CHAPTER 1

INTRODUCTION AND GENERAL DESCRIPTION

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION AND GENERAL DESCRIPTION

1.1 INTRODUCTION

This Site Safety Analysis Report (SSAR) supports PSEG Power's and PSEG Nuclear's (hereafter referred to as PSEG or Applicants) early site permit application (ESPA). The SSAR addresses site suitability issues and complies with applicable portions of Title 10, Part 52 of the Code of Federal Regulations (10 CFR 52), Subpart A, *Early Site Permits*.

The PSEG Site is located on the southern part of Artificial Island on the east bank of the Delaware River in Lower Alloways Creek Township, Salem County, New Jersey. The site is 15 miles south of the Delaware Memorial Bridge, 18 miles south of Wilmington, Delaware, 30 miles southwest of Philadelphia, Pennsylvania, and 7-1/2 miles southwest of Salem, New Jersey.

PSEG has not selected a particular reactor design to be constructed at the site. In order to provide sufficient design information to enable the NRC to determine that the site is suitable for a new plant, a surrogate design has been provided. The surrogate plant is a set of bounding parameters, the plant parameter envelope (PPE). The PPE approach has been accepted by the NRC in previous ESPAs. The combination of PPE values and site characteristics that form the permit basis for NRC's issuance of an early site permit (ESP) are identified in this SSAR and discussed further in Sections 1.3 and 2.0.

The SSAR also contains information about site characteristics, site safety, emergency preparedness, and quality assurance. The following paragraphs briefly describe the contents of the SSAR:

Chapter 1, *Introduction and General Description*, includes a general site description, an overview of reactor types, the PPE approach, and a summary of regulatory conformance.

Chapter 2, *Site Characteristics*, includes geography, demography, nearby industrial installations, transportation facilities, meteorology, hydrology, geology, and seismic characteristics of the site. It also includes descriptions of effluents, thermal discharges, and conformance with 10 CFR 100, *Reactor Site Criteria*, requirements.

Chapter 3, *Design of Structures, Components, Equipment, and Systems* contains information on aircraft hazards in the vicinity of the PSEG Site.

Chapter 11, *Radioactive Waste Management*, includes only information on liquid and gaseous radioactive releases.

Chapter 13, *Conduct of Operations*, includes only an overview of emergency planning for the site and surrounding area in case of plant accidents and of the physical security provided for the site and plant sensitive areas.

Chapter 15, *Transient and Accident Analyses*, includes a discussion of radiological consequence of bounding plant accidents and conformance with applicable 10 CFR 100, *Reactor Site Criteria* for the reactor technologies being considered.

Chapter 17, *Quality Assurance*, includes the Quality Assurance Program under which the ESPA was prepared.

Where possible, the SSAR section numbers correspond to the section numbers identified in NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition*. Consistent with that guidance, there are some gaps in the numbering sequence. This is intentional. This approach is intended to facilitate subsequent integration of the information in this ESPA with a reactor design certification in a combined license (COL) application, in which the complete numbering sequence is used.

Table 1.1-1 provides a list of abbreviations and acronyms used in Part 2.

Table 1.1-1 Sheet (1 of 1)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
°C	degrees Celsius
°F	degrees Fahrenheit
σv'	Overburden pressure
μ	Poisson’s Ratio
φ	Total stress internal friction angle
φ’	Effective stress internal friction angle
χ/Q	atmospheric dispersion factor
ABWR	Advanced Boiling-Water Reactor
ac.	acre
ac.-ft.	acre-feet
acfm	actual cubic feet per minute
ACI	American Concrete Institute
AFB	Air Force Base
AFCCC	Air Force Combat Climatology Center
ALOHA	Areal Locations of Hazardous Atmospheres
amax	foundation level acceleration due to the design earthquake and/or horizontal acceleration
AMC	antecedent moisture condition
ANSI/ANS	American National Standards Institute/American Nuclear Society
ANSS	Advanced National Seismic System
AP1000	Advanced Passive 1000
arc-min	arc minute
arc-sec	arc second

Table 1.1-1 Sheet (2 of 2)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
AST	alternate source term
atm	atmosphere
bgs	below ground surface
BLEVE	Boiling Liquid Expanding Vapor Explosion
bpf	blows per foot
BTP	Branch Technical Position
Btu	British thermal units
BWR	boiling water reactor
c	total stress cohesion intercept
c’	effective stress cohesion intercept
CAV	Cumulative Absolute Velocity
Cc	coefficient of compression
CCW	component cooling water
C&D	Chesapeake & Delaware
CDF	confined disposal facility
CDF	core damage frequency
CEUS	central and eastern United States
CFR	Code of Federal Regulations
cfs	cubic feet per second
Ci	Curie
CL, CH	clay

Table 1.1-1 Sheet (3 of 3)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
cm/s	centimeters per second
COC	chain-of-custody
COL	Combined License
COLA	Combined License Application
CO-OPS	Center for Operational Oceanographic Products and Services
COOP	Cooperative Observing Program
CPT	cone penetration test
Cr	coefficient of recompression
CRM	Coastal Relief Model
CRR	cyclic resistance ratio
CRREL	Cold Regions Research and Engineering Laboratory
CSZ	Charlevoix seismic zone
CU	Consolidated-undrained
cu. ft.	cubic feet
cu. yd.	cubic yards
CVSZ	Central Virginia seismic zone
CWS	circulating water system
DANG	Delaware Air National Guard
DBF	design basis flood
dBA	A-weighted decibels
DBA	design basis accident
DBT	Design Basis Tornado
DBT	dry bulb temperature

Table 1.1-1 Sheet (4 of 4)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
DCD	Design Control Document
deg	degrees
Delaware DataMIL	Delaware Data Mapping and Integration Laboratory
delta-T	vertical temperature difference
DEM	digital elevation model
dia.	diameter
DMDS	demineralized water distribution system
DNAG	Decade of North America Geology
DOE	U.S. Department of Energy
D/Q	ground deposition factor
DRBC	Delaware River Basin Commission
dyn-cm	dyne-centimeters
EAB	Exclusion Area Boundary
EAL	Emergency Action Level
ECFS	East Coast fault system
ECFS-s	East Coast fault system - south
ECL	effluent concentration limit
EDG	emergency diesel generator
EIS	Environmental Impact Statement
Emb	estimated body wave magnitude
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
EPRI-SOG	Electric Power Research Institute Seismic Owner’s Group

Table 1.1-1 Sheet (5 of 5)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
Eq.	equation
ERO	emergency response organization
EPZ	Emergency Planning Zone
EWD	Engineering Weather Data
Es	Elastic Modulus (psf)
ESP	early site permit
ESPA	early site permit application
EST	Earth Science Team
ETE	Evacuation Time Estimate
FAA	Federal Aviation Administration
fc	corner frequency (units of Hertz)
FIRS	foundation input response spectra
fpm	feet per minute
fps	feet per second
FPS	fire protection system
FS	factor of safety
FSAR	Final Safety Analysis Report
ft.	feet
ft/day	feet per day
ft/ft	feet per foot
ft/mi.	feet per mile
ft/s	feet per second
ft/sec	feet per second

Table 1.1-1 Sheet (6 of 6)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
ft/yr	feet per year
g	gram
g	acceleration due to gravity
G	Shear Modulus (psf)
G/Gmax	shear modulus divided by the low strain shear modulus function of the cyclic shear strain described by the damping ratio and the modulus reduction ratio
Ga	billion years ago or Giga Annum
gal.	gallon
GHB	general head boundary
GI-LLI	gastrointestinal tract, lower-large intestine
GIS	Geographic Information System
GMRS	ground motion response spectra
gpd	gallons per day
gpm	gallons per minute
GTG	gas turbine generator
Gs	Specific Gravity
GWh	gigawatthour(s)
HCGS	Hope Creek Generating Station
HEC-HMS	Hydrologic Engineering Center -Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center River Analysis System
HF	high-frequency
Hg	mercury
HMR	Hydrometeorological Reports

Table 1.1-1 Sheet (7 of 7)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
hr.	hour
HT	Hornerstown Formation
HUC	hydrologic unit code
Hz	hertz
I.D.	Inside Diameter
IDLH	Immediately Dangerous to Life and Health
in.	inch
ISFSI	independent spend fuel storage installation
ISMCS	International Surface Meteorological Climate Summary
ITAAC	Inspections, Test, Analysis, and Acceptance Criteria
J	joules
JFD	Joint Frequency Distribution
JFT	Joint Frequency Table
K	Kelvin
ka	thousand years ago
kg	kilogram
km	kilometer
km^3	cubic kilometers
Ko	coefficient of earth pressure at rest
ksf	kips per square foot and/or 1000 pounds per square foot
kt	knots
kW	kilowatts
KW	Kirkwood Formation

Table 1.1-1 Sheet (8 of 8)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
Lat	latitude
l or L	liter
L	Lower
lb.	pounds
LCD	local climatological data
LCSN	Lamont-Doherty Cooperative Seismographic Network
LEL	Lower Explosive Limit
LF	low-frequency
Lidar	resolution light detection and ranging
LMDCT	linear mechanical draft cooling tower
LOCA	loss of coolant accident
LL	Liquid Limit
Long	longitude
LPZ	low population zone
LWR	light water reactor
m	meter
Ma	million years ago
MAP	municipal airport
m_b	body wave magnitude
m_{bLg}	body wave magnitude
m_c	coda magnitude
MCWB	mean coincident wet bulb temperature
Md	duration magnitude

Table 1.1-1 Sheet (9 of 9)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
MEDRB	Maritime Exchange for the Delaware River and Bay
MEI	maximally exposed individual
mg/L	milligrams per liter
mGal	milli-Galileo
MGY	million gallons per year
mi.	miles
min	minute
MISLE	Marine Information for Safety and Law Enforcement
ML	local magnitude
ML, MH	silt
M_{Lg}	body-wave magnitude
Mmax	maximum magnitude
MMI	Modified Mercalli Intensity
MORB	mid-ocean ridge basalt
MOST	Method of Splitting Tsunami
MPa	megapascals
mph	miles per hour
MPSSZ	Middleton Place–Summerville seismic zone
mrad	millirad
mrem	millirem
MTBE	Methyl Tertiary-Butyl Ether
MTR	Military Training Route
MTU	metric ton uranium

Table 1.1-1 Sheet (10 of 10)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
msl	mean sea level
M_w	moment magnitude
MW	megawatt
MWD	megawatt days
MWe	megawatts electric
MWt	megawatts thermal
NAMAG	North American Magnetic Anomaly Group
NAVD	North American Vertical Datum 1988
NCDC	National Climatic Data Center
NDCT	natural draft cooling tower
NEC	not elsewhere classified
NEDB	National Earthquake Database
NEI	Nuclear Energy Institute
Neogene	Upper Tertiary Strata
NESN	New England Seismic Network
NID	National Inventory of Dams
NIOSH	National Institute of Occupational Safety and Health
NJDEP	New Jersey Department of Environmental Protection
NK	Navesink Formation
NM	nautical miles
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRC	U.S. Nuclear Regulatory Commission

Table 1.1-1 Sheet (11 of 11)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
NRCS	Natural Resources Conservation Service
nT	nanotesla
N-values	standard penetration resistance
OBE	operating basis earthquake
ODCM	Offsite Dose Calculation Manual
OX VT	Oxidized Portion of the Vincetown Formation
P	suspension compressional wave
pc	pre-consolidation stress
PHMSA	Pipeline and Hazardous Materials Safety Administration
PI	Plasticity Index
PL	Plastic Limit
PMF	probable maximum flood
PMH	probable maximum hurricane
PMP	probable maximum precipitation
PMS	probable maximum surge
PMT	probable maximum tsunami
PMWP	probable maximum winter precipitation
PM_{10}	particulate matter smaller than 10 microns in diameter
$PM_{2.5}$	particulate matter smaller than 2.5 microns in diameter
Po	total overburden pressure
Po’	effective overburden pressure
PPE	plant parameter envelope
ppm	parts per million

Table 1.1-1 Sheet (12 of 12)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
ppt	parts per thousand
PRM	Potomac-Raritan-Magothy
PS	paleoshoreline
PSAR	Preliminary Safety Analysis Report
PSEG	PSEG Power, LLC and PSEG Nuclear, LLC
psf	pounds per square foot
psi	pounds per square inch
PSWS	potable and sanitary water system
PWR	pressurized water reactor
QAPD	Quality Assurance Program Description
RAI	request for additional information
RCC	roller-compacted concrete
RCRA	Resource Conservation and Recovery Act
RCTS	resonant column torsional shear
rd	stress reduction factor due to depth
Reg. Tons	Registered Tonnage
RERR	Radioactive Effluent Release Report
RG	Regulatory Guide
RM	river mile
RMB	estimate of mb used in rate and b-value calculations
RSZ	Ramapo seismic zone
s	second
S	shear wave

Table 1.1-1 Sheet (13 of 13)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
S/HC	Salem and Hope Creek
SAGE	SAIC Adaptive Grid Eulerian
SARA	Superfund Amendments and Reauthorization Act
SB	subbasin
scf	standard cubic feet
SCR	stable continental region
SC-SM	sand
SCS	Soil Conservation Service
sec.	second
SEIS	Supplemental Environmental Impact Statement
SER	Safety Evaluation Report
SGS	Salem Generating Station
SL	stream lineament
SM	silty sands
SMF	submarine mass failure
SOD	Summary of the Day
SOG	Seismicity Owners Group
SPT	Standard Penetration Test
sq.	square
sq. mi.	square miles
SRP	Standard Review Plan
SRV	safety/relief valve
SSAR	site safety analysis report

Table 1.1-1 Sheet (14 of 14)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
SSC	structures, systems and components
SSE	safe shutdown earthquake
SSI	Soil Structure Interaction
STEL	Short Term Exposure Limit
SWS	service water system
T_{100}	100 percent consolidation
TC	Tonal contrast lineament
TDS	total dissolved solids
TEDE	Total Effective Dose Equivalent
TIN	Triangular Irregular Network
TL	Topographic lineament
TNT	Trinitrotoluene
TOC	top of casing
tsf	tons per square foot
TSS	total suspended solids
TWA	Time Weighted Average
UEL	Upper Explosive Limit
UFSAR	Updated Final Safety Analysis Report
UHS	Ultimate Heat Sink
USACE	U.S. Army Corps of Engineers
US-APWR	U.S. Advanced Passive Pressurized-Water Reactor
USCB	U.S. Census Bureau
USCG	U.S. Coast Guard

Table 1.1-1 Sheet (15 of 15)
Acronyms and Abbreviations Used in the SSAR

Acronym/Abbreviation	Definition
USCS	Unified Soil Classification System
USGS	U.S. Geological Survey
USEPA	U.S. Environmental Protection Agency
U.S. EPR	U.S. Evolutionary Power Reactor
UU	unconsolidated-undrained
VCE	Vapor Cloud Explosion
VL	vegetation lineament
VT	Vincentown Formation
W	watt
WBAN	Weather Bureau Army Navy
WBT	wet bulb temperature
WOH	Weight-of-hammer
WSEL	water surface elevation
wt.	weight
WWTP	Waste Water Treatment Plant
Ybt	Yellow Breaches thrust fault
yr	year

1.2 GENERAL PLANT DESCRIPTION

1.2.1 SITE LOCATION

The existing 734 acre PSEG property is located on the southern part of Artificial Island on the east bank of the Delaware River in Lower Alloways Creek Township, Salem County New Jersey. PSEG is developing an agreement in principle with the U.S. Army Corps of Engineers (USACE) to acquire an additional 85 acres immediately to the north of Hope Creek Generating Station (HCGS). Therefore, with the land acquisition, the PSEG Site will be 819 acres. The specific timing of land acquisition is not currently known and is subject to further PSEG and USACE actions. However the agreement in principle with the USACE will serve to establish the basis for eventual land acquisition and Exclusion Area Boundary (EAB) control, necessary to support the issuance of a future COL.

Subsequent to the agreement in principle with the USACE, PSEG will develop a lease agreement for the USACE Confined Disposal Facility (CDF) land to the north of the PSEG Site, depicted on the Site Utilization Plan (Figure 1.2-3) for the concrete batch plant and temporary construction/laydown use. At the completion of construction, the leased land will be returned to the USACE, subject to any required long-term EAB control conditions.

The site is 15 miles south of the Delaware Memorial Bridge, 18 miles south of Wilmington, Delaware, 30 miles southwest of Philadelphia, Pennsylvania, and 7-1/2 miles southwest of Salem, New Jersey. The site location is shown on Figures 1.2-1 and 1.2-2, and is discussed in more detail in Section 2.1.

1.2.2 SITE DEVELOPMENT

The PSEG Site currently has three operating nuclear reactors. Salem Units 1 and 2 are Westinghouse Pressurized Water Reactors (PWR), rated at 3459 MWt each. Hope Creek Unit 1 is located north of the Salem Units. Hope Creek is a General Electric Boiling Water Reactor, rated at 3840 MWt. Hope Creek Unit 2 was originally planned and partially constructed directly adjacent to Unit 1. Surrounding the Salem and Hope Creek units are many support facilities, including circulating and service water intake structures, switchyards, administration buildings, and an independent spent fuel storage installation (ISFSI).

The location selected for the new plant on the PSEG Site is north of the Salem and Hope Creek units, and is shown on the Site Utilization Plan, Figure 1.2-3. Site layouts for each of the four reactor technology configurations considered for the PSEG Site were established. The primary power generation areas (power block area, switchyard, cooling tower area, etc.) are located in the same general area on the PSEG Site for each layout considered. Once the layouts were established, the bounding footprint for each specific area (e.g., power block area) was developed. This approach provides a bounding depiction of overall land usage on the PSEG Site. In addition to the land acquired from the USACE, as noted above, PSEG will also obtain the right to temporarily use approximately 45 additional acres of USACE property north of the current PSEG property boundary for temporary construction use.

No specific plant design has been chosen for the PSEG Site. Instead, a set of bounding plant parameters is presented to envelop future PSEG Site development. This PPE is based on the addition of power generation from either a single or dual unit light water reactor (LWR) plant.

PSEG used design parameter information from the following reactor designs in development of the PPE.

- Single Unit U.S. Evolutionary Power Reactor (U.S. EPR)
- Single Unit Advanced Boiling Water Reactor (ABWR)
- Single Unit U.S. Advanced Pressurized-Water Reactor (US-APWR)
- Dual Unit Advanced Passive 1000 (AP1000)

The new plant on the PSEG Site may be any of the reactor designs identified or a different design that falls within the range of the information developed to characterize the new plant. The bounding new plant consists of a reactor design with a maximum thermal power that does not exceed 4614 MWt for a single unit or 6830 MWt for a dual unit. The new plant on the PSEG Site is capable of producing up to approximately 2200 MWe net of electrical power.

1.3 PLANT PARAMETER ENVELOPE

The required contents of an ESPA are specified in 10 CFR 52.17. As detailed in 10 CFR 52.17(a)(1), the SSAR portion of the application is required to specify, among other things:

- The number, type, and thermal power level of the facilities
- Boundaries of the site and proposed general location of each facility
- Type of cooling systems, intakes, and outflows
- Anticipated maximum levels of radiological and thermal effluents
- Site seismic, meteorological, hydrologic, and geologic characteristics
- Existing and projected future population profile of the area surrounding the site

The PSEG approach to providing this information is presented in the following subsections.

1.3.1 PLANT PARAMETER ENVELOPE APPROACH

A list of plant parameters necessary to define the plant-site interface was developed in the early 1990s based on work sponsored by the U.S. Department of Energy (DOE) and the nuclear industry, which included reactor vendors and utilities. The effort was intended to provide a comprehensive list of plant parameters to accurately characterize a plant at a site. The original list was reduced to identify information needed to support development of an ESPA, including the SSAR and the Environmental Report (ER).

The PPE is a set of postulated parameters that bound the parameters of a reactor or reactors that might be deployed at a site. This includes site parameters specified by the reactor vendor which must be met by the selected site.

- In terms of safety reviews, design characteristics of potential plant designs are no more demanding from a site suitability perspective than the bounding design parameters in the PPE.
- In terms of environmental reviews, impacts of the selected design are not significantly greater than impacts evaluated in the ESPA using the bounding design parameters in the PPE.

For the purposes of preparing ESPAs, the PPE serves as a surrogate for actual facility information. For example, values for maximum building height, acreage for plant facilities, ponds, etc., and cooling water requirements, are among the design parameters specified in the PPE.

PPE parameters, along with information established by features of the site itself (i.e., “site characteristics”), support the 10 CFR Part 52.17 analyses required to demonstrate site suitability. These analyses are provided in this SSAR and in the environmental impact assessments reported in the ER included with this application.

Prior to the submittal of the first three ESPAs, the PPE concept was discussed in several public meetings involving the NRC and nuclear industry representatives as part of the resolution of Generic Topic ESP-6 (*Use of Plant Parameters Envelope Approach for ESP*) and was the subject of associated correspondence between the NRC and the Nuclear Energy Institute (NEI).

Agreement on the PPE concept was attained and the SRP updated in 2007 to incorporate the concept.

In developing and refining the PPE concept, the industry and the NRC worked to establish a number of definitions for key terms to facilitate discussion and understanding of the PPE approach. These definitions are incorporated into the NRC regulations (10 CFR 52) and are provided below:

- **Site characteristics** are the actual physical, environmental and demographic features of a site. Site characteristics are specified in an early site permit or in a Final Safety Analysis Report for a combined license.
- **Site parameters** are the postulated physical, environmental and demographic features of an assumed site. Site parameters are specified in a standard design approval, standard design certification, or manufacturing license.
- **Design characteristics** are the actual features of a reactor or reactors. Design characteristics are specified in a standard design approval, a standard design certification, a combined license application, or a manufacturing license.
- **Design parameters** are the postulated features of a reactor or reactors that could be built at a proposed site. Design parameters are specified in an early site permit.

In a COL application, the site-specific engineering and design features of the selected reactor design are compared with the ESP basis to demonstrate they are bounded.

1.3.2 PPE DEVELOPMENT PROCESS

The PPE developed for the PSEG ESPA was prepared by reviewing the information developed by the industry prior to the submittal of the Grand Gulf, Clinton and North Anna ESPAs, reviewing the correspondence between the NRC and industry on the PPE subject, and reviewing safety evaluation reports (SER), environmental impact statements (EIS) and requests for additional information (RAIs) associated with the first three ESPA. Based upon these document reviews, the PSEG PPE includes only those parameters needed to support the issuance of an ESP.

The PPE tables are based on information supplied by the reactor vendors for the plant designs listed previously. Site-dependent PPE data was either based on a typical site as provided by the vendors (not a specific site and not the PSEG Site) or was modified to take into account site specific conditions, as appropriate. An example of adapting the vendor provided data to site specific conditions is in the design of the circulating water system, which is based on site-specific water supplies and meteorological conditions. The listed circulating water designs, which include mechanical, fan-assisted natural draft and natural draft towers, are based on a bounding plant design and location, and would be modified to meet the selected reactor design and site characteristics during preparation of a COL application.

The design parameter data included in the PPE was developed considering the values provided by various reactor vendors to characterize the surrogate facility. As applicable, the most limiting (maximum or minimum) bounding value is selected. The complete set of plant parameter values characterizes a new plant at the PSEG Site. This type of facility characterization is considered sufficient to assess the future use of the site for a nuclear electric generating facility from both a safety and environmental perspective.

1.3.3 PSEG SITE PLANT PARAMETER ENVELOPE

Tables 1.3-1 through 1.3-8 present the listing of the PPE values used in assessing the safety and environmental impact of constructing and operating the new plant on the PSEG Site. The numbering of the PPE listing is not meant to be sequential, and was compiled from and is consistent with the list developed by the industry and refined for the PSEG Site ESPA. Table 1.3-1 also provides a description or definition for the plant parameters used in evaluating the safety and/or environmental impact of locating the new plant at the PSEG Site.

Table 1.3-1 (Sheet 1 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
1	**Structure**		
1.1	**Building Characteristics**		
1.1.1	Height	234 ft.	The height from finished grade to the top of the tallest power block structure, excluding cooling towers.
1.1.2	Foundation Embedment	39 ft. to 84.3 ft.	The depth from finished grade to the bottom of the basemat for the most deeply embedded power block structure.
2	**Normal Plant Heat Sink**		
2.3	**Condenser**		
2.3.1	Max Inlet Temp Condenser	91° F	Design assumption for the maximum acceptable circulating water temperature at the inlet to the condenser.
2.3.2	Condenser Heat Rejection	1.508E+10 Btu/hr	Design value for the waste heat rejected to the circulating water system across the condensers.
2.3.3	Maximum Cooling Water Flow Rate Across Condenser	1,200,000 gpm	Design value for the maximum flow rate of the circulating water system through the condenser tubes.
2.3.4	Maximum Cooling Water Temperature Rise Across Condenser	25.2° F	Design value for the maximum temperature differential across the condenser.
2.4	**Mechanical Draft Cooling Towers - Circulating Water System**		
2.4.1	Acreage	50 ac.	The land required for cooling towers, including support facilities.
2.4.2	Approach Temperature	14.4° F	The difference between the cold water temperature and the ambient wet bulb temperature.
2.4.3	Blowdown Constituents and Concentrations	Table 1.3-2	The maximum expected concentrations for anticipated constituents in the circulating water system blowdown to the receiving water body.

Table 1.3-1 (Sheet 2 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
2.4.4	Blowdown Flow Rate (Normal)	50,516 gpm	The normal flow rate of the blowdown stream from the circulating water system to the receiving water body for closed system designs during normal operations.
2.4.5	Blowdown Temperature (Normal)	91° F	The maximum expected blowdown temperature at the point of discharge to the receiving water body during normal operations.
2.4.6	Cycles of Concentration	1.5	The ratio of total dissolved solids in the circulating water system blowdown to the total dissolved solids in the make-up water.
2.4.7	Evaporation Rate (Normal)	25,264 gpm	The expected 1 percent exceedance design rate at which water is lost by evaporation from the circulating water system during normal operations.
2.4.9	Makeup Flow Rate (Normal)	75,792 gpm	The expected rate of removal of water from a natural source to replace water losses from a closed circulating water system during normal operations.
2.4.10	Noise	58 dBA at 1000 ft.	The maximum expected sound level produced by operation of cooling towers, measured in feet from the noise source.
2.4.11	Cooling Tower Temperature Range (Normal)	25.2° F	The temperature difference between the cooling water entering and leaving the towers during normal operations.
2.4.12	Cooling Water Flow Rate (Normal)	1,200,000 gpm	The total cooling water flow rate through the condenser/heat exchangers during normal operations.
2.4.13	Heat Rejection Rate (Normal)	1.508E+10 Btu/hr	The expected heat rejection rate to a receiving water body during normal operations.
2.4.17	Drift	12 gpm	Rate of water lost from the tower as liquid droplets entrained in the vapor exhaust air stream.
2.4.18	Exhaust Stack exit velocity	1730 fpm	The exit velocity of water vapor through the cooling tower exhaust stack.

Table 1.3-1 (Sheet 3 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
2.4.19	Exhaust Stack exit diameter	68 cells at 31.6 ft. each	The diameter of the cooling tower exhaust stack.
2.4.20	Exhaust Stack Height	46 ft.	The vertical height above finished grade of cooling towers associated with the circulating water system.
2.5	**Natural Draft Cooling Towers - Circulating Water System**		
2.5.1	Acreage	50 ac.	The land required for cooling towers, including support facilities.
2.5.2	Approach Temperature	14.4° F	The difference between the cold water temperature and the ambient wet bulb temperature.
2.5.3	Blowdown Constituents and Concentrations	Table 1.3-2	The maximum expected concentrations for anticipated constituents in the circulating water system blowdown to the receiving water body.
2.5.4	Blowdown Flow Rate (Normal)	50,516 gpm	The normal flow rate of the blowdown stream from the circulating water system to the receiving water body for closed system designs during normal operations.
2.5.5	Blowdown Temperature (Normal)	91° F	The maximum expected blowdown temperature at the point of discharge to the receiving water body during normal operations.
2.5.6	Cycles of Concentration	1.5	The ratio of total dissolved solids in the circulating water system blowdown to the total dissolved solids in the make-up water.
2.5.7	Evaporation Rate (Normal)	25,264 gpm	The expected 1 percent exceedance design rate at which water is lost by evaporation from the circulating water system during normal operations.
2.5.9	Makeup Flow Rate (Normal)	75,792 gpm	The expected rate of removal of water from a natural source to replace water losses from a closed circulating water system during normal operations.
2.5.10	Noise	50 dBA at 1000 ft.	The maximum expected sound level produced by operation of cooling towers, measured in feet from the noise source.

Table 1.3-1 (Sheet 4 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
2.5.11	Cooling Tower Temperature Range (Normal)	25.2° F	The temperature difference between the cooling water entering and leaving the towers during normal operations.
2.5.12	Cooling Water Flow Rate (Normal)	1,200,000 gpm	The total cooling water flow rate through the condenser/heat exchangers during normal operations.
2.5.13	Heat Rejection Rate (Normal)	1.508E+10 Btu/hr	The expected heat rejection rate to a receiving water body during normal operations.
2.5.17	Drift	12 gpm	Rate of water lost from the tower as liquid droplets entrained in the vapor exhaust air stream.
2.5.18	Exhaust Stack exit velocity	995 fpm	The exit velocity of water vapor through the cooling tower exhaust stack.
2.5.19	Exhaust Stack exit diameter	242 ft.	The diameter of the cooling tower exhaust stack.
2.5.20	Exhaust Stack Height	590 ft.	The vertical height above finished grade of cooling towers associated with the circulating water system.
2.6	**Fan Assisted Natural Draft Cooling Towers - Circulating Water System**		
2.6.1	Acreage	50 ac.	The land required for cooling towers, including support facilities.
2.6.2	Approach Temperature	14.4° F	The difference between the cold water temperature and the ambient wet bulb temperature.
2.6.3	Blowdown Constituents and Concentrations	Table 1.3-2	The maximum expected concentrations for anticipated constituents in the circulating water system blowdown to the receiving water body.
2.6.4	Blowdown Flow Rate (Normal)	50,516 gpm	The normal flow rate of the blowdown stream from the circulating water system to the receiving water body for closed system designs during normal operations.

Table 1.3-1 (Sheet 5 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
2.6.5	Blowdown Temperature (Normal)	91° F	The maximum expected blowdown temperature at the point of discharge to the receiving water body during normal operations.
2.6.6	Cycles of Concentration	1.5	The ratio of total dissolved solids in the circulating water system blowdown to the total dissolved solids in the make-up water.
2.6.7	Evaporation Rate (Normal)	25,264 gpm	The expected 1 percent exceedance design rate at which water is lost by evaporation from the circulating water system during normal operations.
2.6.9	Makeup Flow Rate (Normal)	75,792 gpm	The expected rate of removal of water from a natural source to replace water losses from a closed circulating water system during normal operations.
2.6.10	Noise	60 dBA at 1000 ft.	The maximum expected sound level produced by operation of cooling towers, measured in feet from the noise source.
2.6.11	Cooling Tower Temperature Range (Normal)	25.2° F	The temperature difference between the cooling water entering and leaving the towers during normal operations.
2.6.12	Cooling Water Flow Rate (Normal)	1,200,000 gpm	The total cooling water flow rate through the condenser/heat exchangers during normal operations.
2.6.13	Heat Rejection Rate (Normal)	1.508E+10 Btu/hr	The expected heat rejection rate to a receiving water body during normal operations.
2.6.17	Drift	12 gpm	Rate of water lost from the tower as liquid droplets entrained in the vapor exhaust air stream.
2.6.18	Exhaust Stack exit velocity	902 fpm	The exit velocity of water vapor through the cooling tower exhaust stack.
2.6.19	Exhaust Stack exit diameter	255 ft.	The diameter of the cooling tower exhaust stack.
2.6.20	Exhaust Stack Height	224 ft.	The vertical height above finished grade of cooling towers associated with the circulating water system.

Table 1.3-1 (Sheet 6 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
3	**Ultimate Heat Sink (UHS)**		
3.2	**Heat Exchangers**		
3.2.1	Maximum Inlet Temperature to CCW Heat Exchanger	95° F	The maximum temperature of safety-related service water at the inlet of the UHS component cooling water heat exchanger.
3.2.2	CCW Heat Exchanger Duty	2.06E+8 Btu/hr (Normal) 4.72E+8 Btu/hr (Peak)	The heat transferred to the safety-related service water system for rejection to the environment in UHS heat removal devices.
3.3	**UHS Cooling Towers**		
3.3.3	Blowdown Constituents and Concentrations	Table 1.3-2	The maximum expected concentrations for anticipated constituents in the UHS blowdown to the receiving water body.
3.3.4a	Blowdown Flow Rate (Normal)	1140 gpm	The maximum flow rate of the blowdown stream from the UHS system to receiving water body for closed system designs during normal operations.
3.3.4b	Blowdown Flow Rate (Accident)	2280 gpm	The maximum flow rate of the blowdown stream from the UHS system to receiving water body for closed system designs during accident conditions.
3.3.5a	Blowdown Temperature (Normal)	< 95° F	The maximum expected UHS blowdown temperature at the point of discharge to the receiving water body during normal operations.
3.3.5b	Blowdown Temperature (Accident)	95° F	The maximum expected UHS blowdown temperature at the point of discharge to the receiving water body during accident conditions.
3.3.6	Cycles of Concentration	2	The ratio of total dissolved solids in the UHS system blowdown streams to the total dissolved solids in the make-up water streams.
3.3.7a	Evaporation Rate (Normal)	1142 gpm	The maximum rate at which water is lost by evaporation from the UHS system during normal operations.
3.3.7b	Evaporation Rate (Accident)	2284 gpm	The maximum rate at which water is lost by evaporation from the UHS system during accident conditions.

Table 1.3-1 (Sheet 7 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
3.3.8a	Cooling Tower Deck Height	63 ft.	The height of the cooling tower deck above grade.
3.3.8b	Exhaust Stack Height	35 ft.	The height of the exhaust stacks above the deck.
3.3.9a	Makeup Flow Rate (Normal)	2404 gpm	The maximum rate of removal of water from a natural source to replace water losses from the UHS system during normal operations.
3.3.9b	Makeup Flow Rate (Accident)	4808 gpm	The maximum rate of removal of water from a natural source to replace water losses from the UHS system during accident conditions.
3.3.10	Noise	57 dBA at 200 ft.	The maximum expected sound level produced by operation of mechanical draft UHS cooling towers, measured in feet from the noise source.
3.3.12	Cooling Water Flow Rate	26,125 gpm (normal) 52,250 gpm (shutdown/accident)	The total cooling water flow rate through the UHS system.
3.3.13a	Heat Rejection Rate (Normal)	2.06E+8 Btu/hr	The maximum expected heat rejection rate to the atmosphere during normal operations.
3.3.13b	Heat Rejection Rate (Accident)	3.95E+8 Btu/hr	The maximum expected heat rejection rate to the atmosphere during accident conditions.
3.3.16	Stored Water Volume	30,600,000 gal.	The quantity of water stored in UHS impoundments.
3.3.17	Drift	2 gpm	Rate of water lost from the tower as liquid droplets entrained in the vapor exhaust air stream.

Table 1.3-1 (Sheet 8 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
5	**Potable/Sanitary Water System**		
5.1	**Discharge to Site Water Bodies**		
5.1.1	Flow Rate (Normal)	93 gpm	The expected effluent flow rate from the potable and sanitary water systems to the receiving water body.
5.1.2	Flow Rate (Maximum)	93 gpm	The maximum effluent flow rate from the potable and sanitary water systems to the receiving water body.
5.2	**Raw Water Requirements**		
5.2.1	Maximum Use	216 gpm	The maximum short-term rate of withdrawal from the water source for the potable and sanitary waste water systems.
5.2.2	Monthly Average Use	93 gpm	The average rate of withdrawal from the water source for the potable and sanitary waste water systems.
6	**Demineralized Water System**		
6.1	**Discharge to Site Water Bodies**		
6.1.1	Flow Rate	27 gpm	The expected (and maximum) effluent flow rate from the demineralized system to the receiving water body.
6.2	**Raw Water Requirements**		
6.2.1	Maximum Use	107 gpm	The maximum short-term rate of withdrawal from the water source for the demineralized water system.
6.2.2	Monthly Average Use	107 gpm	The average rate of withdrawal from the water source for the demineralized water system.

Table 1.3-1 (Sheet 9 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
7	**Fire Protection System**		
7.1	**Raw Water Requirements**		
7.1.1	Maximum Use	625 gpm	The maximum short-term rate of withdrawal from the water source for the fire protection water system.
7.1.2	Monthly Average Use	5 gpm	The average rate of withdrawal from the water source for the fire protection water system.
8	**Miscellaneous Drain**		
8.1	**Discharge to Site Water Bodies**		
8.1.1	Flow Rate (Expected)	39 gpm	The expected effluent flow rate from miscellaneous drains to the receiving water body.
8.1.2	Flow Rate (Maximum)	55 gpm	The maximum effluent flow rate from miscellaneous drains to the receiving water body.
8.2	**Raw Water Requirements**		
8.2.1	Maximum Use	5 gpm	The maximum short-term rate of withdrawal from the water source for miscellaneous activities, such as floor washing.
8.2.2	Monthly Average Use	5 gpm	The average rate of withdrawal from the water source for miscellaneous activities, such as floor washing.
9	**Unit Vent/Airborne Effluent Release Point**		
9.4	**Release Point**		
9.4.2	Elevation (Normal)	Ground Level	The elevation above finished grade of the release point for routine operational releases.
9.4.3	Elevation (Post Accident)	Ground Level	The elevation above finished grade of the release point for accident sequence releases.

Table 1.3-1 (Sheet 10 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
9.5	**Source Term**		
9.5.1	Gaseous (Normal)	Table 1.3-7	The expected annual activity, by isotope, contained in routine plant airborne effluent streams.
9.5.2	Gaseous (Post-Accident)	See Section 15.3	The activity, by isotope, contained in post-accident airborne effluents.
9.5.3	Tritium	Table 1.3-7	The expected annual activity of tritium contained in routine plant airborne effluent streams.
10	**Liquid Radwaste System**		
10.2	**Release Point**		
10.2.1	Flow Rate	11 gpm	The discharge flow rate of potentially radioactive liquid effluent streams from plant systems to the receiving waterbody.
10.2.2	Minimum Blowdown Rate	20,000 gpm	Minimum flow rate of the effluent stream discharging potentially radioactive liquid effluent to the receiving water body during normal operations.
10.3	**Source Term**		
10.3.1	Liquid	Table 1.3-8	The annual activity, by isotope, contained in routine plant liquid effluent streams.
10.3.2	Tritium	Table 1.3-8	The annual activity of tritium contained in routine plant liquid effluent streams.
11	**Solid Radwaste System**		
11.2	**Solid Radwaste**		
11.2.1	Activity	Table 1.3-3	The annual activity, by isotope, contained in solid radioactive wastes generated during routine plant operations.
11.2.2	Principal Radionuclides	Table 1.3-3	The principal radionuclides contained in solid radioactive wastes generated during routine plant operations.

Table 1.3-1 (Sheet 11 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
11.2.3	Volume	16,721.5 ft^3/yr	The expected volume of solid radioactive wastes generated during routine plant operations.
13	**Auxiliary Boiler System**		
13.1	Exhaust Elevation	150 ft.	The height above finished plant grade at which the flue gas effluents are released to the environment.
13.2	Flue Gas Effluents	Table 1.3-4	The expected combustion products and anticipated quantities released to the environment due to operation of the auxiliary boilers.
13.3	Fuel Type	No. 2 Fuel Oil	The type of fuel required for proper operation of the auxiliary boilers.
13.4	Heat Input Rate (Btu/hr)	1.56E+8 Btu/hr	The average heat input rate (fuel consumption rate).
15	**Onsite/Offsite Electrical Power System**		
15.1	**Acreage**		
15.1.1	Switchyard	63 ac.	The land usage required for the high voltage switchyard used to connect the plant to the transmission grid.
16	**Standby Power System**		
16.1	**Diesel**		
16.1.1	Diesel Capacity (kW)	10,130 kW/unit (EDG) 5000 kW/unit (SBO)	The total generating capacity of the diesel generating system.
16.1.2	Diesel Exhaust Elevation	50 ft.	The elevation above finished grade of the release point for standby diesel exhaust releases.
16.1.3	Diesel Flue Gas Effluents	Table 1.3-5	The expected combustion products and anticipated quantities released to the environment due to operation of the emergency standby diesel generators.
16.1.4	Diesel Noise	55 dBA at 1000 ft.	The maximum expected sound level produced by operation of diesel generators, measured in feet from the noise source.

Table 1.3-1 (Sheet 12 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
16.1.5	Diesel Fuel Type	No. 2	The type of diesel fuel required for proper operation of the diesel generator.
16.1.6	Exhaust Stack Diameter	68 in.	The nominal diameter of the exhaust stack.
16.1.7	Flue Gas Flow Rate	68,960 acfm	The maximum flue gas flow rate exiting the exhaust stack.
16.1.8	Flue Gas Temperature	665 °F	The temperature of the flue gas exiting the exhaust stack.
16.1.10	Number of Units	EDG - 4 SBO - 2	The number of generator units.
16.1.11	Diesel Usage	150 hr/yr/unit (EDG) 100 hr/yr/unit (SBO)	The expected duration of usage for each diesel.
16.1.12	Heat Input Rate (Btu/hr)	77,384,160 Btu/hr	The average heat input rate (fuel consumption rate).
16.2	**Gas-Turbine**		
16.2.1	Gas-Turbine Capacity (kW)	26,000 kW	The total generating capacity of the gas turbine generating system.
16.2.2	Gas-Turbine Exhaust Elevation	50 ft.	The elevation above finished grade of the release point for standby gas-turbine exhaust releases.
16.2.3	Gas-Turbine Flue Gas Effluents	Table 1.3-6	The expected combustion products and anticipated quantities released to the environment due to operation of the standby gas-turbine generators
16.2.4	Gas-Turbine Noise	64.3 dBA at 1000 ft.	The maximum expected sound level produced by operation of gas-turbines, measured in feet from the noise source.
16.2.5	Gas-Turbine Fuel Type	Diesel Oil	The type of fuel required for proper operation of the gas-turbines.
16.2.6	Exhaust Stack Diameter	59.1 in.	The nominal diameter of the exhaust stack.
16.2.7	Flue Gas Flow Rate	128,899 acfm	The maximum flue gas flow rate exiting the exhaust stack.
16.2.8	Flue Gas Temperature	940 °F	The temperature of the flue gas exiting the exhaust stack.
16.2.10	Number of Units	4/2	The number of generator units (Class 1E / Non-Class 1E)

Table 1.3-1 (Sheet 13 of 14)
Plant Parameter Envelope

PPE Item		Design Parameter	Definition
16.2.11	Gas-Turbine Usage	48 hr/yr	The expected duration of usage for each gas-turbine.
16.2.12	Heat Input Rate (Btu/hr)	71,513,906 Btu/hr	The average heat input rate (fuel consumption rate).
17	**Plant Characteristics**		
17.2	**Permanent Acreage**		
17.2.2	Parking Lots	8 ac.	The land area required to provide space for parking lots.
17.2.3	Permanent Support Facilities	8 ac.	The land area required to provide space for permanent support facilities.
17.2.4	Power Block	70 ac.	The land area required to provide space for Power Block facilities. Power Block is defined as all structures, systems and components which perform a direct function in the production of, transport of, or storage of heat energy, electrical energy or radioactive wastes. Also included are structures, systems, and components that monitor, control, protect or otherwise support the above equipment.
17.2.6	Other Areas	26.4 ac.	The land area required to provide space for plant facilities not provided in Parameters 17.2.2 - 17.2.4.
17.3	Megawatts Thermal	4614 MWt (single unit) 6830 MWt (dual unit)	The thermal power generated by the nuclear steam supply system.
17.4	Plant Design Life	60 years	The operational life for which the plant is designed.
17.5	**Plant Population**		
17.5.1	Operation	600 people	The number of people required to operate the plant.
17.5.2	Refueling/Major Maintenance	1000 people	The additional number of temporary staff required to conduct refueling and major maintenance activities.
17.6	Station Capacity Factor	96.3 percent	The percentage of time that a plant is capable of providing power to the grid.

**Table 1.3-1 (Sheet 14 of 14)
Plant Parameter Envelope**

PPE Item		Design Parameter	Definition
17.7	Plant Operating Cycle	18 or 24 months	The normal plant operating cycle length.
18	**Construction**		
18.2	**Acreage**		
18.2.1	Laydown Area	128 ac.	The land area required to provide space for construction support facilities.
18.2.2	Temporary Construction Facilities	77 ac.	
18.3	**Construction**		
18.3.1	Noise	102 dBA at 50 ft.	The maximum expected sound level due to construction activities, measured in feet from the noise source.
18.4	**Plant Population**		
18.4.1	Construction	3950 to 4100 people	Number of workers on-site for construction of the new plant.
19	**Miscellaneous Parameters**		
19.7	Maximum Fuel Enrichment	5 percent wt.	Concentration of U-235 in the fuel.
19.8	Maximum Average Assembly Burnup	54,200 MWD/MTU	Maximum assembly average burnup at end of assembly life.
19.9	Peak Fuel Rod Burnup	62,000 MWD/MTU	Peak fuel rod exposure at end of life.
19.11	Rated Thermal Power	4590 MWt (single unit) 6800 MWt (dual unit)	Maximum core thermal power.
19.12	Liquid-Containing Tank Failure Radionuclide Concentrations	See Table 1.3-9	The concentrations of radionuclides and associated tank volumes for the analysis of liquid-containing tank failure.

Table 1.3-2
Blowdown Constituents and Concentrations

Constituents		CWS Blowdown	SWS/UHS Blowdown	SWS Water Treatment Discharge	Sanitary System Discharge	Other Plant Discharge[(a)]	Combined Discharge[(b)]
pH		7.6	7.5	7.1	8.1	8.1	7.6
Alkalinity	mg/l as $CaCO_3$	70	64	47.1	283	293	71
Suspended Solids	mg/l	180	30	30	30	30	176
TDS	mg/l	9860	13,150	6280	624	545	9894
Total Hardness	mg/l as $CaCO_3$	2020	2700	1330	134	120	2027
Calcium	mg/l	146	195	96	29	27	147
Magnesium	mg/l	403	537	264	15	12	404
Sodium	mg/l	3020	4030	1980	120	99	3030
Chloride	mg/l	5490	7330	3725	52	26	5508
Sulfate	mg/l	748	1020	507	33	16	751
Bicarbonate	mg/l	83	77	56.4	310	357	84
Ammonia	mg/l	0.5	0.6	0.313	25		0.5
ortho-Phosphate	mg/l	0.5	0.7	0.35	5		0.5
Silica	mg/l as SiO_2	1.0	1.3	0.67	12	10	1.0
BOD_5	mg/l				30		
Cycles of concentration		1.5	2				
H_2SO_4 added	mg/l	0	14				
Max TDS		17,800	23,750				

a) Other plant discharges include demineralizer wastes and other plant drains.
b) Combined discharge is the mass-balanced combination of the five primary flow paths.

Table 1.3-3 (Sheet 1 of 2)
Single Unit Principal Radionuclides in Solid Radwaste

Radionuclide	ABWR Quantity (Ci/yr)	AP1000 Quantity (Ci/yr)	U.S. EPR Quantity (Ci/yr)	US-APWR Quantity (Ci/yr)	Bounding Value Quantity (Ci/yr)
H-3		1.61E+00	8.52E-02		1.61E+00
C-14		2.85E-01	2.70E-01		2.85E-01
Na-24				6.50E+01	6.50E+01
Cr-51	5.24E+03	2.92E-01	1.75E+00	2.73E+02	5.24E+03
Mn-54	7.51E+01	2.24E+01	3.60E+02	1.69E+03	1.69E+03
Fe-55	5.64E+02	3.11E+02	4.73E+02	2.60E+03	2.60E+03
Mn-56				3.64E+01	3.64E+01
Co-58	1.96E+02	6.23E+01	1.14E+02	1.14E+03	1.14E+03
Fe-59	2.87E+01		1.09E+00	5.20E+01	5.20E+01
Co-60	4.34E+02	2.87E+02	2.36E+02	1.04E+03	1.04E+03
Ni-63	1.09E+03	3.16E+02	4.46E+00		1.09E+03
Zn-65			9.34E+01	4.16E+02	4.16E+02
Br-82				3.38E+01	3.38E+01
Br-83				2.08E+01	2.08E+01
Br-84				2.47E+00	2.47E+00
Rb-86				2.21E+02	2.21E+02
Rb-88				8.19E+01	8.19E+01
Rb-89				1.56E+00	1.56E+00
Sr-89				2.60E+02	2.60E+02
Sr-90			2.63E+00	1.56E+02	1.56E+02
Y-90			2.55E+00	1.56E+02	1.56E+02
Sr-91				1.30E+00	1.30E+00
Y-91				4.81E+01	4.81E+01
Y-91m				8.19E-01	8.19E-01
Sr-92				2.08E-01	2.08E-01
Y-92				4.29E-01	4.29E-01
Y-93				2.73E-01	2.73E-01
Nb-95	7.73E+00	3.23E-01	7.59E+00	9.49E+01	9.49E+01
Zr-95	7.73E+00	7.16E-02	3.66E+00	6.24E+01	6.24E+01
Mo-99				3.25E+03	3.25E+03
Tc-99m				2.99E+03	2.99E+03
Mo-101				5.33E-01	5.33E-01
Rh-103m			1.12E+01		1.12E+01
Ru-103			1.25E+01	3.12E+01	3.12E+01
Ru-106			2.08E+01	7.80E+01	7.80E+01

Table 1.3-3 (Sheet 2 of 2)
Single Unit Principal Radionuclides in Solid Radwaste

Radionuclide	ABWR Quantity (Ci/yr)	AP1000 Quantity (Ci/yr)	U.S. EPR Quantity (Ci/yr)	US-APWR Quantity (Ci/yr)	Bounding Value Quantity (Ci/yr)
Ag-110m	1.06E+00	4.60E-02	1.11E+02	5.59E-01	1.11E+02
Te-125m				6.63E+01	6.63E+01
Te-127m				4.94E+02	4.94E+02
Te-129				9.49E-01	9.49E-01
Te-129m				5.20E+02	5.20E+02
I-130				8.06E+04	8.06E+04
I-131				3.38E+04	3.38E+04
Te-131				3.90E-01	3.90E-01
Te-131m				5.20E+01	5.20E+01
Cs-132				5.59E+02	5.59E+02
I-132				1.69E+03	1.69E+03
Te-132				1.43E+03	1.43E+03
I-133				6.37E+03	6.37E+03
Te-133m				1.69E+00	1.69E+00
Cs-134			1.83E+02	4.16E+05	4.16E+05
I-134				5.98E+01	5.98E+01
Te-134				2.21E+00	2.21E+00
Cs-135m				4.94E-01	4.94E-01
I-135				1.30E+03	1.30E+03
Cs-136				4.16E+03	4.16E+03
Ba-137m				2.99E+05	2.99E+05
Cs-137			3.48E+02	3.12E+05	3.12E+05
Cs-138				3.25E+01	3.25E+01
Ba-140	2.62E+02	8.73E-02	1.92E-01	7.80E+01	2.62E+02
La-140	2.62E+02	4.01E-02	1.92E-01	7.93E+01	2.62E+02
Ce-141				3.12E+01	3.12E+01
Ce-143				1.09E+00	1.09E+00
Ce-144			7.74E-01	1.69E+02	1.69E+02
Pr-144				1.69E+02	1.69E+02
Pm-147				3.12E+01	3.12E+01
Eu-154				3.51E+00	3.51E+00
Np-239	1.50E+03				1.50E+03
Pu-241		1.14E-01	3.39E-01		3.39E-01
Total w/o H-3	9.67E+03	1.00E+03	1.99E+03	1.17E+06	1.18E+06
Total w/ H-3	**9.67E+03**	**1.00E+03**	**1.99E+03**	**1.17E+06**	**1.18E+06**

Table 1.3-4
Emissions from Auxiliary Boilers

Pollutant Discharged	**(lbs)[a]**
Particulates (PM_{10})	34,500
Sulfur Oxides	115,000
Carbon Monoxide	1749
Volatile Organic Compounds[b]	100,200
Nitrogen Oxides	19,022

a) Emissions based on 30 days continuous operation per boiler.
b) As total hydrocarbons

Table 1.3-5
Emissions from Standby Diesel Generators

Pollutant Discharged	Diesel Generators (lb/yr)[a]
Particulates (PM_{10})	1620
Sulfur Oxides	5010
Carbon Monoxide	4600
Volatile Organic Compounds[b]	3070
Nitrogen Oxides	28,968

a) Emissions based on 4 hr/month operation for all of the generators.
b) As total hydrocarbons

Table 1.3-6
Standby Power System Gas Turbine Flue Gas Effluents

Pollutant	Emission Factor[a][b]	Emission Rate (per GTG) [f] (Normal Operation)		
	(lb/MMBtu)	(lb/hr)	(lb/24-hr)	(lb/2-yr)[c]
NOx (Uncontrolled)	8.80E-01	66.25	1589.96	3179.93
NOx (Water-Steam Injection)	2.40E-01	18.07	433.63	867.25
CO (Uncontrolled)	3.30E-03	0.25	5.96	11.92
CO (Water-Steam Injection)	7.60E-02	5.72	137.32	274.63
SO2[d]	5.05 E-02	3.8	91.24	182.48
Filterable Particulate Matter[e]	4.30E-03	0.32	7.77	15.54
Condensable Particulate Matter[e]	7.20E-03	0.54	13.01	26.02
Total Particulate Matter[e]	1.20E-02	0.9	21.68	43.36
Total Hydrocarbons [e]	4.00E-03	0.3	7.23	14.45

a) Emission factors obtained from AP 42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combustion Sources, Section 3.1: Stationary Gas Turbines; U.S. EPA.

b) Based on average distillate oil heating value of 139 MMBtu/103 gallons. To convert from (lb/MMBtu) to (lb/103 gallons), multiply by 139.

c) Value based on operation 1 hour per month and one additional 24-hour period every 24 months.

d) Emission Factor = 1.01S, where S=percent sulfur in fuel. Example if sulfur content in the fuel is 3.4 percent, then S=3.4. All sulfur in the fuel is assumed to be converted to SO2.

e) Emission factor is based on combustion turbines using water-steam injection, which is not expected to have a large effect on particulate matter emissions. Particulate matter data for uncontrolled gas turbines were not available.

f) The bounding plant design has a total of six gas turbine generators.

Table 1.3-7 (Sheet 1 of 3)
Single Unit Composite Average Annual Normal Gaseous Release

Isotope	ABWR Release[(a)] (Ci/yr)	AP1000 Release[(b)] (Ci/yr)	U.S. EPR Release[(c)] (Ci/yr)	US-APWR Release[(d)] (Ci/yr)	Bounding Value Release (Ci/yr)
H-3	7.30E+01	3.50E+02	1.80E+02	1.80E+02	3.50E+02
C-14	9.19E+00	7.30E+00	1.89E+01[(e)]	7.30E+00	1.89E+01
Na-24	4.05E-03				4.05E-03
P-32	9.19E-04				9.19E-04
Ar-41	6.76E+00	3.40E+01	3.40E+01	3.40E+01	3.40E+01
Cr-51	3.51E-02	6.10E-04	9.70E-05	6.10E-04	3.51E-02
Mn-54	5.41E-03	4.30E-04	5.70E-05	4.30E-04	5.41E-03
Fe-55	6.49E-03				6.49E-03
Mn-56	3.51E-03				3.51E-03
Co-57		8.20E-06	8.20E-06	8.20E-06	8.20E-06
Co-58	2.41E-03	2.30E-02	4.80E-04	2.30E-02	2.30E-02
Fe-59	8.11E-04	7.90E-05	2.80E-05	7.90E-05	8.11E-04
Co-60	1.30E-02	8.70E-03	1.10E-04	8.80E-03	1.30E-02
Ni-63	6.49E-06				6.49E-06
Cu-64	1.00E-02				1.00E-02
Zn-65	1.11E-02				1.11E-02
Kr-83m	8.38E-04				8.38E-04
Kr-85	5.68E+02	4.10E+03	2.80E+03[(e)]	1.40E+03	4.10E+03
Kr-85m	2.11E+01	3.60E+01	1.50E+02	0.00E+00	1.50E+02
Kr-87	2.51E+01	1.50E+01	5.30E+01	0.00E+00	5.30E+01
Kr-88	3.78E+01	4.60E+01	1.80E+02	0.00E+00	1.80E+02
Kr-89	2.41E+02				2.41E+02
Rb-89	4.32E-05				4.32E-05
Sr-89	5.68E-03	3.00E-03	1.60E-04	3.00E-03	5.68E-03
Kr-90	3.24E-04				3.24E-04
Sr-90	7.03E-05	1.20E-03	6.30E-05	1.20E-03	1.20E-03
Y-90	4.59E-05				4.59E-05
Sr-91	1.00E-03				1.00E-03
Y-91	2.41E-04				2.41E-04
Sr-92	7.84E-04				7.84E-04
Y-92	6.22E-04				6.22E-04
Y-93	1.11E-03				1.11E-03
Nb-95	8.38E-03	2.50E-03	4.20E-05	2.50E-03	8.38E-03
Zr-95	1.59E-03	1.00E-03	1.00E-05	1.00E-03	1.59E-03
Mo-99	5.95E-02				5.95E-02
Tc-99m	2.97E-04				2.97E-04

Table 1.3-7 (Sheet 2 of 3)
Single Unit Composite Average Annual Normal Gaseous Release

Isotope	ABWR Release[(a)] (Ci/yr)	AP1000 Release[(b)] (Ci/yr)	U.S. EPR Release[(c)] (Ci/yr)	US-APWR Release[(d)] (Ci/yr)	Bounding Value Release (Ci/yr)
Ru-103	3.51E-03	8.00E-05	1.70E-05	8.00E-05	3.51E-03
Rh-103m	1.11E-04				1.11E-04
Rh-106	1.89E-05				1.89E-05
Ru-106	1.89E-05	7.80E-05	7.80E-07	7.80E-05	7.80E-05
Ag-110m	2.00E-06				2.00E-06
Sb-124	1.81E-04				1.81E-04
Sb-125		6.10E-05	6.10E-07	6.10E-05	6.10E-05
Te-129m	2.19E-04				2.19E-04
I-131	2.59E-01	1.20E-01	8.80E-03	4.20E-03	2.59E-01
Te-131m	7.57E-05				7.57E-05
Xe-131m	5.14E+01	1.80E+03	2.70E+03[(e)]	2.60E+02	2.70E+03
I-132	2.19E+00	4.00E-01			2.19E+00
Te-132	1.89E-05				1.89E-05
I-133	1.70E+00		3.20E-02	6.40E-02	1.70E+00
Xe-133	2.41E+03	4.60E+03	7.20E+03[(e)]	0.00E+00	7.20E+03
Xe-133m	8.65E-02	8.70E+01	1.70E+02[(e)]	2.00E+00	1.70E+02
Cs-134	6.22E-03	2.30E-03	4.80E-05	2.30E-03	6.22E-03
I-134	3.78E+00				3.78E+00
I-135	2.41E+00				2.41E+00
Xe-135	4.59E+02	3.30E+02	1.20E+03	2.00E+00	1.20E+03
Xe-135m	4.05E+02	7.00E+00	1.40E+01	4.00E+00	4.05E+02
Cs-136	5.95E-04	8.50E-05	3.30E-05	8.50E-05	5.95E-04
Cs-137	9.46E-03	3.60E-03	9.00E-05	3.60E-03	9.46E-03
Xe-137	5.14E+02		0.00E+00	4.00E+00	5.14E+02
Ba-137m				3.60E-03	3.60E-03
Cs-138	1.70E-04				1.70E-04
Xe-138	4.32E+02	6.00E+00	1.20E+01	1.00E+00	4.32E+02
Xe-139	4.05E-04				4.05E-04
Ba-140	2.70E-02	4.20E-04	4.20E-06	4.20E-04	2.70E-02
La-140	1.81E-03				1.81E-03
Ce-141	9.19E-03	4.20E-05	1.30E-05	4.20E-05	9.19E-03
Ce-144	1.89E-05				1.89E-05
Pr-144	1.89E-05				1.89E-05
W-187	1.89E-04				1.89E-04
Np-239	1.19E-02				1.19E-02
Total w/o H-3	5.19E+03	1.11E+04	1.45E+04[(e)]	1.71E+03	1.74E+04
Total w/ H-3	**5.26E+03**	**1.14E+04**	**1.47E+04[(e)]**	**1.89E+03**	**1.78E+04**

Table 1.3-7 (Sheet 3 of 3)
Single Unit Composite Average Annual Normal Gaseous Release

Notes:

a) The annual average normal gaseous release from the ABWR for each isotope was taken from ABWR DCD (Rev. 4) Table 12.2-20.
b) The annual average normal gaseous release from the AP1000 for each isotope was taken from AP1000 DCD (Rev. 19) Table 11.3-3.
c) The annual average normal gaseous release from the U.S. EPR for each isotope was taken from U.S. EPR DCD (Rev. 1) Table 11.3-3, except for specific isotopes identified by footnote e below.
d) The annual average normal gaseous release from the US-APWR for each isotope was taken from US-APWR DCD (Rev. 3) Table 11.3-5.
e) The annual average normal gaseous release for the U.S. EPR for this isotope was obtained from the Bell Bend Nuclear Power Plant (BBNPP) Final Safety Analysis Report (FSAR), Revision 2.

Table 1.3-8 (Sheet 1 of 3)
Single Unit Composite Average Annual Normal Liquid Release

Isotope	ABWR Release[a] (Ci/yr)	AP1000 Release[b] (Ci/yr)	U.S. EPR Release[c] (Ci/yr)	US-APWR Release[d] (Ci/yr)	Bounding Value Release (Ci/yr)
H-3	8.00E+00	1.01E+03	1.66E+03	1.60E+03	1.66E+03
C-14	0.00E+00				0.00E+00
Na-24	5.05E-03	1.63E-03	6.10E-03	4.70E-03	6.10E-03
P-32	5.68E-04			1.80E-04	5.68E-04
Cr-51	1.70E-02	1.85E-03	1.00E-03	6.00E-03	1.70E-02
Mn-54	3.97E-03	1.30E-03	5.40E-04	4.50E-03	4.50E-03
Fe-55	9.46E-03	1.00E-03	4.10E-04	7.70E-03	9.46E-03
Co-56	0.00E+00				0.00E+00
Mn-56	2.04E-03				2.04E-03
Co-57	0.00E+00				0.00E+00
Co-58	8.38E-03	3.36E-03	1.50E-03	9.80E-03	9.80E-03
Fe-59	2.23E-03	2.00E-04	1.00E-04	2.30E-03	2.30E-03
Co-60	1.54E-02	4.40E-04	1.80E-04	1.40E-02	1.54E-02
Ni-63	1.70E-03			1.70E-03	1.70E-03
Cu-64	1.26E-02				1.26E-02
Zn-65	4.41E-04	4.10E-04	1.70E-04	2.20E-04	4.41E-04
Br-84		2.00E-05			2.00E-05
Rb-88		2.70E-04		2.80E-02	2.80E-02
Rb-89	0.00E+00				0.00E+00
Sr-89	3.14E-04	1.00E-04	5.00E-05	1.50E-04	3.14E-04
Sr-90	2.68E-05	1.00E-05		1.80E-05	2.68E-05
Y-90	0.00E+00				0.00E+00
Sr-91	1.25E-03	2.00E-05	8.00E-05	6.80E-05	1.25E-03
Y-91	2.35E-04			9.00E-05	2.35E-04
Y-91m		1.00E-05	5.00E-05	4.40E-05	5.00E-05
Sr-92	4.43E-04				4.43E-04
Y-92	1.69E-03				1.69E-03
Y-93	1.36E-03	9.00E-05	3.60E-04	2.90E-04	1.36E-03
Nb-95	3.14E-04	2.10E-04	1.00E-04	2.00E-03	2.00E-03
Zr-95	1.11E-03	2.30E-04	1.30E-04	1.30E-03	1.30E-03
Mo-99	2.61E-03	5.70E-04	1.80E-03	1.70E-03	2.61E-03
Tc-99m	5.68E-03	5.50E-04	1.70E-03	1.70E-03	5.68E-03
Ru-103	3.27E-04	4.93E-03	2.50E-03	3.40E-03	4.93E-03
Rh-103m	0.00E+00	4.93E-03	2.50E-03	3.10E-03	4.93E-03
Rh-106	0.00E+00	7.35E-02	3.10E-02	3.90E-02	7.35E-02
Ru-106	8.89E-03	7.35E-02	3.10E-02	4.70E-02	7.35E-02
Ag-110		1.40E-04	6.00E-05	7.20E-05	1.40E-04

Table 1.3-8 (Sheet 2 of 3)
Single Unit Composite Average Annual Normal Liquid Release

Isotope	ABWR Release[(a)] (Ci/yr)	AP1000 Release[(b)] (Ci/yr)	U.S. EPR Release[(c)] (Ci/yr)	US-APWR Release[(d)] (Ci/yr)	Bounding Value Release (Ci/yr)
Ag-110m		1.05E-03	4.40E-04	1.80E-03	1.80E-03
Sb-124				4.30E-04	4.30E-04
Te-129		1.50E-04	4.00E-05	3.10E-04	3.10E-04
Te-129m	8.43E-05	1.20E-04	6.00E-05	7.80E-05	1.20E-04
I-131	9.05E-03	1.41E-02	3.40E-02	2.00E-03	3.40E-02
Te-131		3.00E-05	6.00E-05	7.60E-05	7.60E-05
Te-131m	8.38E-05	9.00E-05	3.10E-04	2.50E-04	3.10E-04
I-132	1.93E-03	1.64E-03	1.20E-03	3.10E-04	1.93E-03
Te-132	1.35E-05	2.40E-04	4.80E-04	4.70E-04	4.80E-04
I-133	3.73E-02	6.70E-03	3.50E-02	8.10E-04	3.73E-02
Cs-134	1.13E-02	9.93E-03	2.60E-03	1.20E-02	1.20E-02
I-134	1.14E-04	8.10E-04		8.90E-05	8.10E-04
I-135	1.09E-02	4.97E-03	1.50E-02	7.80E-04	1.50E-02
Cs-136	7.51E-04	6.30E-04	3.10E-04	2.20E-02	2.20E-02
Cs-137	1.78E-02	1.33E-02	3.50E-03	1.80E-02	1.80E-02
Ba-137m		1.25E-02	3.30E-03	4.60E-04	1.25E-02
Cs- 138	8.00E-07				8.00E-07
Ba-140	1.68E-03	5.52E-03	4.20E-03	5.80E-03	5.80E-03
La-140	0.00E+00	7.43E-03	7.60E-03	8.00E-03	8.00E-03
Ce-141	2.97E-04	9.00E-05	5.00E-05	2.90E-04	2.97E-04
Ce-143		1.90E-04	6.10E-04	5.00E-04	6.10E-04
Pr-143	8.11E-05	1.30E-04	5.00E-05	7.90E-05	1.30E-04
Ce-144	3.89E-03	3.16E-03	1.30E-03	5.60E-03	5.60E-03
Pr-144		3.16E-03	1.30E-03	1.70E-03	3.16E-03
Nd-147	2.00E-06				2.00E-06
W -187	2.23E-04	1.30E-04	4.60E-04	3.50E-04	4.60E-04
Np-239	9.49E-03	2.40E-04	5.80E-04	5.30E-04	9.49E-03
Other		2.00E-05	2.00E-05	1.20E-05	2.00E-05
Total w/o H-3	2.08E-01	2.56E-01	1.94E-01	2.62E-01	4.75E-01
Total w/ H-3	**8.21E+00**	**1.01E+03**	**1.66E+03**	**1.60E+03**	**1.66E+03**

Table 1.3-8 (Sheet 3 of 3)
Single Unit Composite Average Annual Normal Liquid Release

Notes:

a) The annual average normal liquid release from the ABWR for each isotope was taken from South Texas Project 3 & 4 FSAR (Rev. 2) Table 12.2-22.
b) The annual average normal liquid release from the AP1000 for each isotope was taken from AP1000 DCD (Rev. 19) Table 11.2-7.
c) The annual average normal liquid release from the U.S. EPR for each isotope was taken from U.S. EPR DCD (Rev. 1) Table 11.2-4.
d) The annual average normal liquid release from the US-APWR for each isotope was taken from US-APWR DCD (Rev. 3) Table 11.2-10.

Table 1.3-9 (Sheet 1 of 3)
Liquid-Containing Tank Failure Radionuclide Concentrations

Radionuclide	ABWR[a] (MBq)	ABWR[a] (µCi/cc[e])	AP-1000[b] (µCi/cc)	US-APWR[c] (µCi/cc)	U.S. EPR[d] (µCi/cc)	Bounding Value (µCi/cc)
Br-82				3.50E-03		3.50E-03
Br-83				2.40E-02	3.20E-02	3.20E-02
Br-84				1.10E-02	1.70E-02	1.70E-02
Br-85					2.00E-03	2.00E-03
Rb-86m					3.00E-07	3.00E-07
Rb-86				1.10E-02	1.90E-03	1.10E-02
Rb-88			1.50E+00	1.40E+00	1.00E+00	1.50E+00
Rb-89	2.80E+02	8.41E-05	6.90E-02	2.50E-02	4.70E-02	6.90E-02
Sr-89	5.10E+03	1.53E-03	1.10E-04	8.30E-04	6.40E-04	1.53E-03
Sr-90	4.20E+02	1.26E-04		5.40E-05	3.30E-05	1.26E-04
Sr-91	7.00E+03	2.10E-03		4.70E-04	1.00E-03	2.10E-03
Sr-92	5.30E+03	1.59E-03		2.20E-04	1.70E-04	1.59E-03
Y-90	4.20E+02	1.26E-04		1.80E-04	7.70E-06	1.80E-04
Y-91m				2.70E-04	5.20E-04	5.20E-04
Y-91	2.00E+03	6.01E-04		1.30E-04	8.10E-05	6.01E-04
Y-92	4.10E+03	1.23E-03		2.10E-04	1.40E-04	1.23E-03
Y-93	6.80E+03	2.04E-03		9.00E-05	6.50E-05	2.04E-03
Zr-95	4.10E+02	1.23E-04		1.60E-04	9.30E-05	1.60E-04
Zr-97					6.70E-05	6.70E-05
Nb-95	3.70E+02	1.11E-04		1.80E-04	9.40E-05	1.80E-04
Mo-99	2.00E+04	6.01E-03	2.10E-01	1.80E-01	1.10E-01	2.10E-01
Mo-101				5.00E-03		5.00E-03
Tc-99m	2.00E+04	6.01E-03		1.10E-01	4.60E-02	1.10E-01
Ru-103	9.70E+02	2.91E-04		1.30E-04	7.80E-05	2.91E-04
Ru-105					9.50E-05	9.50E-05
Ru-106	1.80E+02	5.41E-05		4.70E-05	2.70E-05	5.41E-05
Rh-103m	9.70E+02	2.91E-04			6.80E-05	2.91E-04
Rh-105					4.40E-05	4.40E-05
Rh-106	1.80E+02	5.41E-05			2.70E-05	5.41E-05
Ag-110m	5.80E+01	1.74E-05		4.30E-07	2.00E-07	1.74E-05
Ag-110					1.10E-08	1.10E-08
Sb-125					8.00E-07	8.00E-07
Sb-127					5.00E-06	5.00E-06
Sb-129					6.80E-06	6.80E-06
Te-125m				1.90E-04		1.90E-04
Te-127m				7.50E-04	4.40E-04	7.50E-04
Te-127					2.20E-03	2.20E-03
Te-129m	1.80E+03	5.41E-04		2.50E-03	1.50E-03	2.50E-03
Te-129				2.00E-03	2.40E-03	2.40E-03
Te-131m	4.60E+02	1.38E-04		6.30E-03	3.70E-03	6.30E-03

Table 1.3-9 (Sheet 2 of 3)
Liquid-Containing Tank Failure Radionuclide Concentrations

Radionuclide	ABWR[a] (MBq)	ABWR[a] (µCi/cc[e])	AP-1000[b] (µCi/cc)	US-APWR[c] (µCi/cc)	U.S. EPR[d] (µCi/cc)	Bounding Value (µCi/cc)
Te-131				2.20E-03	2.60E-03	2.60E-03
Te-132	1.10E+02	3.30E-05		7.00E-02	4.10E-02	7.00E-02
Te-133m				4.30E-03		4.30E-03
Te-134				7.60E-03	6.70E-03	7.60E-03
I-129					4.60E-08	4.60E-08
I-130				2.70E-02	5.00E-02	5.00E-02
I-131	1.20E+05	3.60E-02	7.10E-02	6.70E-01	7.40E-01	7.40E-01
I-132	1.70E+04	5.11E-03	9.30E-02	2.90E-01	3.70E-01	3.70E-01
I-133	1.10E+05	3.30E-02	1.30E-01	1.10E+00	1.30E+00	1.30E+00
I-134	1.10E+04	3.30E-03	2.20E-02	1.50E-01	2.40E-01	2.40E-01
I-135	5.20E+04	1.56E-02	7.80E-02	6.40E-01	7.90E-01	7.90E-01
Cs-132				2.20E-03		2.20E-03
Cs-134	1.60E+03	4.80E-04	6.90E-01	2.00E+00	1.70E-01	2.00E+00
Cs-135m				2.40E-03		2.40E-03
Cs-136	6.00E+02	1.80E-04	1.00E+00	2.50E-01	5.30E-02	1.00E+00
Cs-137	4.40E+03	1.32E-03	5.00E-01	1.20E+00	1.10E-01	1.20E+00
Cs-138	1.20E+03	3.60E-04	3.70E-01	2.60E-01	2.20E-01	3.70E-01
Ba-137m			5.00E-01	8.00E+00	1.00E-01	8.00E+00
Ba-139					2.20E-02	2.20E-02
Ba-140	1.30E+04	3.90E-03		9.80E-04	6.20E-04	3.90E-03
La-140	1.30E+04	3.90E-03		4.20E-04	1.60E-04	3.90E-03
La-141					5.30E-05	5.30E-05
La-142					3.10E-05	3.10E-05
Ce-141	1.40E+03	4.20E-04		1.50E-04	8.90E-05	4.20E-04
Ce-143				1.20E-04	7.60E-05	1.20E-04
Ce-144	1.70E+02	5.11E-05		1.20E-04	6.90E-05	1.20E-04
Pr-143	1.00E+02	3.00E-05			8.80E-05	8.80E-05
Pr-144				2.90E-03	6.90E-05	2.90E-03
Pm-147				1.30E-05		1.30E-05
Nd-147					3.40E-05	3.40E-05
Eu-154				1.20E-06		1.20E-06
Np-239	6.80E+04	2.04E-02			8.70E-04	2.04E-02
Pu-238					2.00E-07	2.00E-07
Pu-239					2.00E-08	2.00E-08
Pu-240					2.80E-08	2.80E-08
Pu-241					6.90E-06	6.90E-06
Am-241					7.80E-09	7.80E-09
Cm-242					1.90E-06	1.90E-06
Cm-244					1.00E-07	1.00E-07
Na-24	2.50E+04	7.51E-03		1.50E-02	3.70E-02	3.70E-02

Table 1.3-9 (Sheet 3 of 3)
Liquid-Containing Tank Failure Radionuclide Concentrations

Radionuclide	ABWR[(a)] (MBq)	ABWR[(a)] (µCi/cc[(e)])	AP-1000[(b)] (µCi/cc)	US-APWR[(c)] (µCi/cc)	U.S. EPR[(d)] (µCi/cc)	Bounding Value (µCi/cc)
P-32	6.90E+03	2.07E-03				2.07E-03
Cr-51	2.70E+05	8.11E-02		1.60E-03	2.00E-03	8.11E-02
Mn-54	4.10E+03	1.23E-03		1.10E-03	1.00E-03	1.23E-03
Mn-56	2.50E+04	7.51E-03	1.70E-02	4.00E-02		4.00E-02
Fe-55	6.00E+04	1.80E-02		1.10E-03	7.60E-04	1.80E-02
Fe-59	1.50E+03	4.50E-04		1.90E-04	1.90E-04	4.50E-04
Co-58	1.10E+04	3.30E-03		2.60E-03	2.90E-03	3.30E-03
Co-60	2.40E+04	7.21E-03		3.90E-04	3.40E-04	7.21E-03
Ni-63	6.00E+01	1.80E-05				1.80E-05
Cu-64	6.40E+04	1.92E-02				1.92E-02
Zn-65	1.20E+04	3.60E-03		3.20E-04	3.20E-04	3.60E-03
W-187	1.10E+03	3.30E-04			1.80E-03	1.80E-03
H-3		1.00E-02	3.50E+00	1.00E+00	1.00E+00	3.50E+00

Notes:

a) Data is based on ABWR DCD (Rev. 4) Table 12.2-13a and Section 11.1.2.3. The associated tank size is 90 m^3 (23,778 gallons) per Table 12.2-13a of the ABWR DCD.

b) Data is based on AP1000 DCD (Rev. 18) Table 12.2-9 and Section 11.1.1.3. The associated tank size is 28,000 gallons per Table 12.2-9 of the AP1000 DCD.

c) Data is based on US-APWR DCD (Rev. 2) Table 12.2-37 and Section 11.1.1.3. The associated tank size is 30,000 gallons per Table 11.2-3 of the US-APWR DCD.

d) Data is based on U.S. EPR DCD (Rev. 1) Table 11.1-2. The associated tank size is 19,600 gallons per Table 11.2-2 of the U.S. EPR DCD.

e) A conversion factor between MBq (in a 90 m^3 tank) and µCi/cc is:
10^6 Bq / 1 MBq x 1 µCi / 3.7×10^4 Bq x 1 m^3 / 10^6 cc x 1 / 90 m^3 = 3×10^{-7} µCi/cc x m^3/MBq.

1.4 IDENTIFICATION OF AGENTS AND CONTRACTORS

1.4.1 APPLICANT

1.4.1.1 PSEG Power, LLC and PSEG Nuclear, LLC

PSEG Power, LLC submits this application for an Early Site Permit for itself and PSEG Nuclear, LLC.

PSEG Power, LLC is a Delaware limited liability company, which is wholly owned by Public Service Enterprise Group, Incorporated, a corporation formed under the laws of the State of New Jersey. PSEG Nuclear, LLC is a Delaware limited liability company formed to own and operate nuclear generating stations and is a wholly owned subsidiary of PSEG Power, LLC. PSEG Nuclear, LLC is the owner and licensed operator of the Hope Creek Generating Station and the partial owner and licensed operator of the Salem Nuclear Generating Station, Units 1 and 2. These existing nuclear generating stations are adjacent to the PSEG Site that is the subject of this Early Site Permit application. It is anticipated that PSEG Nuclear, LLC will be the licensed operator of the new plant at the PSEG site, which is the subject of this application.

1.4.2 CONTRACTORS

1.4.2.1 Sargent & Lundy, LLC

Sargent & Lundy, LLC is a full-service architect-engineering firm with considerable nuclear plant expertise. The firm has demonstrated and proven capabilities in the design and licensing of nuclear plants both domestically and overseas. Sargent & Lundy, LLC has engineered, designed, planned, evaluated, and managed large, complex nuclear projects including 30 new nuclear units.

Sargent & Lundy, LLC provided engineering, management, and consulting services to prepare the ESPA for PSEG. This included project management and engineering services, developing SSAR and ER sections, developing the emergency plan, and preparing the ESPA.

1.4.2.2 MACTEC Engineering and Consulting, Inc.

MACTEC Engineering and Consulting, Inc. is a leader in the engineering, environmental, and remedial construction industries and provides a full range of engineering consulting services to clients worldwide. These services include site development, planning and engineering design, construction phase services, environmental services, and facilities operations and maintenance services.

MACTEC Engineering and Consulting, Inc. performed hydrogeological, hydrological and geotechnical field investigations and laboratory testing in support of the ESPA for the PSEG Site. This includes performing standard penetration tests, obtaining core samples, and installing groundwater observation wells.

In June 2011, AMEC acquired MACTEC Engineering and Consulting, Inc. AMEC Environment and Infrastructure, Inc. is providing hydrogeological, hydrological and geotechnical engineering services in support of the ESPA for the PSEG Site.

1.4.3 OTHER CONSULTANTS

1.4.3.1 William Lettis & Associates, Inc.

William Lettis & Associates, Inc. performed geologic mapping and characterized seismic sources in support of SSAR Section 2.5, including literature review, geologic field reconnaissance, review and evaluation of existing seismic source characterization models, identification and characterization of any new or different sources, and preparation of the related SSAR sections.

In December 2007, William Lettis & Associates, Inc. was acquired by Fugro Consultants, Inc. William Lettis & Associates operated as a unit of Fugro Consultants until being integrated into Fugro Consultants. Fugro Consultants is supporting geoscience topics associated with SSAR Section 2.5.

1.5 REQUIREMENTS FOR FURTHER TECHNICAL INFORMATION

No technical development programs remain to be performed to support this application.

1.6 MATERIAL INCORPORATED BY REFERENCE

No material has been incorporated by reference in this application.

1.7 DRAWINGS AND OTHER DETAILED INFORMATION

No such information has been submitted separately as part of this application.

1.8 INTERFACES WITH STANDARD DESIGNS

This topic is not applicable to this ESPA and will be discussed at the COL Application stage.

1.9 CONFORMANCE TO NRC REGULATIONS AND REGULATORY GUIDANCE

This section discusses the conformance of the ESPA SSAR with applicable NRC regulations and guidance. NRC regulations are contained in Title 10 of the Code of Federal Regulations. NRC guidance is contained in NRC Regulatory Guides (RGs) and in NRC Standard Review Plan NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition*.

The applicable NRC regulations, Regulatory Guides, and the Standard Review Plan are identified in Table 1.9-1 for each SAR section. Conformance with the regulation is determined using the acceptance criteria sections of NUREG-0800. The revision number and date are provided for applicable Regulatory Guides.

Clarifications are identified when guidance is met, but additional information is needed to provide complete understanding of the method of conformance. In certain instances, regulations and regulatory guides do not apply due to design features not being applicable or due to process timing (i.e., applies at COL application versus ESPA). Clarification explanations are provided in Table 1.9-2.

In some cases, the regulations or guidance documents in question contain requirements that apply only in part to an ESPA. This table indicates conformance with the portions of the regulations or guidance applicable to an ESPA.

Table 1.9-1 (Sheet 1 of 3)
Regulatory Conformance Matrix

Legend: X = Complies C = Clarification Required, See Table 1.9-2 **Regulatory Requirements Document Title**	**Rev.**	**Date**	**Chapter 1**	**2.0**	**2.1.1**	**2.1.2**	**2.1.3**	**2.2.1-2.2.2**	**2.2.3**	**2.3.1**	**2.3.2**	**2.3.3**	**2.3.4**	**2.3.5**	**2.4.1**	**2.4.2**	**2.4.3**	**2.4.4**	**2.4.5**	**2.4.6**	**2.4.7**	**2.4.8**	**2.4.9**	**2.4.10**	**2.4.11**	**2.4.12**	**2.4.13**	**2.5.1**	**2.5.2**	**2.5.3**	**2.5.4**	**2.5.5**	**3.5.1.6**	**11.2.3**	**11.3.3**	**13.3**	**13.6**	**Chapter 15**	**Chapter 17**
NRC Regulations																																							
10 CFR 20					X																																		
10 CFR 20, Appendix B, Table 2																																		X	X				
10 CFR 20.1301																																		X	X				
10 CFR 50.33			X																																	X			
10 CFR 50.34			X																																	X			X
10 CFR 50.34(a)														X																									
10 CFR 50.34(a)(1)					X	X	X																															X	
10 CFR 50.47(b)												X																								X			
10 CFR 50, Appendix B																															X	X							X
10 CFR 50, Appendix E												X																								X			
10 CFR 50, Appendix I												X		X																				X	X				
10 CFR 50, Appendix S																X															X	X							
10 CFR 52.16			X																																				
10 CFR 52.17			X	X			X																													X	X		
10 CFR 52.17(a)					X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X
10 CFR 52.18																																				X			
10 CFR 73.55																																					X		
10 CFR 100				X			X																					X		X	X				X	X			
10 CFR 100.3					X	X																														X			
10 CFR 100.20							X																									X			X				
10 CFR 100.20(b)					X	X	X	X	X																														
10 CFR 100.20(c)										X	X	X				X		X	X	X	X	X	X	X	X	X	X												
10 CFR 100.21							X																									X							
10 CFR 100.21(c)												X																											
10 CFR 100.21(c)(2)													X	X																								X	
10 CFR 100.21(d)										X	X	X				X					X	X	X	X	X	X	X												
10 CFR 100.21(f)																																					X		
10 CFR 100.21(g)																																				X			
10 CFR 100.23																												X	X	X	X	X							
10 CFR 100.23(d)																	X	X	X	X		X	X	X	X	X	X												
40 CFR 190																																		X	X				

Table 1.9-1 (Sheet 2 of 3)
Regulatory Conformance Matrix

Legend:
X = Complies
C = Clarification Required, See Table 1.9-2

Regulatory Requirements Document Title	Rev.	Date	Chapter 1	2.0	2.1.1	2.1.2	2.1.3	2.2.1-2.2.2	2.2.3	2.3.1	2.3.2	2.3.3	2.3.4	2.3.5	2.4.1	2.4.2	2.4.3	2.4.4	2.4.5	2.4.6	2.4.7	2.4.8	2.4.9	2.4.10	2.4.11	2.4.12	2.4.13	2.5.1	2.5.2	2.5.3	2.5.4	2.5.5	3.5.1.6	11.2.3	11.3.3	13.3	13.6	Chapter 15	Chapter 17
NRC Guidance																																							
NRC RG 1.23	1	Mar-07								C	X	X	X	X																						X			
NRC RG 1.26	4	Mar-07																																					X
NRC RG 1.27	2	Jan-76								X					X	X	X	X	X	X	X	X	X		X	X					X	X							
NRC RG 1.28	3	Aug-85																																					C
NRC RG 1.29	4	Mar-07														X		X	X	X	X	X	X	X	X														X
NRC RG 1.59	2	Aug-77														X		X	X	X	X	X	X	X															
NRC RG 1.60	1	Dec-73																											X										
NRC RG 1.70	3	Nov-78	C		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
NRC RG 1.76	1	Mar-07								C																													
NRC RG 1.78	1	Dec-01							X				C	C																									
NRC RG 1.91	1	Feb-78							X																														
NRC RG 1.101	5	Jun-05																																		C			
NRC RG 1.102	1	Sep-76													X	X	X	X	X	X	X	X	X	X															
NRC RG 1.109	1	Oct-77												X																				X	X				
NRC RG 1.111	1	Jul-77												X																					X				
NRC RG 1.112	1	Mar-07												C																				X	X				
NRC RG 1.113	1	Apr-77																									X							X					
NRC RG 1.125	2	Mar-09																	X	X		X																	
NRC RG 1.132	2	Oct-03																										X	X	X	X	X							
NRC RG 1.138	2	Dec-03																										X			X	X							
NRC RG 1.145	1	Feb-83											X																									X	
NRC RG 1.165	0	Mar-97																										X	X	X									
NRC RG 1.183	0	Jul-00																																				X	
NRC RG 1.198	0	Nov-03																										X		X	X	X							
NRC RG 1.206	0	Jun-07								X	X	X	X															X	X	X	X	X				C			
NRC RG 1.208	0	Mar-07																										X	X	X									
NRC RG 4.7	2	Apr-98					X																					X	X	X	X					X	X		
NUREG-0800																																							
NUREG-0800, Section 1.0	1	Nov-07	C																																				
NUREG-0800, Section 2.0	0	Mar-07		X																																			
NUREG-0800, Section 2.1.1	3	Mar-07			X																																		
NUREG-0800, Section 2.1.2	3	Mar-07				X																																	
NUREG-0800, Section 2.1.3	3	Mar-07					X																																

Table 1.9-1 (Sheet 3 of 3)
Regulatory Conformance Matrix

Legend: X = Complies C = Clarification Required, See Table 1.9-2 **Regulatory Requirements Document Title**	**Rev.**	**Date**	**Chapter 1**	**2.0**	**2.1.1**	**2.1.2**	**2.1.3**	**2.2.1-2.2.2**	**2.2.3**	**2.3.1**	**2.3.2**	**2.3.3**	**2.3.4**	**2.3.5**	**2.4.1**	**2.4.2**	**2.4.3**	**2.4.4**	**2.4.5**	**2.4.6**	**2.4.7**	**2.4.8**	**2.4.9**	**2.4.10**	**2.4.11**	**2.4.12**	**2.4.13**	**2.5.1**	**2.5.2**	**2.5.3**	**2.5.4**	**2.5.5**	**3.5.1.6**	**11.2.3**	**11.3.3**	**13.3**	**13.6**	**Chapter 15**	**Chapter 17**
NUREG-0800, Section 2.2.1-2.2.2	3	Mar-07						X																															
NUREG-0800, Section 2.2.3	3	Mar-07							X																														
NUREG-0800, Section 2.3.1	3	Mar-07								X																													
NUREG-0800, Section 2.3.2	3	Mar-07									X																												
NUREG-0800, Section 2.3.3	3	Mar-07										X																											
NUREG-0800, Section 2.3.4	3	Mar-07											C																										
NUREG-0800, Section 2.3.5	3	Mar-07												X																									
NUREG-0800, Section 2.4.1	3	Mar-07													X																								
NUREG-0800, Section 2.4.2	4	Mar-07														X																							
NUREG-0800, Section 2.4.3	4	Mar-07															X																						
NUREG-0800, Section 2.4.4	3	Mar-07																X																					
NUREG-0800, Section 2.4.5	3	Mar-07																	X																				
NUREG-0800, Section 2.4.6	3	Mar-07																		X																			
NUREG-0800, Section 2.4.7	3	Mar-07																			X																		
NUREG-0800, Section 2.4.8	3	Mar-07																				X																	
NUREG-0800, Section 2.4.9	3	Mar-07																					X																
NUREG-0800, Section 2.4.10	3	Mar-07																						X															
NUREG-0800, Section 2.4.11	3	Mar-07																							X														
NUREG-0800, Section 2.4.12	3	Mar-07																								X													
NUREG-0800, Section 2.4.13	3	Mar-07																									X												
NUREG-0800, Section 2.5.1	4	Mar-07																										X											
NUREG-0800, Section 2.5.2	4	Mar-07																											X										
NUREG-0800, Section 2.5.3	4	Mar-07																												X									
NUREG-0800, Section 2.5.4	3	Mar-07																													X								
NUREG-0800, Section 2.5.5	3	Mar-07																														X							
NUREG-0800, Section 3.5.1.6	3	Mar-07																															C						
NUREG-0800, Section 11.2	3	Mar-07																																X					
NUREG-0800, Section 11.3	3	Mar-07																																	X				
NUREG-0800, Section 13.3	3	Mar-07																																		C			
NUREG-0800, Section 13.6	3	Mar-07																																			X		
NUREG-0800, Section 15.0.3	0	Mar-07																																				X	
NUREG-0800, Section 17.5	0	Mar-07																																					X

Table 1.9-2 (Sheet 1 of 2)
Regulatory Conformance Matrix Clarifications

SAR Section/Subsection	Document	Clarification
1.3	RG 1.70	The RG guidance for Section 1.3 is to provide a comparison with other facilities. Since the reactor technology is not selected at this stage, this section is used for presenting the PPE.
	NUREG-0800, Section 1.0	The SRP guidance for Section 1.3 is to provide a comparison with other facilities. Since the reactor technology is not selected at this stage, this section is used for presenting the PPE.
2.3.1	RG 1.23	ESPA data collected from the existing Salem and Hope Creek meteorological monitoring program prior to July 2008 conforms to RG 1.23, Revision 0. As of July 1, 2008 upgrades have been implemented to meet RG 1.23, Revision 1.
	RG 1.76	The AP1000 and ABWR Design Control Documents (DCDs) comply with RG 1.76, Revision 0. The U.S. EPR and US-APWR DCDs comply with RG 1.76, Revision 1.
2.3.4	RG 1.78	Control room habitability is addressed in the COL Application.
	NUREG-0800, Subsection 2.3.4	Control room habitability is addressed in the COL Application.
2.3.5	RG 1.78	Control room habitability is addressed in the COL Application.
	RG 1.112	Source terms for gaseous and liquid releases during normal plant operation are provided as part of the PPE and are listed in other sections involving dose assessment.
3.5.1.6	NUREG-0800, Subsection 3.5.1.6	U.S. Department of Energy methodology is used to evaluate the air hazard impact frequency (DOE-STD-3014-96).

Table 1.9-2 (Sheet 2 of 2)
Regulatory Conformance Matrix Clarifications

SAR Section/Subsection	Document	Clarification
13.3	RG 1.101	NUREG-0654, Criterion II.B.5 defines a 30 and 60-minute augmentation time. The existing Salem/Hope Creek Nuclear Generating Station's Emergency Plan (E-Plan) describes an Emergency Response Organization (ERO) augmentation time of 90 minutes to augment the affected unit on-shift staff upon the declaration of an Alert or higher classification (E-Plan Section B.5). The existing on-shift staffing, as augmented by the capabilities for additions in 90 minutes, satisfies the staffing requirements of NUREG-0654, Table B-1. In the Safety Evaluation Report (SER) for the revision to the E-Plan that approved the on-shift ERO capabilities, as well as the 90 minute augmentation time capabilities, the NRC found that the ERO augmentation (response) time of 90 minutes meets the intent of the NRC-approved E-plan, and continues to meet the standards of 10 CFR 50.47(b) and the requirements of Appendix E to 10 CFR Part 50. The NRC Safety Evaluation Report is dated June 26, 2008 (ADAMS Ascension # ML081690552)
	RG 1.206 C.I.13.3	Certain aspects of the technology specific Emergency Action Levels (EAL) required by 10 CFR 50.47(b)(4) and 10 CFR 50 App. E Section IV.B cannot be completed until actual as-built information is available, and certain Technical Specifications are finalized. PSEG will adopt its EAL scheme prior to initial fuel load of the unit.
	NUREG-0800, Section 13.3	NUREG-0654, Criterion II.B.5 defines a 30 and 60-minute augmentation time. The existing Salem/Hope Creek Nuclear Generating Station's Emergency Plan (E-Plan) describes an Emergency Response Organization (ERO) augmentation time of 90 minutes to augment the affected unit on-shift staff upon the declaration of an Alert or higher classification (E-Plan Section B.5). The existing on-shift staffing, as augmented by the capabilities for additions in 90 minutes, satisfies the staffing requirements of NUREG-0654, Table B-1. In the Safety Evaluation Report (SER) for the revision to the E-Plan that approved the on-shift ERO capabilities, as well as the 90 minute augmentation time capabilities, the NRC found that the ERO augmentation (response) time of 90 minutes meets the intent of the NRC-approved E-plan, and continues to meet the standards of 10 CFR 50.47(b) and the requirements of Appendix E to 10 CFR Part 50. The NRC Safety Evaluation Report is dated June 26, 2008 (ADAMS Ascension # ML081690552)
17.5 QAPD Part IV	RG 1.28	Quality assurance requirements utilize the more recently NRC endorsed NQA-1 in lieu of the identified outdated standards.

1.10 NUCLEAR POWER PLANTS TO BE OPERATED ON MULTI-UNIT SITES

This topic is not applicable to this ESPA and will be discussed at the COL Application stage.