 gpm to 850,000 gpm). The AP1000 design used as a reference for Design Certification assumes a circulating water system with a cooling tower, a flow rate of 600,000 gpm, and a 25.2 °F range.

Make-up for a circulating water system that utilizes a cooling tower can be estimated to be up to 4% of the circulating water flow rate.

The service water system consists of two 100-percent-capacity service water pumps, automatic backwash strainers, a two-cell cooling tower with a divided basin, and associated piping, valves, controls, and instrumentation.

The service water pumps, located in the turbine building, take suction from piping which connects to the basin of the service water cooling tower. Service water is pumped through strainers to the component cooling water heat exchangers for removal of heat. Heated service water from the heat exchangers then returns through piping to a mechanical draft cooling tower where the system heat is rejected to the atmosphere. Cool water, collected in the tower basin, flows through fixed screens to the pump suction piping for recirculation through the system.

NOMINAL SERVICE WATER FLOWS AND HEAT LOADS AT DIFFERENT OPERATING MODES

	Component Cooling Water Pumps and Heat Exchangers	SWS Pumps and Cooling Tower Cells (Number Normally is Service)	Flow (gpm)	Heat Transferred (Btu/hr)
Normal Operation (Full Load)	1	1	8,000	83×10^6
Cooldown	2	2	16,000	296×10^6 (148×10^6 per cell)
Refueling (Full Core Offload)	2	2	16,000	74×10^6
Plant Startup	2	2	16,000	96×10^6
Minimum to Support Shutdown Cooling and Spent Fuel Cooling	2	2	14,400	240×10^6 (120×10^6 per cell)

A small portion of the service water flow is normally diverted to the circulating water system (CWS) basin. This blowdown is used to control levels of solids concentration in the SWS. [An alternate blowdown flow path is provided to the waste water system (WWS) for times when the CWS is not operating.] This design affords a single blowdown interface from the CWS to the site.

Make-up for the service water cooling tower is estimated to be 80 gpm nominally. Potable water and sanitary drain requirements can be estimated based on the assumption that there may be up to 300 operating personnel required for the first single unit and up to 420 operating personnel required for the first twin unit. The AP1000 design for these systems is based upon 1000 persons on site and 100 gallons/day/person.

2.1.1.2.1 Cooling Water Supply

PPE Section	Requirement	AP1000 Value
2.7.15	Makeup Flow Rate (Closed Cycle Systems)	See Section 4, Table Item 2.7.15
2.7.16 2.8.15 2.10.11	Maximum Consumption of Raw Water (Closed Cycle System)	See Section 4, Table Items 2.7.16, 2.8.15 and 2.10.11

PPE Section	Requirement	AP1000 Value
2.7.17 2.8.16 2.10.12	Monthly Average Consumption of Raw Water (Closed Cycle Systems)	See Section 4, Table Items 2.7.17, 2.8.16 and 2.10.12
2.9.2	Cooling Water Flow Rate (Cooling Tower)	See Section 4, Table Item 2.9.2

2.1.1.2.2 Ambient Temperature Requirements

PPE Section	Requirement	AP1000 Value
2.1.1	Normal Maximum Ambient Temperature with 1% Exceedance	See Section 4, Table Item 2.1.1
2.1.2	Normal Maximum Wet Bulb Temperature with 1% Exceedance	See Section 4, Table Item 2.1.2
2.1.3	Normal Minimum Ambient Temperature with 1% Exceedance	See Section 4, Table Item 2.1.3
2.1.5	Maximum Safety Ambient Temperature with 0% Exceedance	See Section 4, Table Item 2.1.5
2.1.6	Maximum Safety Wet Bulb Temperature with 0% Exceedance	See Section 4, Table Item 2.1.6
2.1.7	Minimum Safety Ambient Temperature with 0% Exceedance	See Section 4, Table Item 2.1.7
2.7.3 2.8.2	Approach Temperature	See Section 4, Table Items 2.7.3 and 2.8.2

2.1.1.3 Flooding

The maximum flood level assumed for AP1000 is the plant design grade elevation. The standard grid coordinate system for AP1000 labels plant grade as plant elevation 100 ft. Structural analyses have assumed grade to be at 100 ft. Actual grade will be a few inches lower to prevent surface water from entering doorways.

Adverse effects of flooding due to high water or ice effects do not have to be considered for site-specific non-safety-related structures and water sources outside the scope of the certified AP1000 design. Flooding of intake structures, cooling canals, or reservoirs or channel diversions would not prevent safe operation of the plant.

2.1.1.4 Nearby Hazardous Land Uses

AP1000 has no specific requirements or restrictions on nearby land use over and above those generally imposed by NRC for plants of this type. There are design provisions for detection of aerosols that may be toxic to the main control room staff and there are combined license applicant action items requiring identification of nearby hazardous land use.

2.1.1.5 Extreme Weather Conditions

See Section 4, Table Item 1.

2.1.1.5.1 Winds

The design wind is specified as a basic wind speed of 145 mph with an annual probability of occurrence of 0.02 based on the most severe location identified in American Society of Civil Engineers," Minimum Design Loads for Buildings and Other Structures," ASCE 7-98. This wind speed is the 3 second gust speed at 33 feet above the ground in open terrain (ASCE 7-98, exposure C). This basic wind speed of 145 mph is the 3 second gust speed that has become the basis of wind design codes since 1995. It corresponds to the 110 mph fastest mile wind used as the basis for the AP600 design in accordance with the 1988 edition of ASCE 7-98. Higher winds with a probability of occurrence of 0.01 are used in the design of seismic Category I structures by using an importance factor of 1.15.

2.1.1.5.2 Precipitation

There are no additional AP1000 requirements or restrictions.

2.1.2 Accident Effects-Related

2.1.2.1 Population

There are no additional or specific AP1000 requirements or restrictions related to population concentration or distribution. See Section 4, Table Item 9.6.6.

2.1.2.2 Emergency Planning

There are no additional or specific AP1000 requirements or restrictions related to emergency planning.

2.1.2.3 Atmospheric Dispersion

See Section 4, Table Item 9.1.

2.1.3 Operational Effects-Related

2.1.3.1 Surface Water – Radionuclide Pathway

See Section 4, Table Item 10.1.

There are no additional or specific AP1000 requirements or restrictions related to radionuclide pathways.

2.1.3.1.1 Dilution Capacity

There are no additional or specific AP1000 requirements or restrictions related to dilution capacity.

2.1.3.1.2 Baseline Loadings

There are no additional or specific AP1000 requirements or restrictions related to baseline loadings.

2.1.3.1.3 Proximity to Consumptive Users

There are no additional or specific AP1000 requirements or restrictions related to proximity of consumptive users.

2.1.3.2 Groundwater Radionuclide Pathway

There are no additional or specific AP1000 requirements or restrictions related to the groundwater radionuclide pathway.

2.1.3.3 Air Radionuclide Pathway

There are no additional or specific AP1000 requirements or restrictions related to air radionuclide pathway.

2.1.3.3.1 Topographic Effects

There are no additional or specific AP1000 requirements or restrictions related to the site topography as it relates to air radionuclide pathway.

2.1.3.3.2 Atmospheric Dispersion

See Section 4, Table Item 9.2.

2.1.3.4 Air-Food Ingestion Pathway

There are no additional or specific AP1000 requirements or restrictions related to the air-food ingestion pathway.

2.1.3.5 Surface Water – Food Radionuclide Pathway

There are no additional or specific AP1000 requirements or restrictions related to the use of irrigation waters in downstream areas is a potential pathway for radionuclides.

2.1.3.6 Transportation Safety

There are no additional or specific AP1000 requirements or restrictions related to potential impacts from facility operations on transportation safety that could occur as a result of increased hazards such as fog and ice from the operation of cooling systems (e.g., cooling towers and cooling reservoirs).

2.2 Environmental Criteria

2.2.1 Construction-Related Effects on Aquatic Ecology

2.2.1.1 Disruption of Important Species/Habitats

There are no additional or specific AP1000 requirements or restrictions related to the disruption of important species or habitats.

2.2.1.2 Bottom Sediment Disruption Effects

There are no additional or specific AP1000 requirements or restrictions related to bottom sediment disruption effects. The nature and extent of construction and cooling water related disruption is site specific.

2.2.1.2.1 Contamination

There are no additional or specific AP1000 requirements or restrictions related to contamination.

2.2.1.2.2 Grain Size

There are no additional or specific AP1000 requirements or restrictions related to grain size.

2.2.2 Construction-Related Effects on Terrestrial Ecology

2.2.2.1 Disruption of Important Species/Habitats and Wetlands

There are no additional or specific AP1000 requirements or restrictions related to construction-related effects on terrestrial ecology.

2.2.2.1.1 Important Species/Habitats

There are no additional or specific AP1000 requirements or restrictions related to construction-related effects on important species or their habitats.

2.2.2.1.2 Groundcover/Habitat

There are no additional or specific AP1000 requirements or restrictions related to construction related effects on groundcover.

2.2.2.1.3 Wetlands

There are no additional or specific AP1000 requirements or restrictions related to construction-related effects on wetlands.

2.2.2.2 Dewatering Effects on Adjacent Wetlands

During construction, dewatering is required for AP1000 to the depth of 40 feet below the working grade elevation for the excavation of the Nuclear Island. The footprint of this excavation is an irregular rectangle about 260 feet by 160 feet. In addition, dewatering will be required for the site specific circulating water system. At a minimum this excavation will include the condenser waterbox sump under the turbine building, the circulating water pipe trench and the pump house or cooling tower sump. After plant completion, dewatering is not required.

2.2.2.2.1 Depth to Water Table

See Section 4, Table Item 1.8.2.

2.2.2.2.2 Proximal Wetlands

There are no additional or specific AP1000 requirements or restrictions related to the proximity of wetlands.

2.2.3 Operational-Related Effects on Aquatic Ecology

2.2.3.1 Thermal Discharge Effects

2.2.3.1.1 *Migratory Species Effects*

There are no additional or specific AP1000 requirements or restrictions related to potential effects on migratory species water and land use during construction.

2.2.3.1.2 *Disruption of Important Species/Habitats*

There are no additional or specific AP1000 requirements or restrictions related to the disruption of important species or their habitats during plant operation.

2.2.3.1.3 *Water Quality*

Most of the values presented below for AP1000 are estimates for use in preliminary site investigations. AP1000 is designed to be adaptable to a variety of cooling water sources. Details of blowdown rates, constituents and concentrations will be site specific. They are a function of the type of cooling (cooling tower or once through), the inlet water quality and the cycles of concentration. Once-through discharge temperature and temperature rise will most likely be dictated by inlet temperature, inlet flow rate and local environmental regulations. The values presented should envelop most sites in the United States. They are as follows:

PPE Section	Requirement	AP1000 Value
2.7.4 2.8.3 2.10.2	Blowdown Constituents and Concentrations	See " Blowdown Constituents and Concentrations" table directly below this table
2.7.5 2.10.3	Blowdown Flow Rate (Mechanical Draft & Pond)	See Section 4, Table Items 2.7.5 and 2.10.3
2.8.4	Blowdown Flow Rate (Natural Draft)	See Section 4, Table Item 2.8.4
2.7.6 2.8.5 2.10.4	Blowdown Temperature (Closed Cycle)	See Section 4, Table Items 2.7.6, 2.8.5 and 2.10.4
2.7.9 2.8.8 2.10.7	Cycles of Concentration (Closed Cycle)	See Section 4, Table Items 2.7.9, 2.8.8 and 2.10.7
2.9.1	Cooling Water Discharge Temp (Once-	See Section 4, Table Item 2.9.1

PPE Section	Requirement	AP1000 Value
	through)	
2.9.3	Cooling Water Temperature Rise (Once-through)	See Section 4, Table Item 2.9.3
2.9.5	Heat Rejection Rate (Once-through)	See Section 4, Table Item 2.9.5

Blowdown Constituents and Concentrations

Constituent	Concentration (ppm)[1]		
	River Source	Well/Treated Water	Envelope
Chlorine demand	10.1	--	10.1
Free available chlorine	0.5	--	0.5
Chromium	--	--	--
Copper	--	6	6
Iron	0.9	3.5	3.5
Zinc	--	0.6	0.6
Phosphate	--	7.2	7.2
Sulfate	599	3,500	3,500
Oil and grease	--	--	--
Total dissolved solids	--	17,000(1)	17,000(1)
Total suspended solids	49.5	150	150
BOD, 5-day	--	--	--

(1) Assumed cycles of concentration equals 4

These parameters define the thermal and water quality impacts that cooling system blowdown effluents will have on the receiving water body for the various cooling system configurations.

2.2.3.2 Entrainment/Impingement Effects

2.2.3.2.1 Entrainable Organisms

There are no additional or specific AP1000 requirements or restrictions related to entrainable organisms.

2.2.3.3 Dredging/Disposal Effects

2.2.3.3.1 Upstream Contamination Sources

There are no additional or specific AP1000 requirements or restrictions related to potential upstream contamination sources.

2.2.3.3.2 Sedimentation Rates

There are no additional or specific AP1000 requirements or restrictions related to sedimentation rates.

2.2.4 Operational-Related Effects on Terrestrial Ecology

2.2.4.1 Drift Effects on Surrounding Areas

2.2.4.1.1 Important Species Habitat Areas

There are no additional or specific AP1000 requirements or restrictions related to the plants operational drift effects on important species habitat areas.

2.2.4.1.2 Source Water Suitability

There are no additional or specific AP1000 requirements or restrictions related to the drift effects of site source water including evaporation rate and concentrations of dissolved solids.

2.3 Socioeconomics Criteria

The siting, construction and operation of a nuclear power station can place stresses on the local labor supply, transportation facilities, and community services. An evaluation of suitability of nuclear power station sites should include an assessment of impacts of construction and operation, including transmission and transportation corridors, and potential problems relating to community services (e.g., schools, police and fire protection, water and sewage, and health facilities).

Incompatible land uses, referred to as "nearby hazardous land uses," are discussed in Section 3.1.1.4. The following sections discuss the socioeconomic and environmental justice criteria associated with construction and operation of a nuclear power facility.

2.3.1 Socioeconomic - Construction Related Effects

See Section 4, Table Item 29.4.

There are no additional or specific AP1000 requirements or restrictions related to construction workforce or other construction related socioeconomic effects.

2.3.2 Socioeconomics – Operation

The operation of a single AP1000 requires a labor force of about 300 skilled workers (including security personnel and an allowance for attrition) for the first plant and about 200 each for follow plants. If twins are paced on one site the first twin requires about 420 skilled workers (including security personnel and an allowance for attrition) and follow twins require about 320.

2.3.3 Environmental Justice

There are no additional or specific AP1000 requirements or restrictions related to environmental justice

2.3.4 Land Use

There are no additional or specific AP1000 requirements or restrictions related to land use. Land uses that are incompatible with nuclear power facilities because of the hazards they pose to safe operation are categorized as "nearby hazardous land uses;" these are discussed in Section 2.1.1.4.

2.4 Engineering and Cost-Related Criteria

This section addresses those criteria that are cost-sensitive. Consideration of these criteria allows important site-related cost differentials to be considered in the site selection process. Because of the amount of detailed design work incorporated into the AP1000 design, cost estimates for it should be considered relatively reliable. This is due to the amount of reusable design created for AP600 and the resulting detailed bill of material developed during the design phase.

Cost estimates specified in these criteria should be developed in constant-year dollars, taking into account timing of each expense and a consistent discount rate. For example, a "present value" for operational costs such as water pumping and transmission losses should be developed so these costs can be directly compared with construction costs. All costs should be discounted to a single year.

2.4.1 Health and Safety Related Criteria

A number of these issues are also addressed in Section 3.1 and from a site suitability perspective, it may be helpful to revisit these evaluations as part of the development of the Engineering and Cost-Related criteria. Correlation with the health and safety utility functions may be helpful in evaluating cost.

2.4.1.1 Water Supply

There are no additional or specific AP1000 requirements or restrictions related to the cost of water supply. The analysis in this section addresses the costs associated with supplying the facility water requirements, in light of future, competitive, non-facility consumption rates.

2.4.1.2 Pumping Distance

There are no additional or specific AP1000 requirements or restrictions related to the cost of constructing pumping stations and infrastructure developments necessary to transport water from the source to the site.

2.4.1.3 Flooding

Flooding was initially treated in Section 2.1.1.3. The site storm drain system should be adequate to remove expected precipitation without flooding. There are no additional or specific AP1000 requirements or restrictions related to the cost of flooding protection.

2.4.1.4 Vibratory Ground Motion

For the AP1000, site cost increments that are a function of Peak Ground Acceleration do not exist as a result of standardization. There may a cost associated with site soil preparation for foundations of non-safety-related buildings or construction load paths.

2.4.1.5 Soil Stability

Soil stability was initially treated in Section 2.1.1.1.4 from the standpoint of soil properties and their relationship to the suitability of foundation conditions. For this criterion, the applicant should estimate the cost of site-specific foundation design features and associated construction requirements that might arise from soil conditions (e.g., slope stability).

2.4.1.6 Industrial Site Remediation

The purpose of this criterion is to capture costs associated with any environmental cleanup activities, that may be required at industrial sites before they can be developed for a nuclear power facility. There are no additional or specific AP1000 requirements or restrictions related to the cost of remediation.

2.4.2 Transportation or Transmission-Related Criteria

AP1000 has been designed to allow shipment by rail. It is preferable to ship larger units (assembled from the rail shippable units) by barge. An access and transportation plan will be

required for each site to optimize the balance between offsite fabrication, shipping and onsite assembly. See Section 4, Table Item 29.1.

2.4.2.1 Railroad Access

See 2.4.2 above. An adequate railroad spur is recommended, but not required.

2.4.2.2 Highway Access

There are no additional or specific AP1000 requirements or restrictions related to highway access.

2.4.2.3 Barge Access

See 2.4.2 above. Adequate barge and load handling facilities will be required if barge delivery is appropriate for the site in question.

2.4.2.4 Transmission Cost and Market Price Differentials

2.4.2.4.1 Transmission Construction

AP1000 has no requirement for redundant connections to transmission grids. There are no additional or specific AP1000 requirements or restrictions related to transmission.

2.4.2.4.2 Electricity Market Price Differentials

There are no additional or specific AP1000 requirements or restrictions related to electricity market price differentials.

2.4.3 Criteria Related to Land Use and Site Preparation

2.4.3.1 Topography

The standard AP1000 design is based upon a relatively level site. Site plot plans for a variety of circulating water supply options are shown on AP1000 drawings APP-0000-X2-010 through APP-0000-X2-022. The standard AP1000 plot plans showing construction laydown, access and assembly areas are AP1000 drawings APP-0000-X2-810 through APP-0000-X2-822. The costs associated with any topographic features that would translate into site-specific differences in site preparation costs. For example, extensive cutting and filling, grading, and blasting could be factors that differentiate among sites.

2.4.3.2 Land Rights

There are no additional or specific AP1000 requirements or restrictions related to land rights.

2.4.3.3 Labor Rates

A significant portion of AP1000 can be fabricated in a shop or shipyard. This reduces the expected amount of site labor for a plant of this type and size. The impact of this construction approach may require negotiations with impacted labor unions both at the site and at the fabrication factories.

3
ADDITIONAL DETAIL SITE INTERFACES

3.1 Security Criteria

The AP1000 Design Certification is based upon the existence of an adequate site boundary security system. There are no additional or specific AP1000 requirements or restrictions related to land rights.

3.2 Grounding and Lightning Criteria

The AP1000 Design Certification is based upon the existence of an adequate station grounding system and a connection between it and the lightning protection system. There are no additional or specific AP1000 requirements or restrictions.

3.3 Raw Water Criteria

The AP1000 raw water treatment system will be based upon an adequate supply of surface water, clear well water or municipal water.

3.4 Detail Site Interface Dimensions

These AP1000 documents define detailed site interface dimensions.

AP1000 Document Number	Document Title
APP-0000-X2-010	AP1000 Single Unit Site Plot Plan Plant with Pumphouse
APP-0000-X2-011	AP1000 Single Unit Site Plot Plan Plant with Cooling Tower
APP-0000-X2-020	AP1000 Twin Unit Site Plot Plan with Separate Pumphouses
APP-0000-X2-021	AP1000 Twin Unit Site Plot Plan with Common Pumphouse
APP-0000-X2-022	AP1000 Twin Unit Site Plot Plan with Cooling Tower
APP-0000-X2-810	AP1000 Single Unit Construction Plot Plan Plant with Pumphouse

APP-0000-X2-811	AP1000 Single Unit Construction Plot Plan Plant with Cooling Tower
APP-0000-X2-820	AP1000 Twin Unit Construction Plot Plan with Separate Pumphouses
APP-0000-X2-821	AP1000 Twin Unit Construction Plot Plan with Common Pumphouse
APP-0000-X2-822	AP1000 Twin Unit Construction Plot Plan with Cooling Towers
APP-0000-X4-901	AP1000 Plant Grid Coordinates & Column Line Identification View A-A
APP-0000-X4-902	AP1000 Plant Grid Coordinates & Column Line Identification Views B-B
APP-0000-X4-903	AP1000 Plant Grid Coordinates & Column Line Identification Views C-C
APP-0030-X4-001	AP1000 Plant Grid Coordinates & Column Line Identification Plan
APP-0031-X4-001	Yard Arrangement Fuel Tank Storage/Transfer Facility
APP-0031-X4-002	Plant Grid Coordinates for Fuel Tank Storage/Transfer Facility Plan
APP-0035-X4-001	Yard Arrangement CWS Cooling Tower
APP-00350-X4-001	Yard Arrangement CWS Cooling Tower Area
APP-0036-X4-001	Yard Arrangement Hydrogen Storage Tank Area
APP-00360-X4-001	Yard Arrangement Hydrogen Storage Tank Area
APP-0070-X4-001	AP1000 Plant Grid Coordinates & Roof Plan

3.5 Detail Fuel and Waste Shipping Information

3.5.1 Information on Annual Fuel Requirements

3.5.1.1 Standard Technical Configuration

Reactor Power	3400 MW_t
Plant Power	1117 – 1150 MW_e
Number of Plants per Unit	1

3.5.1.2 Expected Fuel Loading

Initial Core Fuel Loading	84.5 MTU

Annual Average Fuel Loading 24.4 MTU

3.5.1.3 Average Fuel Enrichment (initial load)

Region 1	2.35 weight % U-235
Region 2	3.40 weight % U-235
Region 3	4.45 weight % U-235

3.5.1.4 Fuel Form

Total mass	1730 lb/assembly
Uranium mass	0.5383 MTU/assembly
Volume (FA envelope)	13404.3 in^3
Outside Dimensions	8.426x8.426x188.8 in
Number of Assemblies (Initial)	157
Number of Assemblies (Reload)	68 on 18 month cycle

3.5.1.5 Fuel Materials

Fuel	211,588 lb UO_2
Structure and Cladding	43,105 lb Zircaloy or ZIRLO™
	270 lb Alloy 718 (top & bottom Grids for 157 assemblies)

3.5.1.6 Expected Typical Transport Truck

3.5.1.7 Fresh Fuel Transport Containers

Capacity	2 assemblies per container
Shipping	6 containers per truck

3.5.1.8 Fuel reload data:

Cycle Length	18 months - 520 EFPD @ 3400 MWT
Capacity Factor	95% including refueling outage
Reload fuel requirement	68 Fuel Assemblies
Average Enrichment	4.51 w/o U235

3.5.1.9 Spent fuel data:

At 5 years decay, the average spent fuel assembly curie content:

Actinides	8.506E+04 curies
Fission Products	4.450E+05 curies
Total	5.301E+05 curies

3.5.1.10 Spent fuel data:

At 5 years decay, the average spent fuel assembly curie content:

Actinides	8.506E+04 curies
Fission Products	4.450E+05 curies
Total	5.301E+05 curies

3.5.1.11 Spent Fuel Shipping Information

Quantity of spent fuel (MTU):

Truck Cask	To be provided later
Rail Car Cask	To be provided later

3.2.1.12 Average Fuel Burnup

Expected	21000 MWD/MTU (3400 MWt x 520 efpd / 84.5 MTU)
Design	60000 MWD/MTU

3.2.1.13 Estimate of Decay Heat in watts per MTU after 5 years of decay

While we use ORIGEN, we have not used it for decay heat calculation for AP1000. We therefore have estimated decay heat based on ANS 1979 standards, with 0 sigma margin, at five years to be 1.127E-4 watts/watt. With core power of 3400 MW and core loading of 84.5 MTU, the estimated specific decay heat for AP1000 is 4530 watts/MTU.

3.5.1.14 Estimates of spent fuel inventories and radioactivity

ORIGEN results for spent fuel inventories and radioactivity are addressed by AP1000 document APP-SSAR-GS2-496. This is based on one burned AP1000 assembly, decayed to 5 years. (Note that ORIGEN was run assuming a core loading of 83.6 MTU.) The 5 year decay data is in the last column (as label indicates). Also note that the inventory units are total Curies (based on 532337.6 grams for an assembly).

3.5.1 Information on Expected Low Level Waste Production

3.5.2.1 LLW Production

Volume	1964 cubic feet per year (average, as shipped)
Activity	1830 curies per year (average, as shipped)

3.5.2.2 LLW from Decommissioning

No AP1000 specific estimate has been made. Information from Sizewell indicates 6200 cubic meters of LLW from decommissioning. The AP1000 value should be significantly less (maybe half) considering the design differences.

4

OTHER PLANT PARAMETER ENVELOPES

Structure, System, Component			(Value)
1.	Structures		
	1.1	Foundation Embedment	39' 6" to bottom of Basemat from Plant Grade
	1.2	Height	234' 0"
	1.4	Precipitation (for Roof Design)	
		1.4.1 Maximum Rainfall Rate	19.4 in/hr (6.3 in/5 min)
		1.4.2 Snow Load	75 lbs/sq ft on ground with exposure factor of 1.0 and importance factor of 1.2 (safety) and 1.0 (non-safety)
	1.5	Safe Shutdown Earthquake (SSE)	
		1.5.1 Design Response Spectra	modified Regulatory Guide 1.60
		1.5.2 Peak Ground Acceleration	0.30g at base of foundation or at grade
		1.5.3 Time History	Envelope SSE Resp Spectra
		1.5.4 Fault Displacement Potential	None
	1.8	Site Water Level (Allowable)	
		1.8.1 Maximum Flood (or Tsunami)	Plant grade or plant elevation 100 feet. See Section 2.1.1.3
		1.8.2 Maximum Ground Water	Less than 98 feet with plant grade defined at 100 feet.
	1.9	Soil Properties Design Bases	
		1.9.1 Liquefaction	None. See Section 2.1.1.1.5
		1.9.2 Minimum Bearing Capacity (Static)	Greater than or equal to 8,000 pounds per square foot over the footprint of the nuclear island at its excavation depth. See Section 2.1.1.1.5
		1.9.3 Minimum Shear Wave Velocity	Greater than or equal to 1000 ft/sec based on low strain best estimate soil properties. See Section 2.1.1.1.5
	1.11	Tornado (Design Bases)	
		1.11.1 Maximum Pressure Drop	2.0 PSID
		1.11.2 Maximum Rotational Speed	240 MPH
		1.11.3 Maximum Translational Speed	60 MPH
		1.11.4 Maximum Wind Speed	300 MPH

Structure, System, Component			(Value)
	1.11.5	Missile Spectra	A 4000 pound automobile at 105 mph horizontal and 74 mph vertical, a 275 pound 8 inch shell at 105 mph horizontal and 74 mph vertical, and a 1 inch diameter steel ball at 105 mph horizontal and 105 mph vertical.
	1.11.6	Radius of Maximum Rotational Speed	150 ft
	1.11.7	Rate of Pressure Drop	1.2 psi/sec
1.12	Wind		
	1.12.1	Basic Wind Speed	145 MPH. See Section 2.1.1.5.1
	1.12.2	Importance Factors	See Section 2.1.1.5.1
2. Normal Plant Heat Sink			*Also see discussion in Section 2.1.1.2*
2.1	Ambient Air Requirements		
	2.1.1	Normal Shutdown Max Ambient Temp (1% Exceedance)	100 °F db/77 °F wb coincident
	2.1.2	Normal Shutdown Max Wet Bulb Temp (1% Exceedance)	80 °F wb non-coincident
	2.1.3	*Normal Shutdown Min Ambient* Temp (1% Exceedance)	-10 °F
	2.1.5	Rx Thermal Power Max Ambient Temp (0% Exceedance)	115 °F db/80 °F wb coincident
	2.1.6	Rx Thermal Power Max Wet Bulb Temp (0% Exceedance)	81 °F wb non-coincident
	2.1.7	Rx Thermal Power Min Ambient Temp (0% Exceedance)	-40 °F
2.2	Blowdown Pond Acreage		24 hr blowdown
2.3	Condenser/Heat Exchanger Duty		7.54E9 Btu/hr
2.6	Maximum Inlet Temp Condenser/Heat Exchanger		91 °F
2.7	Mech Draft Cooling Towers		Also see discussion in Section 2.1.1.2
	2.7.1	Acreage	25 acres
	2.7.3	Approach Temperature	10 °F
	2.7.4	Blowdown Constituents and Concentrations	See Section 2.2.3.1.3
	2.7.5	Blowdown Flow Rate (Circ and Service Water)	6000 (24,500 max) gpm
	2.7.6	Blowdown Temperature (Circ and Service Water)	100 °F
	2.7.7	Cooling Tower Temperature Range	25.2 °F
	2.7.8	Cooling Water Flow Rate	600,000 gpm (nominal)
	2.7.9	Cycles of Concentration	4

Structure, System, Component			(Value)
	2.7.10	Evaporation Rate (Circulating and Service Water)	15,000 gpm
	2.7.12	Heat Rejection Rate	7.54E9 Btu/hr
	2.7.13	Height	60 ft
	2.7.15	Makeup Flow Rate (Circulating and Service Water)	21,000 gpm
	2.7.16	Maximum Consumption of Raw Water (Circulating and Service Water)	30,000 gpm
	2.7.17	Monthly Average Consumption of Raw Water (Circulating and Service Water)	21,000 gpm
	2.7.18	Noise	55 dba at 1000 ft
	2.7.22	Stored Water Volume	7,000,000 gal
2.8	Natural Draft Cooling Towers		Also see discussion in Section 2.1.1.2
	2.8.1	Acreage	2.3 acres without basin
	2.8.2	Approach Temperature	10 °F
	2.8.3	Blowdown Constituents and Concentrations	See Section 2.2.3.1.3
	2.8.4	Blowdown Flow Rate (Circ and Service Water)	6,000 (24,500 max) gpm
	2.8.5	Blowdown Temperature (Circ and Service Water)	100 °F
	2.8.6	Cooling Tower Temperature Range	25.2 °F
	2.8.7	Cooling Water Flow Rate	600,000 gpm
	2.8.8	Cycles of Concentration	4
	2.8.9	Evaporation Rate (Circulating and Service Water)	15,000 gpm
	2.8.11	Heat Rejection Rate	7.54E9 Btu/hr
	2.8.12	Height	500 ft
	2.8.14	Makeup Flow Rate (Circulating and Service Water)	21,000 gpm
	2.8.15	Maximum Consumption of Raw Water (Circulating and Service Water)	30,000 gpm
	2.8.16	Monthly Average Consumption of Raw Water (Circulating and Service Water)	21,000 gpm
	2.8.17	Noise	55 dba at 1000 ft
	2.8.20	Stored Water Volume	5,500,000 gal

Structure, System, Component			(Value)
2.9	Once-Through Cooling		Also see discussion in Section 2.1.1.2
	2.9.1	Cooling Water Discharge Temperature	88 °F
	2.9.2	Cooling Water Flow Rate	850,000 gpm
	2.9.3	Cooling Water Temperature Rise	18 °F
	2.9.4	Evaporation Rate	14,500 gpm
	2.9.5	Heat Rejection Rate	7.76E9 Btu/hr. See Sections 2.1.1.2.
2.10	Ponds		Also see discussion in Section 2.1.1.2
	2.10.1	Acreage	Site Specific
	2.10.2	Blowdown Constituents and Concentrations	See Section 2.2.3.1.3
	2.10.3	Blowdown Flow Rate	Site Specific
	2.10.4	Blowdown Temperature	Site Specific
	2.10.5	Cooling Pond Temperature Range	Site Specific
	2.10.6	Cooling Water Flow Rate	Site Specific
	2.10.7	Cycles of Concentration	Site Specific
	2.10.8	Evaporation Rate	Site Specific
	2.10.9	Heat Rejection Rate	7.54E9 Btu/hr
	2.10.10	Makeup Flow Rate	Site Specific
	2.10.11	Maximum Consumption of Raw Water	Site Specific
	2.10.12	Monthly Average Consumption of Raw Water	Site Specific
	2.10.13	Stored Water Volume	Site Specific
3.	Ultimate Heat Sink		None. See Section 2.1.1.2
4.	Containment Heat Removal System (Post-Accident)		
4.1	Ambient Air Requirements		
	4.1.1	Maximum Ambient Air Temperature (0% Exceedance)	115 °F db/80 °F wb
	4.1.2	Minimum Ambient Temperature (0% Exceedance)	-40 °F
5.	Potable Water/Sanitary Waste System		
5.2	Discharge to Site Water Bodies		30,000 gal/day normal (single unit)
	5.2.1	Flow Rate	42,000 gal/day normal (twin unit) 100,000 gal/day (max)
5.4	Raw Water Requirements		
	5.4.1	Maximum Use	100,000 gal/day
	5.4.2	Monthly Average Use	30,000 gal/day normal (single unit) 42,000 gal/day normal (twin unit)

Structure, System, Component			(Value)
6.	Demineralized Water System		
	6.2 Discharge to Site Water Bodies		
		6.2.1 Flow Rate	25 expected (70 max) gpm
	6.4 Raw Water Requirements		
		6.4.1 Maximum Use	200 gpm
		6.4.2 Monthly Average Use	75 gpm
7.	Fire Protection System		
	7.1 Raw Water Requirements		
		7.1.1 Maximum Use	625 gpm
		7.1.2 Monthly Average Use	225,000 gal/mo (5 gpm)
		7.1.4 Stored Water Volume	775,000 gallons
8.	Miscellaneous Drain		
	8.2 Discharge to Site Water Bodies		
		8.2.1 Flow Rate	25 (50) gpm
9.	Unit Vent/Airborne Effluent Release Point		
	9.1 Atmospheric Dispersion (CHI/Q) (Accident)		
		9.1.1 0.5 mile, 0-2 hr	0.61E-3 sec/m^3
		9.1.2 2 mile, 0-8 hr	1.35E-4 sec/m^3
		9.1.5 2 mile, 8-24 hour	1.0E-4 sec/m^3
		9.1.3 2 mile, 1-4 day	5.4E-5 sec/m^3
		9.1.4 2 mile, 4-30 day	2.2E-5 sec/m^3
	9.2 Atmospheric Dispersion (CHI/Q) (Annual Average)		Site Boundary 2.0E-5 sec/m^3
	9.3 Containment Leakage Rate		0.5%/day (+35 scfh/ms line BWR only)
	9.5 Dose Consequences		
		9.5.1 Normal	10CFR20, 10CFR50 APP I
		9.5.2 Post-Accident	10CFR -20, -50 APP I, -100
		9.5.3 Severe Accidents	25 rem wb in 24 hr @ 0.5 mi <1E-6/rx-yr
	9.6 Release Point		
		9.6.1 Configuration (Horiz vs Vert)	Vertical
		9.6.3 Elevation (Normal)	160'
		9.6.4 Elevation (Post Accident)	Ground Level
		9.6.6 Minimum Distance to Site Boundary	0.5 mile
		9.6.7 Temperature	50-120 °F (estimate)
		9.6.8 Volumetric Flow Rate	171, 500 SCFM (Norm)
	9.7 Source Term		
		9.7.1 Gaseous (Normal)	See Table 4
		9.7.2 Gaseous (Post-Accident)	See Chap 15 Tables - Reg Guide 1.70
		9.7.4 Tritium	350 ci/yr

Structure, System, Component			(Value)
10. Liquid Radwaste System			
10.1	Dose Consequences		
	10.1.1	Normal	10 CFR 50, Appendix I 10 CFR 20
	10.1.2	Post-Accident	10 CFR 20 10 CFR 100
10.2	Release Point		
	10.2.1	Flow Rate	1.4 gpm average
10.3	Source Term		
	10.3.1	Liquid	0.26 ci/yr, see Table 5
	10.3.2	Tritium	1010 ci/yr
11. Gaseous Radwaste System			
12. Solid Radwaste System			
12.1	Acreage		
	12.1.1	Low Level Radwaste Storage	2 years @ expected generation rate 1 year @ maximum generation rate
12.2	Solid Radwaste		
	12.2.1	Activity	1630 ci/yr
	12.2.2	Principal Radionuclides	See Table 1
	12.2.3	Volume	1964 cu ft/yr avg expected shipped
13. Reactor Coolant System			
14. RCS Cleanup System			
15. CVCS Letdown Subsystem			
16. CVCS Purification Subsystem			
17. CVCS Shim/Bleed Subsystem			
18. Spent Fuel Storage			
18.3	Spent Fuel Dry Storage		
	18.3.1	Acreage	15 acres
	18.3.2	Minimum Distance to Nearest Residence	3500 ft
	18.3.3	Minimum Distance to Power Block	1500-2200 ft
	18.3.4	Storage Capacity	60 years dry storage
19. Steam Generator Blowdown System			
20. Standby-Gas Treatment System			
21. Auxiliary Boiler System			
21.1	Exhaust Elevation		150 ft above plant grade
21.2	Flue Gas Effluents		See Table 2
21.3	Fuel		
	21.3.2	Type	No. 2
21.4	Heat Input Rate (Btu/hr)		156,000,000 Btu/hr
22. Condensate Cleanup System			

Structure, System, Component			(Value)
23.	Gas Storage System		
24.	Heating, Ventilation and Air Conditioning System		
24.1	Ambient Air Requirements		
24.1.2	Non-safety HVAC max ambient temp (1% Exceedance)		100 °F db/77 °F wb coincident
24.1.3	Non-safety HVAC min ambient temp (1% Exceedance)		-10 °F
24.1.4	Safety HVAC max ambient temp (0% Exceedance)		115 °F db/80 °F wb coincident
24.1.5	Safety HVAC min ambient temp (0% Exceedance)		-40 °F
24.1.6	Vent System max ambient temp (5% Exceedance)		95 °F dry bulb/77 °F coincident wet bulb
	(1% Exceedance)		100 °F db/77 °F wb coincident
24.1.7	Vent System min ambient temp (5% Exceedance)		-5 °F
	(1% Exceedance)		-10 °F
25.	Onsite/Offsite Electrical Power System		
25.1	Acreage		
25.1.1	Switchyard		12 acres
25.3	Duty Cycles		35 peak-to-peak per day
26.	Standby Power System		
26.1	Diesel Capacity (kW)		2 x 4000 kW
26.2	Diesel Exhaust Elevation		50 ft
26.3	Diesel Flue Gas Effluents		See Table 3
26.4	Diesel Fuel		
26.4.1	Resupply Time		7 days
26.4.2	Type		No. 2 Oil Per ASTM D 975
26.5	Diesel Noise		55 dba at 1000 ft
26.6	Gas-Turbine Capacity (kW)		None
26.7	Gas-Turbine Exhaust Elevation		None
26.8	Gas-Turbine Flue Gas Effluents		None
26.9	Gas-Turbine Fuel		None
26.9.2	Type		
26.10	Gas-Turbine Noise		None
27.	Severe Accident Features		
28.	Plant Characteristics		
28.1	Access Routes		
28.1.3	Heavy Haul Routes		4 acres
28.1.5	Spent Fuel Cask Weight		100 tons
28.2	Acreage		27 acres

Structure, System, Component		(Value)
28.4	Megawatts - Thermal	3415 MWt
28.5	Plant Design Life	60 years
28.6	Plant Population	
28.6.1	Operation	About 300. See Section 2.3.2
28.6.2	Refueling	1000 people
28.9	Station Capacity Factor	93%

29. Construction

29.1	Access Routes	
29.1.1	Construction Module Dimensions	
	Shipping Dimensions (ft)	
	Reactor Vessel	22 (Dia) x 34 (L)
	Steam Generator	20 (Dia) x 80 (L)
	Turbine Rotor	18 (Dia) x 29 (L)
	Generator Stator	18 (Dia) x 40 (L)
	Modules by Rail	12(H) x 12(W) x 80(L)
	Modules by Barge	90(H) x 82(W) x 93(L) or 130(Dia) x 51(H)
29.1.2	Heaviest Construction Shipment	
	Heaviest Shipment Weight	
	Reactor Vessel	652,000 lbs
	Steam Generator	1,464,000 lbs
	Turbine Rotor	350,000 lbs
	Generator Stator	1,020,000 lbs
	Modules by Rail	160,000 lbs.
	Modules by Barge	1,900,000 lbs.
29.2	Acreage	
29.2.1	Laydown Area	10 acres
29.2.2	Temporary Construction Facilities	2.36 acres
29.3	Construction	
29.3.6	Noise	76-101 db @ 50 ft
29.4	Plant Population	
29.4.1	Construction	1200 monthly maximum
29.5	Site Preparation Duration	18 months with construction and test of 4 to 5 years

Table 1 Principal Radionuclides in Solid Radwaste[1]

Radionuclide	PWR (Ci/yr)
Fe-55	311.488
Fe-59	--
Co-60	287.256
Mn-54	22.428
Cr-51	0.29151
C0-58	62.289
Ni-63	316.386
H-3	1.6057
C-14	0.285
Nb-95	0.3233
Ag-110m	0.04604
Zr-95	0.07163
Ba-140	0.08725
Pu-241	0.114027
La-140	0.04011
Other	29.982
Total (rounded to nearest hundred)	1100

Notes:
(1) See PPE Section 12.2.2

Table 2 Yearly Emissions Auxiliary Boilers[1]

Pollutant Discharged[2]	AP600 Quantity (lbs)
Particulates	17,250
Sulfur oxides	51,750
Carbon monoxide	-
Hydrocarbons	50,100
Nitrogen oxides	

Notes:
(1) See PPE Section 21.2.
(2) Emissions are based on 30 days/year operation for each of the generators.

Table 3 Yearly Emissions From Diesel Generators (DG)[1]

Pollutant Discharged[2]	Two 4000 kW Standby DGs Quantity[2] (lbs)	Two 35 kW Ancillary DGs Quantity[2] (lbs)
Particulates	<800	<10
Sulfur Oxides	<2,500	<5
Carbon Monoxide	<1,000	<30
Hydrocarbons	<600	<11
Nitrogen oxides	<12,000	<140

Notes:
(1) See PPE Section 26.3.
(2) Emissions are based on 4 hrs/month operation for each of the generators.

Table 4
EXPECTED ANNUAL AVERAGE RELEASE OF AIRBORNE RADIONUCLIDES AS DETERMINED BY THE PWR-GALE CODE, REVISION 1 (RELEASE RATES IN Ci/yr)

Noble Gases[1]	Waste Gas System	Building/Area Ventilation			Condenser Air Removal System	Total
		Cont.	Auxiliary Building	Turbine Building		
Kr-85m	0.	3.0E+01	4.0E+00	0.	2.0E+00	3.6E+01
Kr-85	1.65E+02	2.4E+03	2.9E+01	0.	1.4E+01	4.1E+03
Kr-87	0.	9.0E+00	4.0E+00	0.	2.0E+00	1.5E+01
Kr-88	0.	3.4E+01	8.0E+00	0.	4.0E+00	4.6E+01
Xe-131m	1.42E+02	1.6E+03	2.3E+01	0.	1.1E+01	1.8E+03
Xe-133m	0.	8.5E+01	2.0E+00	0.	0.	8.7E+01
Xe-133	3.0E+01	4.5E+03	7.6E+01	0.	3.6E+01	4.6E+03
Xe-135m	0.	2.0E+00	3.0E+00	0.	2.0E+00	7.0E+00
Xe-135	0.	3.0E+02	2.3E+01	0.	1.1E+01	3.3E+02
Xe-138	0.	1.0E+00.	3.0E+00	0.	2.0E+00	6.0E+00
					Total	1.1E+04
Additionally:						
H-3 released via gaseous pathway						350
C-14 released via gaseous pathway						7.3
Ar-41 released via containment vent						34

Iodines[1]	Fuel Handling Area[2]	Building/Area Ventilation			Condenser Air Removal System	Total
		Cont.	Auxiliary Building	Turbine Building		
I-131	4.5E-03	2.3E-03	1.1E-01	0.	0.	1.2E-01
I-133	1.6E-02	5.5E-03	3.8E-01	2.0E-04	0.	4.0E-01

Radionuclide[1]	Waste Gas System	Building/Area Ventilation			Total
		Cont.	Auxiliary Building	Fuel Handling Area[2]	
Cr-51	1.4E-05	9.2E-05	3.2E-04	1.8E-04	6.1E-04
Mn-54	2.1E-06	5.3E-05	7.8E-05	3.0E-04	4.3E-04

Co-57	0.	8.2E-06	0.	0.	8.2E-06
Co-58	8.7E-06	2.5E-04	1.9E-03	2.1E-02	2.3E-02
C0-60	1.4E-05	2.6E-05	5.1E-04	8.2E-03	8.7E-03
Fe-59	1.8E-06	2.7E-05	5.0E-05	0.	7.9E-05
Sr-89	4.4E-05	1.3E-04	7.5E-04	2.1E-03	3.0E-03
Sr-90	1.7E-05	5.2E-05	2.9E-04	8.0E-04	1.2E-03
Zr-95	4.8E-06	0.	1.0E-03	3.6E-06	1.0E-03
Nb-95	3.7E-06	1.8E-05	3.0E-05	2.4E-03	2.5E-03
Ru-103	3.2E-06	1.6E-05	2.3E-05	3.8E-05	8.0E-05
Ru-106	2.7E-06	0.	6.0E-06	6.9E-05	7.8E-05
Sb-125	0.	0.	3.9E-06	5.7E-05	6.1E-05
Cs-134	3.3E-05	2.5E-05	5.4E-04	1.7E-03	2.3E-03
Cs-136	5.3E-06	3.2E-05	4.8E-05	0.	8.5E-05
Cs-137	7.7E-05	5.5E-05	7.2E-04	2.7E-03	3.6E-03
Ba-140	2.3E-05	0.	4.0E-04	0.	4.2E-04
Ce-141	2.2E-06	1.3E-05	2.6E-05	4.4E-07	4.2E-05

Notes:

1. The appearance of 0. in the table indicates less than 1.0 Ci/yr for noble gas or less than 0.0001 Ci/yr for iodine. For particulates, release is not observed and assumed less than 1 percent of the total particulate releases.
2. The fuel handling area is within the auxiliary building but is considered separately.

Table 5
RELEASES TO DISCHARGE CANAL (CI/YR) CALCULATED BY GALE CODE

Nuclide	Shim Bleed	Misc. Wastes	Turbine Building	Combined Releases	Total Releases[1]
Corrosion and Activation Products					
Na-24	0.00053	0.0[2]	0.00008	0.00061	0.00163
Cr-51	0.00068	0.0	0.0	0.00070	0.00185
Mn-54	0.00048	0.0	0.0	0.00049	0.00130
Fe-55	0.00037	0.0	0.0	0.00037	0.00100
Fe-59	0.00008	0.0	0.0	0.00008	0.00020
Co-58	0.00125	0.0	0.00001	0.00126	0.00336
Co-60	0.00016	0.0	0.0	0.00017	0.00044
Zn-65	0.00015	0.0	0.0	0.00015	0.00041
W-187	0.00004	0.0	0.0	0.00005	0.00013
Np-239	0.00008	0.0	0.0	0.00009	0.00024
Fission Products					
Br-84	0.00001	0.0	0.0	0.00001	0.00002
Rb-88	0.00010	0.0	0.0	0.00010	0.00027
Sr-89	0.00004	0.0	0.0	0.00004	0.00010
Sr-90	0.0	0.0	0.0	0.0	0.00001
Sr-91	0.00001	0.0	0.0	0.00001	0.00002
Y-91m	0.0	0.0	0.0	0.00001	0.00001
Y-93	0.00003	0.0	0.0	0.00002	0.00009
Zr-95	0.00010	0.0	0.0	0.00005	0.00023
Nb-95	0.00009	0.0	0.0	0.00005	0.00021
Mo-99	0.00028	0.0	0.00001	0.00013	0.00057
Tc-99m	0.00027	0.0	0.00001	0.00013	0.00055
Ru-103	0.00183	0.00001	0.00002	0.00185	0.00493
Rh-103m	0.00183	0.00001	0.00002	0.00185	0.00493
Ru-106	0.02729	0.00011	0.00021	0.02761	0.07352
Rh-106	0.02729	0.00011	0.00021	0.02761	0.07352
Ag-110m	0.00039	0.0	0.0	0.00039	0.00105
Ag-110	0.00005	0.0	0.0	0.00005	0.00014
Te-129m	0.00004	0.0	0.0	0.00005	0.00012
Te-129	0.00006	0.0	0.0	0.00006	0.00015
Te-131m	0.00003	0.0	0.0	0.00003	0.00009
Te-131	0.00001	0.0	0.0	0.00001	0.00003
I-131	0.00512	0.00004	0.00015	0.00531	0.01413
Te-132	0.00009	0.0	0.0	0.00009	0.00024
I-132	0.00054	0.00001	0.00007	0.00062	0.00164
I-133	0.00211	0.00003	0.00038	0.00252	0.00670
I-134	0.00030	0.0	0.0	0.00031	0.00081
Cs-134	0.00370	0.00001	0.00002	0.00373	0.00993
I-135	0.00144	0.00002	0.00041	0.00187	0.00497

Table 5
RELEASES TO DISCHARGE CANAL (CI/YR) CALCULATED BY GALE CODE

Nuclide	Shim Bleed	Misc. Wastes	Turbine Building	Combined Releases	Total Releases[1]
Cs-136	0.00023	0.0	0.0	0.00024	0.00063
Cs-137	0.00496	0.00001	0.00003	0.00500	0.01332
Ba-137m	0.00464	0.00001	0.00002	0.00468	0.01245
Ba-140	0.00203	0.00001	0.00003	0.00207	0.00552
La-140	0.00272	0.00002	0.00005	0.00279	0.00743
Ce-141	0.00003	0.0	0.0	0.00004	0.00009
Ce-143	0.00006	0.0	0.00001	0.00007	0.00019
Pr-143	0.00005	0.0	0.0	0.00005	0.00013
Ce-144	0.00117	0.0	0.00001	0.00119	0.00316
Pr-144	0.00117	0.0	0.00001	0.00119	0.00316
All others	0.00001	0.0	0.0	0.00001	0.00002
Total (except tritium)	0.09398	0.00043	0.00182	0.09623	0.25623
Tritium release		1010 curies per year			

Notes:
1. The release totals include an adjustment of 0.16 Ci/yr added by PWR-GALE code to account for anticipated operational occurrences such as operator errors that result in unplanned releases.
2. An entry of 0.0 indicates that the value is less than 10-5 Ci/yr.

5

SITE RELATED COMBINED LICENSE INFORMATION ITEMS

This section provides a listing of the Combined License (COL) information items identified in the AP1000 Design Control Document (DCD) that are site related. The AP1000 DCD (APP-GW-GL-700) includes identification of information items which must be provided to NRC during a COL application process. In addition to the site related items listed below there are items are related to additional detail in the plant design and to the COL applicant's organization information. It is important for a COL applicant to plan for the submittal of required site related COL information items and include planning for data acquisition in the Early Site Permit process. The following information items and their referenced DCD sections are site related and should be acknowledged during Early Site permit planning.

Item Number	Subject	DCD Subsection
2.1-1	Geography and Demography	2.1.1
	Combined License applicants referencing the AP1000 certified design will provide site-specific information related to site location and description, exclusion area authority and control, and population distribution. Site Information – Site-specific information on the site and its location will include political subdivisions, natural and man-made features, population, highways, railways, waterways, and other significant features of the area. Exclusion Area – Site-specific information on the exclusion area will include the size of the area and the exclusion area authority and control. Activity that may be permitted within the exclusion area will be included in the discussion. Population Distribution – Site-specific information will be included on population distribution.	
2.2-1	Identification of Site-specific Potential Hazards	2.2.1
	Combined License applicants referencing the AP1000 certified design will provide site-specific information related to the identification of potential hazards within the site vicinity, including an evaluation of potential accidents and verify that the frequency of site-specific potential hazards is consistent with the criteria outlined in Section 2.2. The site-specific information will provide a review of aircraft hazards, information on nearby transportation routes, and information on potential industrial and military hazards.	

2.3-1	Regional Climatology	2.3.6.1

Combined License applicants referencing the AP1000 certified designwill address site-specific information related to regional climatology.

2.3-2	Local Meteorology	2.3.6.2

Combined License applicants referencing the AP1000 certified design will address site-specific local meteorology information.

2.3-3	Onsite Meteorological Measurements Program	2.3.6.3

Combined License applicants referencing the AP1000 certified design will address the site-specific onsite meteorological measurements program.

2.3-4	Short-Term Diffusion Estimates	2.3.6.4

Combined License applicants referencing the AP1000 certified design will address the site-specific X/Q values specified in subsection 2.3.4.For a site selected that exceeds the boundingX/Q values, the Combined License applicant will address how the radiological consequences associated with the controlling design basis accident continue to meet the dose reference values given in 10CFR Part 50.34 and control room operator dose limits given in General Design Criteria 19 using site-specific X/Q values. The Combined License applicant should consider topographical characteristics in the vicinity of the site for restrictions of horizontal and/or vertical plume spread, channeling or other changes in airflow trajectories, and other unusual conditions affecting atmospheric transport and diffusion between the source and receptors. No further action is required for sites within the bounds of the site parameters for atmospheric dispersion.

2.3-5	Long-Term Diffusion Estimates	2.3.6.5

Combined License applicants referencing the AP1000 certified design will address long-term diffusion estimates andX/Q values specified in subsection 2.3.5. The Combined License applicant should consider topographical characteristics in the vicinity of the site for restrictions of horizontal and/or vertical plume spread, channeling or other changes in airflow trajectories, and other unusual conditions affecting atmospheric transport and diffusion between the source and receptors. No further action is required for sites within the bounds of the site parameter for atmospheric dispersion.

2.4-1	Hydrological Description	2.4.1.1

Combined License applicants referencing the AP1000 certified designwill describe major hydrologic features on or in the vicinity of the site including critical elevations of the nuclear island and access routes to the plant.

2.4-2	Floods	2.4.1.2

Combined License applicants referencing the AP1000 certified designwill address the following site-specific information on historical flooding and potential flooding factors, including the effects of local intense precipitation.

- Probable Maximum Flood on Stream and Rivers – Site-specific information that will be used to determine the design basis flooding at the site. This information will include the probable maximum flood on streams and

rivers.

- Dam Failures – Site-specific information on potential dam failures.
- Probable Maximum Surge and Seiche Flooding – Site-specific information on probable maximum surge and seiche flooding.
- Probable Maximum Tsunami Loading – Site-specific information on probable maximum tsunami loading.
- Flood Protection Requirements – Site-specific information on flood protection requirements or verification that flood protection is not required to meet the site parameter for flood level.

No further action is required for sites within the bounds of the site parameter for flood level.

2.4-3 Cooling Water Supply — 2.4.1.3

Combined License applicants will address the water supply sources to provide makeup water to the service water system cooling tower.

2.4-4 Groundwater — 2.4.1.4

Combined License applicants referencing the AP1000 certified design will address site-specific information on groundwater. No further action is required for sites within the bounds of the site parameter for ground water.

2.4-5 Site Effects of Accidental Release of Liquid Effluents in Ground and Surface Water — 2.4.1.5

Combined License applicants referencing the AP1000 certified design will address site-specific information on the ability of the ground and surface water to disperse, dilute, or concentrate accidental releases of liquid effluents. Effects of these releases on existing and known future use of surface water resources will also be addressed.

2.4-6 Flood Protection Emergency Operation Procedures — 2.4.1.6

Combined License applicants referencing the AP1000 certified design will address any flood protection emergency procedures required to meet the site parameter for flood level.

2.5-1 Basic Geologic and Seismic Information — 2.5.1

Combined License applicants referencing the AP1000 certified design will address the following site-specific geologic and seismic information:

- Regional and site physiography
- Geomorphology
- Stratigraphy
- Lithology

- Structural geology
- Tectonics

Seismicity

2.5-2 Site Seismic and Tectonic Characteristic Information — 2.5.2.1

Combined License applicants referencing the AP1000 certified design will address the following site-specific information related to seismic and tectonic characteristics of the site and region:

Correlation of earthquake activity with geologic structure or tectonic provinces

Maximum earthquake potential

Seismic wave transmission characteristics of the site

Safe shutdown earthquake (SSE) ground response spectra

The Combined License applicant must demonstrate that the proposed site meets the following requirements:

The free field peak ground acceleration at the foundation level is less than or equal to a 0.30g safe shutdown earthquake.

The site design response spectra at the foundation level in the free-field are less than or equal to those given in Figures 3.7.1-1 and 3.7.1-2.

2.5-3 Surface Faulting — 2.5.3

Combined License applicants referencing the AP1000 certified designwill address surface and subsurface geological and geophysical information including the potential for surface or near-surface faulting affecting the site.

2.5-4 Site and Structures — 2.5.4.6.1

Site and Structures – Site-specific information regarding the underlying site conditions and geologic features will be addressed. This information will include site topographical features, as well as the locations of seismic Category I structures.

2.5-5 Properties of Underlying Materials — 2.5.4.6.2

The Combined License applicant will establish the properties of the foundation soils to be within the range considered for design of the nuclear island basemat.

Properties of Underlying Materials – A determination of the static and dynamic engineering properties of foundation soils and rocks in the site area will be addressed. This information will include a discussion of the type, quantity, extent, and purpose of field explorations, as well as logs of borings and test pits. Results of field plate load tests, field permeability tests, and other special field tests (e.g., bore-hole extensometer or pressuremeter tests) will also be provided. Results of geophysical surveys will be presented in tables and profiles. Data will be provided pertaining to site-specific soil layers (including theirthicknesses, densities, moduli, and Poisson's ratios) between the basemat and the underlying rock stratum. Plot plans and profiles of site explorations will be provided.

Laboratory Investigations of Underlying Materials – Information about the number and type of laboratory tests and the location of samples used to investigate underlying materials will be provided. Discussion of the results of laboratory tests on disturbed and undisturbed soil and rock samples obtained from field investigations will be provided.

2.5-6 Excavation and Backfill 2.5.4.6.3

Excavation and Backfill – Information concerning the extent (horizontal and vertical) of seismic Category I excavations, fills, and slopes, if any will be addressed. The sources, quantities, and static and dynamic engineering properties of borrow materials will be described in the site-specific application. The compaction requirements, results of field compaction tests, and fill material properties (such as moisture content, density, permeability, compressibility, and gradation) will also be provided. Information will be *provided concerning the specific soil retention system, for example, the soil* nailing system, including the length and size of the soil nails, which is based on actual soil conditions and applied construction surcharge loads. Information will also be provided on the waterproofing system along the vertical face and the mudmat.

2.5-7 Ground Water Conditions 2.5.4.6.4

Ground Water Conditions – Groundwater conditions will be described relative to the foundation stability of the safety-related structures at the site. The soil properties of the various layers under possible groundwater conditions during the life of the plant will be compared to the range of values assumed in the standard design in Table 2-1 of the DCD.

2.5-8 Response of Soil and Rock to Dynamic Loading 2.5.4.6.5

Response of Soil and Rock to Dynamic Loading – The Combined License applicant will establish the dynamic characteristics of the soil and rock to be used in the soil structure interaction analyses and the foundation design for soil sites. For rock sites the dynamic characteristics will be compared to the assumptions made in the standard design regarding the variation of shear wave velocity and material damping.

2.5-9 Liquifaction Potential 2.5.4.6.6

Liquefaction Potential – Soils under and around seismic Category I structures will be evaluated for liquefaction potential for the site specific SSE ground motion. This should include justification of the selection of the soil properties, as well as the magnitude, duration, and number of excitation cycles of the earthquake used in the liquefaction potential evaluation (e.g., laboratory tests, field tests, and published data). Liquefaction potential will also be evaluated to address seismic margin.

2.5-10 Bearing Capacity 2.5.4.6.7

Bearing Capacity – The Combined License applicant will verify that the site-specific soil static bearing capacity is equal to or greater than the value documented in Table 2-1 of the DCD. The Combined License applicant will verify that the dynamic site-specific bearing capacity is equal or greater than the seismic bearing demand.

2.5-11 Earth Pressures 2.5.4.6.8

Earth Pressures – The Combined License applicant will describe the design for *static and dynamic lateral earth pressures and hydrostatic groundwater*

pressures acting on plant safety-related facilities using soil parameters as evaluated in previous subsections.

2.5-12	Static and Dynamic Stability of Facilities	2.5.4.6.10

Static and Dynamic Stability of Facilities – Soil characteristics affecting the stability of the nuclear island will be addressed including foundation rebound, settlement, and differential settlement.

2.5-14	Stability of Slopes	2.5.5

Combined License applicants referencing the AP1000 design will address site-specific information about the static and dynamic stability of soil and rock slopes, the failure of which could adversely affect the nuclear island.

2.5-15	Embankments and Dams	2.5.6

Combined License applicants referencing the AP1000 design will address site-specific information about the static and dynamic stability of embankments and dams, the failure of which could adversely affect the nuclear island.

3.3-1	Wind and Tornado Site Interface Criteria	3.3.3

Combined License applicants referencing the AP1000 certified design will address site interface criteria for wind and tornado.

3.4-1	Site-Specific Flooding Hazards Protective Measures	3.4.3

The Combined License applicant will demonstrate that the site satisfies the interface requirements as described in Section 2.4 of the DCD. If these criteria cannot be satisfied because of site-specific flooding hazards, the Combined License applicant may propose protective measures as discussed in Section 2.4 of the DCD.

3.5-1	External Missile Protection Requirements	3.5.4

The Combined License applicant will demonstrate that the site satisfies the interface requirements provided in Section 2.2 of the DCD. This requires an evaluation for those external events that produce missiles that are more energetic than the tornado missiles postulated for design of the AP1000, or additional analyses of the AP1000 capability to handle the specific hazard.

3.7-1	Seismic Analysis of Dams	3.7.5.1

Combined License applicants referencing the AP1000 certified design will evaluate dams whose failure could affect the site interface flood level specified in subsection 2.4.1.2 of the DCD. The evaluation of the safety of existing and new dams will use the site-specific safe shutdown earthquake.

6.4-1	Local Toxic Gas Service and Monitoring	6.4.7

Combined License applicants referencing the AP1000 certified design are responsible for the amount and location of possible sources of toxic chemicals in or near the plant and for seismic Category I Class 1E toxic gas monitoring, as required. Regulatory Guides 1.78 and 1.95 address control room protection for toxic chemicals, and for evaluating offsite toxic releases (including the potential for toxic releases beyond 72 hours) in accordance with the guidelines of Regulatory Guides 1.78 and 1.95 in order to meet the requirements of TMI

Action Plan Item II.D.3.4 and GDC 19.

Combined License applicants referencing the AP1000 certified design are responsible for verifying that procedures and training for control room habitability are consistent with the intent of Generic Issue 83 (see Section 1.9 of the DCD).

8.2-1 Offsite Electrical Power 8.2.5

Combined License applicants referencing the AP1000 certified design will address the design of the ac power transmission system and its testing and inspection plan.

8.2-2 Plant/Site Technical Interfaces 8.2.5

The Combined License applicant will address the technical interfaces for this nonsafety-related system listed in Table 1.8-1 and subsection 8.2.2. These technical interfaces include those for ac power requirements from offsite and the analysis of the offsite transmission system and the setting of protective devices.

8.3-1 Onsite (Grounding and Lightning) Electrical Power 8.3.3

Combined License applicants referencing the AP1000 certified design will address the design of grounding and lightning protection.
The Combined License applicant will establish plant procedures as required for:

- Clearing ground fault on the Class 1E dc system
- Checking sulfated battery plates or other anomalous conditions through periodic inspections
- Battery maintenance and surveillance (for battery surveillance requirements, refer to DCD Chapter 16, Section 3.8)
- Periodic testing of penetration protective devices

Diesel generator operation, inspection, and maintenance in accordance with manufacturers' recommendations.

9.5-2 Fire Protection Analysis Information on Adjacent Structures 9.5.1.8

The Combined License applicant will address qualification requirements for individuals responsible for development of the fire protection program, training of firefighting personnel, administrative procedures and controls governing the fire protection program during plant operation, and fire protection system maintenance.

The Combined License applicant will provide site-specific fire protection analysis information for the yard area, the administration building, and for other outlying buildings consistent with Appendix 9A of the DCD.

The Combined License applicant will address BTP CMEB 9.5-1 issues identified in Table 9.5.1-1 of the DCD by the acronym "WA."

The Combined License applicant will address updating the list of NFPA exceptions after design certification, if necessary.

The Combined License applicant will provide an analysis that demonstrates that operator actions which minimize the probability of the potential for spurious ADS actuation as a result of a fire can be accomplished within 30

minutes following detection of the fire.

9.5-9	Cathodic Protection of External Tanks	9.5.4.7

Combined License applicants referencing the AP1000 certified design will address the site-specific need for cathodic protection in accordance with NACE Standard RP-01-69 for external metal surfaces of metal tanks in contact with the ground.

Combined License applicants referencing the AP1000 certified design will address site-specific factors in the fuel oil storage tank installation specification to reduce the effects of sun heat input into the stored fuel, the diesel fuel specifications grade and the fuel properties consistent with manufacturers' recommendations, and will address measures to protect against fuel degradation by a program of fuel sampling and testing.

10.4-1	Circulating Water Supply	10.4.12.1

The Combined License applicant will address the final configuration of the plant circulating water system including piping design pressure, the cooling tower or other site-specific heat sink.

As applicable, the Combined License applicant will address the acceptable Langelier or Stability Index range, the specific chemical selected for use in the CWS water chemistry control, pH adjuster, corrosion inhibitor, scale inhibitor, dispersant, algicide and biocide applications reflecting potential variations in site water chemistry and in micro macro biological lifeforms. A biocide such as sodium hypochlorite is recommended. Toxic gases such as chlorine are not recommended. The impact of toxic gases on the main control room compatibility is addressed in Section 6.4 of the DCD.

10.4-3	Potable Water Biocide	10.4.12.3

The Combined License applicant will address the specific biocide. A biocide such as sodium hypochlorite is recommended. Toxic gases such as chlorine are not recommended. The impact of toxic gases on the main control room compatibility is addressed in Section 6.4 of the DCD.

11.2-1	Liquid Radwaste Processing by Mobile Equipment	11.2.5.1

The Combined License applicant will discuss how any mobile or temporary equipment used for storing or processing liquid radwaste conforms to Regulatory Guide 1.143. For example, this includes discussion of equipment containing radioactive liquid radwaste in the nonseismic Radwaste Building.

11.2-2	Cost Benefit Analysis of Population Doses (Liquid)	11.2.5.2

The analysis performed to determine offsite dose due to liquid effluents is based upon the AP1000 generic site parameters included in Chapter 1 and Tables 11.2-5 and 11.2-6 of the DCD. The Combined License applicant will provide a site specific cost-benefit analysis to address the requirements of 10 CFR 50, Appendix I, regarding population doses due to liquid effluents.

11.2-4	Dilution and Control of Boric Acid Discharge	11.2.5.4

The Combined License applicant will determine the rate of discharge and the required dilution to maintain acceptable concentrations. Refer to Section 11.5 of the DCD for a discussion of the program to control releases.

The Combined License applicant will discuss the planned discharge flow rate for borated wastes and controls for limiting the boric acid concentration in the circulating water system blowdown.

11.3-1	Cost Benefit Analysis of Population Doses (Gas)	11.3.5.1

The analysis performed to determine offsite dose due to gaseous effluents is based upon the AP1000 generic site parameters included in Chapter 1 and Tables 11.3-1, 11.3-2 and 11.3-4 of the DCD. The Combined License applicant will provide a site specific cost-benefit analysis to demonstrate compliance with 10 CFR 50, Appendix I, regarding population doses due to gaseous effluents.

11.5-2	Effluent Monitoring and Sampling	11.5.7

The Combined License applicant will develop an offsite dose calculation manual that contains the methodology and parameters used for calculation of offsite doses resulting from gaseous and liquid effluents. The Combined License applicant will address operational setpoints for the radiation monitors and address programs for monitoring and controlling the release of radioactive material to the environment, which eliminates the potential for unmonitored and uncontrolled release. The offsite dose calculation manual will include planned discharge flow rates.

The Combined License applicant is responsible for the site-specific and program aspects of the process and effluent monitoring and sampling per ANSI N13.1 and Regulatory Guides 1.21 and 4.15.

11.5-3	10 CFR 50, Appendix I	11.5.7

The Combined License applicant is responsible for addressing the 10 CFR 50, Appendix I guidelines for maximally exposed offsite individual doses and population doses via liquid and gaseous effluents.

13.3-2	Activation of Emergency Operations Facility	13.3.1

Combined License applicants referencing the AP1000 certified design will address emergency planning including post-72 hour actions and its communication interface.
Combined License applicants referencing the AP1000 certified design will address the activation of the emergency operations facility consistent with current operating practice and NUREG-0654/FEMA-REP-1 except for a loss of offsite power and loss of all onsite AC power. For this initiating condition, the Combined License applicant shall immediately activate the emergency operations facility rather than bringing it to a standby status.

To initially and continuously assess the course of an accident for emergency response purposes, Combined License applicants referencing the AP1000 certified design will address the capability for promptly obtaining and analyzing grab samples of reactor coolant and containment atmosphere and sump in accordance with the guidance of Item II.B.3 of NUREG-0737.

13.6-1	Security Plans, Organization and Testing	13.6.13.1

Combined License applicants referencing the AP1000 certified design will address site-specific information related to the security, contingency, and guard training plans. Those plans will include descriptions of the tests planned to show operational status, maintenance of the plant security system, the security organization, communication, and response requirements.

The Combined License applicant will develop the comprehensive physical security program which includes the security plan, contingency plan, and guard training plan. Each COL applicant will describe in its physical security plan how the requirements of 10 CFR Part 26 will be met. At least 60 days before loading fuel, the Combined License applicant will confirm that the security systems and programs described in its physical security plan, safeguards contingency plan, and training and qualification plan have achieved operational status and are available for the staff's inspection. Operational status means that

the security systems and programs are functioning. The determination that operational status has been achieved will be based on tests conducted under realistic operating conditions of sufficient duration to demonstrate that:

the equipment is properly operating;

procedures have been developed, approved, and implemented; and

personnel responsibility for security operations and maintenance have been appropriately trained and have demonstrated their capability to perform their assigned duties and responsibilities.

13.6-3 Site-Specific Security System 13.6.13.3

Combined License applicants referencing the AP1000 certified design will address site-specific information related to the maintenance and testing of the plant security system including the intrusion detection and assessment system, the access control features specified in subsections 13.6.6, 13.6.7.2, and 13.6.7.3 of the DCD, and the vehicle barrier system. The Combined License applicant will address in its safeguards plans how the physical protection system will provide the protection stated in subsection 13.6.3.2 of the DCD.

14.4-5 Testing Interface Requirements 14.4.5

The combined license applicant is responsible for testing that may be required of structures and systems which are outside the scope of this design certification. Test Specifications and acceptance criteria are provided by the responsible design organizations as identified in subsection 14.2.3. The interfacing systems to be considered for testing are taken from Table1.8-1 and include as a minimum, the following:

- storm drains
- site specific seismic sensors
- offsite ac power systems
- circulating water heat sink
- raw and sanitary water systems
- individual equipment associated with the fire brigade
- portable personnel monitors and radiation survey instruments
- equipment associated with the physical security plan

(Westinghouse 2005) *AP1000 Design Control Document*, Revision 15, AP1000 Document APP-GW-GL-700, Westinghouse Electric Company, LLC, November 11, 2005.

Available electronically