



Presentation to the ACRS Subcommittee

Safety Review of the PSEG Site Early Site Permit Application

Presented by

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NRO/DNRL/LB1

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Purpose

- Brief the Subcommittee on the status of the staff's safety review of the PSEG Site early site permit (ESP) application
- Support the Subcommittee's review of the application and subsequent interim letter from the ACRS to the Commission
- Address the Subcommittee's questions

Meeting Agenda

- Introduction, Schedule Milestones, Status of Safety Evaluations (SEs)
- Key Review Area:
 - ♦ Hydrologic Engineering
- Advanced Safety Evaluation (ASE) with no Open Items (OIs) Conclusions
- Presentation Conclusions
- Summary of Safety Evaluations
- Discussion / Questions

PSEG Site ESP Application

- ESP applicants: PSEG Power, LLC and PSEG Nuclear, LLC (PSEG)
- Proposed ESP Site located in Lower Alloways Creek Township, Salem County, NJ (30 miles southwest of Philadelphia, PA, 7.5 miles southwest of Salem, NJ)
- Located on the upper Delaware Bay adjacent to and north of Hope Creek Generating Station (HCGS). The two-unit Salem Generating Station (SGS) is co-located on this site to the south of HCGS

PSEG Site ESP Application

- PSEG developed Plant Parameter Envelope (PPE) using 1-Unit U.S. EPR, 1-Unit ABWR, 1-Unit US-APWR, and 2-Unit Passive AP1000
- PSEG requests permit approval for a 20-year term
- PSEG does not seek approval for limited work authorization (LWA) activities
- PSEG seeks approval for complete and integrated emergency plans with ITAAC as part of ESP

Schedule Milestones

Completed

- PSEG Site ESP Application Received - 5/25/2010
- Acceptance Review Completed - 8/4/2010
- **Phase A** - RAIs Issued - 9/2013
- **Phase B** - Advanced Safety Evaluation (SE) with no Open Items Issued – 5/2015
- Chapters **Presented to ACRS** on March 19, 2014 -
 - ♦ 3.5.1.6, 11.2&11.3 (combined), 13.3, 15.0.3, 17.5
- Chapters **Presented to ACRS** on Sept. 29 & 30, 2014 -
 - ♦ 2.1&2.2 (combined), 2.3, 2.5
- Chapter 20 (Fukushima) points to other SEs where applicable Fukushima NTTF recommendations are evaluated

Schedule Milestones

Remaining

- Chapter 2.4 (Hydrologic Engineering) - Being Presented to ACRS Today (June 9, 2015)
- ACRS Full Committee Meeting - Scheduled for June 10, 2015
- **Phase C** - ACRS Meetings - Completion by 07/31/2015
- **Phase D** - Final Safety Evaluation Report (FSER) - Completion by 09/30/2015

Inspections / Site Visits/ Audits

- Inspections / Site Visits/ Audits:
 - ♦ Pre-application Site Visit – 1/2008
 - ♦ Emergency Planning Site Visit - 5/2010
 - ♦ Hydrologic Engineering Site Visit and Audit - 2/2011
 - ♦ Quality Assurance Audit - 5, 6/2011
 - ♦ Geology Site Visit and Audit - 9/2011
 - ♦ Meteorology Site Visit - 5/2012
 - ♦ Seismic Software Audit – 9/2013

Acronyms

- ANS/ANSII – American Nuclear Society / American National Standards Institute
- COL – Combined License
- CP – Construction Permit
- DC – Design Certification
- ESP – Early Site Permit
- HCGS – Hope Creek generating Station
- NAVD88 – North American Vertical Datum 1988
- NJDEP – New Jersey Department of Environmental Protection
- PPE – Plant Parameter Envelope
- SER – Safety Evaluation Report
- SGC – Salem Generating Station
- SSAR – Site Safety Analysis Report
- SSC – Structures, Systems, and Components
- USACE – United States Army Corps of Engineers

Key Review Area

Chapter 2, Section 2.4

“Hydrologic Engineering”

(ASE Issued April 22, 2015; ADAMS Accession No. ML13211A144)

Principal Contributors

Joseph Giacinto, PG

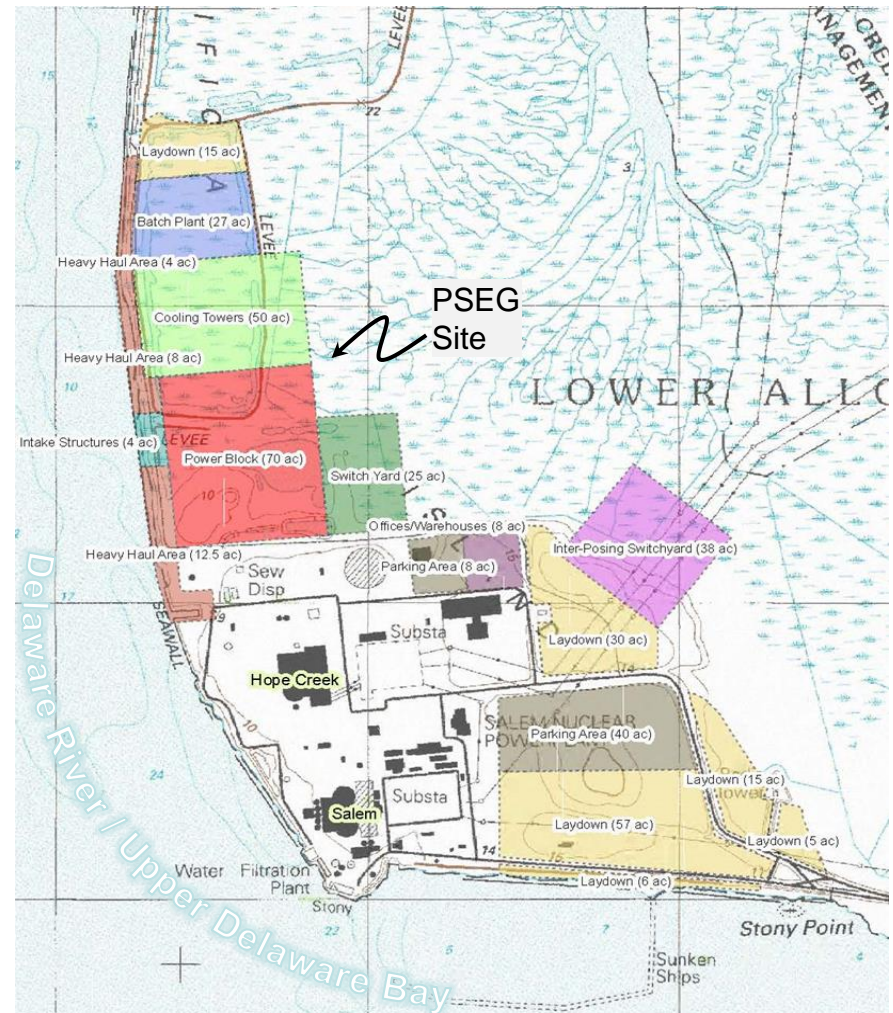
Henry Jones, Ph.D.



PSEG Site - Regional Setting.

Background

- Hydrologic engineering staff conducted a visit at the PSEG site February 2011
 - ♦ Topics included site setting, hydrologic site characteristics and associated document reviews
- Staff coordinated review with state and federal agencies
 - ♦ NJDEP, USGS (surface water / tsunami), USACE, NOAA
- Performed independent review and confirmatory analyses as explained in upcoming slides



Proposed PSEG Site Layout (from SSAR Rev 0 Figure 1.2-3).

Overview

- PSEG ESP Site located on eastern shore of lower Delaware River / upper Delaware Bay
- Approximately 13,600 mi² watershed
- Tidal flow dominates fresh water flow at the Site
 - ♦ Wide & open connection to Atlantic
- Existing site grade 5-15 ft
- Proposed site grade 36.9 ft
- Storm surge is DBF determining event at 32.1 ft



Looking north over Salem/Hope Creek.

Flood Analysis Summary

– Local Intense Precipitation

- Site drainage design dependent on reactor technology selected
- Local intense precipitation review deferred to COL stage
 - ♦ **COL Action Item 2.4-1:**

COL or Construction Permit (CP) applicant referencing this ESP should design the site grading to provide flooding protection to safety-related structures at the ESP site based on a comprehensive flood water routing analysis for a local PMP event without relying on any active surface drainage systems that may be blocked during this event.

Flood Analysis Summary

– Probable Maximum Flood

- **Probable maximum flood (PMF) 21.0 ft per ANSI/ANS-2.8-1992 combinatory events**
 - ♦ Probable maximum precipitation
 - ♦ Runoff and infiltration conservatively estimated
 - ♦ Surge/seiche from worst regional historical hurricane and 10 percent exceedance high tide
- **Results**
 - ♦ Maximum calculated riverine water level 15.9 ft below proposed site grade

Probable Maximum Surge and Seiche

- Initial screening method (1D with wind model)
 - ♦ Results extremely conservative (42.4 ft NAVD88)
- Moved to current best practice approach
 - ♦ Physics-based 2D model added realism / incorporated conservatism
 - ♦ Resulting design basis flood (DBF) 32.1 ft NAVD88

| | |
|--|----------------|
| 100-yr Sea Level Rise¹ (ft) | 1.35 ft |
| Ten Percent Astronomical High Tide² (ft) | 4.5 ft |
| Maximum Still Water Level (ft-NAVD88) | 20.2 ft |
| Wave Runup² (ft) | 7.4 ft |
| Maximum Total Water Surface Elevation (ft. NAVD88) | 32.1 ft |

¹Added prior to model simulation for initial sea level

²Added after model simulation to maximum still water level at site

Flood Protection

- Intake Structure

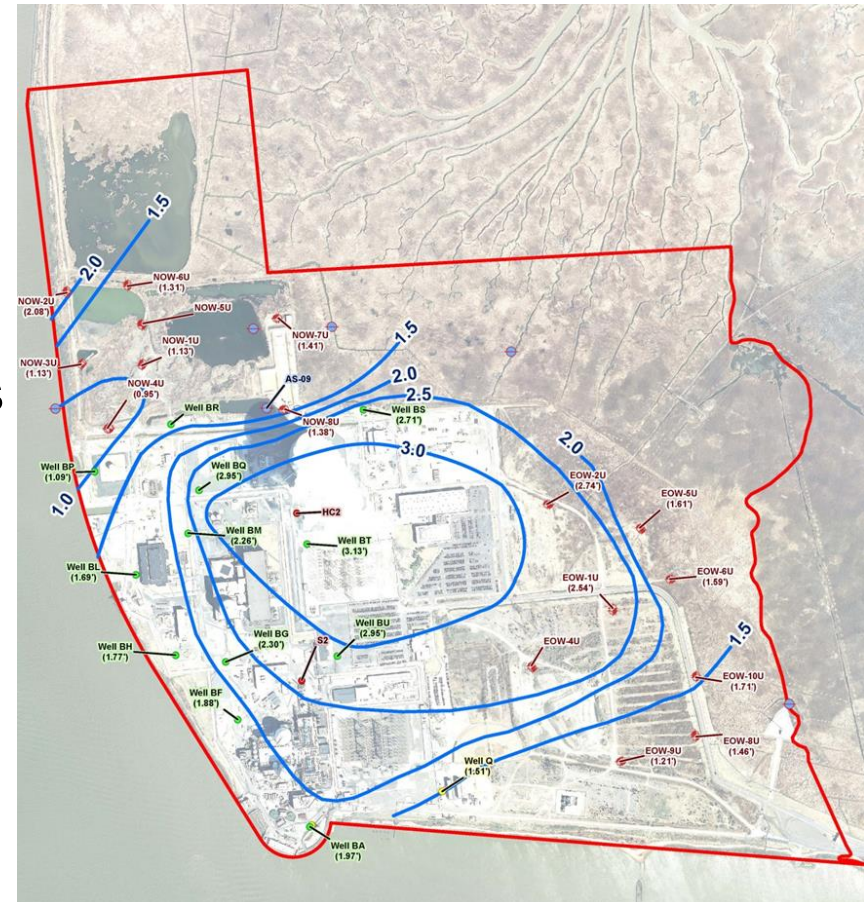
- Site grade of 36.9 ft
- DBF of 32.1 ft
- Sufficient margin for safety related site grade SSCs
- Intake structure design and associated flood protection considered at COL stage

- ♦ **COL Action Item 2.4-2:**

COL or CP applicant referencing this ESP should address whether the intake structure of the selected design is a safety-related SSC. If so, the applicant should address necessary flooding protection for a safety-related intake structure at the ESP site based on the design basis flooding event and associated effects.

Groundwater

- **Proposed site grade 36.9 ft**
 - ♦ Maximum groundwater level 10 ft
- **Monitoring program implemented during construction and operation**
 - ♦ **COL Action Item 2.4-3:**
COL or CP applicant referencing this ESP should refine hydrogeologic parameters and model estimates of dewatering rates and drawdowns beneath existing site structures after determination of the final excavation geometry consistent with a selected reactor technology.



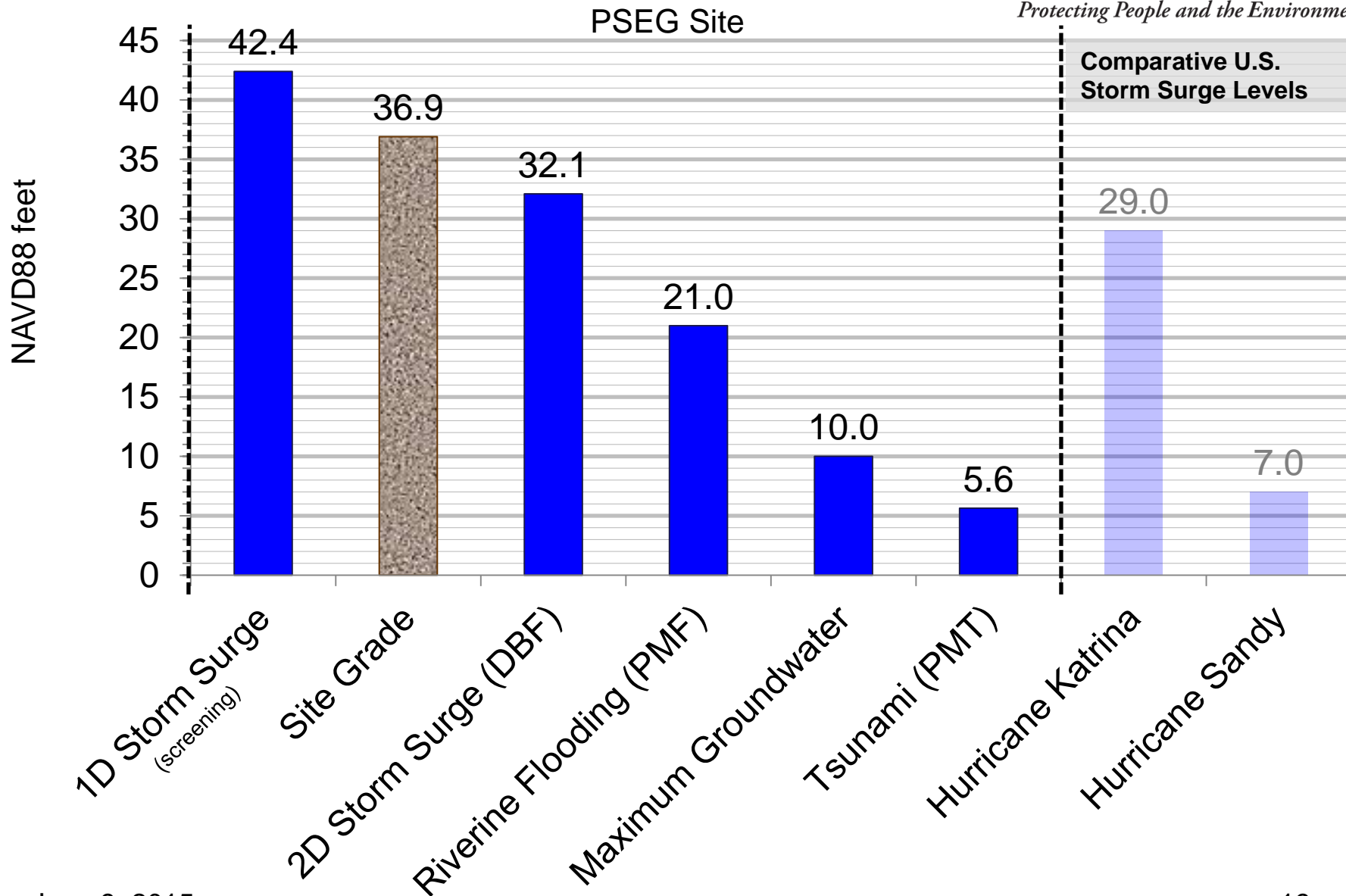
PSEG Site September 2009 Potentiometric Contours.
(from SSAR Rev 0, Figure 2.4.12-4).

Plant Parameter Envelope

- Site parameters

| Technology | Max Flood Level (ft below grade) | Max Groundwater Level (ft below grade) |
|-------------------|--|--|
| U.S. EPR | 1.0 | 3.3 |
| ABWR | 1.0 | 2.0 |
| APWR | 1.0 | 1.0 |
| AP1000 | 0.0 | 2.0 |

Water Levels and PSEG ESP Site Grade



Accidental Releases of Radioactive Liquid Effluents

- Scenarios account for potential post-construction flow directions:
 - ♦ Delaware River towards west
 - ♦ Marshland towards northeast
- Incorporated bounding PPE and conservative hydrologic characteristics
- Results
 - ♦ Concentration of each radionuclide is less than associated limit in 10 CFR 20.
 - ♦ Sum of the ratios (predicted concentration vs. 10 CFR 20 limit) for all radionuclides in the mixture is less than unity

SE Conclusions

- Conclusions from the Hydrologic Engineering review:

The applicant has provided sufficient information about the site description, satisfied the requirements, and considered the most severe natural phenomena that have been historically reported for the site and surrounding area and appropriately estimated the design-basis flood (DBF) elevation.

Presentation Conclusions

- ASER defers general regulatory conclusion regarding site safety and suitability to FSER in Phase D
- ASE with no Open Items on Chapter 2, Section 2.4 –
 - Contains no permit conditions
 - Contains three (3) Action Items to be addressed by a COL or CP applicant referencing the PSEG Site Early Site Permit
- Summary of Safety Evaluations
- Next Interaction with ACRS – June 10, 2015