



ND-2012-0011
February 16, 2012

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: **PSEG Early Site Permit Application**
Docket No. 52-043
Response to Request for Additional Information, RAI No. 48, Regional
Climatology

- References:
- 1) PSEG Power, LLC letter to USNRC, Application for Early Site Permit for the PSEG Site, dated May 25, 2010
 - 2) RAI No. 48, SRP Section: 02.03.01 – Regional Climatology, dated February 2, 2012 (eRAI 6226)
 - 3) PSEG Power, LLC Letter No. ND-2011-0030 to USNRC, Response to Request for Additional Information, RAI No. 14, Regional Climatology, dated May 13, 2011

The purpose of this letter is to respond to the request for additional information (RAI) identified in Reference 2 above. This RAI addresses Regional Climatology, as described in Subsection 2.3.2 of the Site Safety Analysis Report (SSAR), as submitted in Part 2 of the PSEG Site Early Site Permit Application, Revision 0.

Enclosure 1 provides our response for RAI No. 48, Question No. 02.03.01-7. Enclosure 2 includes the revisions to SSAR Subsection 2.3.1 resulting from our response to RAI No. 48, Question No. 02.03.01-7. Enclosure 3 includes the new regulatory commitments established in this submittal.

If any additional information is needed, please contact David Robillard, PSEG Nuclear Development Licensing Engineer, at (856) 339-7914.

D079
LRO

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 16th day of February, 2012.

Sincerely,

A handwritten signature in black ink, appearing to read "James Mallon". The signature is fluid and cursive, with the first name "James" and last name "Mallon" clearly distinguishable.

James Mallon
Early Site Permit Manager
Nuclear Development
PSEG Power, LLC

- Enclosure 1: Response to NRC Request for Additional Information, RAI No. 48, Question No. 02.03.01-7, SRP Section: 2.3.1 – Regional Climatology
- Enclosure 2: Proposed Revisions, Part 2 – Site Safety Analysis Report (SSAR), Section 2.3.1 - Regional Climatology
- Enclosure 3: Summary of Regulatory Commitments

cc: USNRC Project Manager, Division of New Reactor Licensing, PSEG Site (w/enclosures)
USNRC, Environmental Project Manager, Division of Site and Environmental Reviews (w/enclosures)
USNRC Region I, Regional Administrator (w/enclosures)

PSEG Letter ND-2012-0011, dated February 16, 2012

ENCLOSURE 1

RESPONSE to RAI No. 48

**QUESTION No.
02.03.01-7**

Response to RAI No. 48, Question 02.03.01-7:

In Reference 2, the NRC staff asked PSEG for information regarding the Regional Climatology, as described in Subsection 2.3.1 of the Site Safety Analysis Report. The specific request for Question 02.03.01-7 was:

[Follow up to RAI 14, Question 02.03.01-2]

10 CFR 52.17(a)(1)(vi) states, in part, that ESP applicants must identify the meteorological characteristics of the proposed site with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.

In response to RAI 14, Question 02.03.01-2, PSEG committed to updating the SSAR to include a discussion in accordance with the Interim Staff Guidance (ISG) DC/COL-ISG-07, "Interim Staff Guidance on Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures" (ML081990438). The NRC staff has reviewed the response and has determined that PSEG's response and associated SSAR markups did not include the normal and extreme winter precipitation loads specified in the ISG.

Expand the list of site characteristics presented in SSAR Table 2.0-1 to include site characteristic values that correspond to the normal and extreme winter precipitation site parameter values contained in the design control documents (DCDs) for the reactor designs that are referenced in SSAR Section 1.2.2 (i.e., the U.S. EPR, ABWR, US-APWR, and AP1000 reactor designs). Normal and extreme winter precipitation loads should be determined in accordance with the guidance provided in the DC/COL-ISG-07.

PSEG Response to NRC RAI:

The Interim Staff Guidance (ISG) DC/COL-ISG-07, "Interim Staff Guidance on Assessment on Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures" (Reference 2.3.1-53) defines the normal winter precipitation event as the highest ground-level weight (in lb/ft²) among: (1) the 100-year return period snowpack; (2) the historical maximum snowpack; (3) the 100-year return period two-day snowfall event; or (4) the historical maximum snowfall event in the site region.

The 100-year return period snowpack (24 lb/ft²) is provided in SSAR Subsection 2.3.1.5.4. The 100-year return period two-day snowfall event (20.51 lb/ft²) and the historical maximum snowfall event in the site region (8.06 lb/ft²) are provided in SSAR Subsection 2.3.1.5.4 as part of the response to RAI 14 in Reference 2. SSAR Subsection 2.3.1.5.4 will be revised to include the historical maximum snowpack and

the normal winter precipitation load as defined by ISG DC/COL-ISG-07. SSAR Table 2.0-1 will be revised to include the normal winter precipitation load as defined by ISG DC/COL-ISG-07.

ISG DC/COL-ISG-07 defines the extreme frozen winter precipitation load as the higher of the ground-level weight (in lb/ft²) between: (1) the 100-year return period two-day snowfall event; and (2) the historical maximum snowfall event in the site region. The 100-year return period snowfall event (20.51 lb/ft²), historical maximum snowfall event (8.06 lb/ft²), and the resulting extreme winter precipitation load (20.51 lb/ft²) are provided in Reference 2 as a response to RAI 14. SSAR Table 2.0-1 will be revised to include the extreme frozen winter precipitation load (20.51 lb/ft²) as defined by ISG DC/COL-ISG-07.

Associated PSEG Site ESP Application Revisions:

SSAR Subsection 2.3.1.5.4 will be revised to include the normal winter precipitation load and the four loads that are used to determine the normal winter precipitation load in ISG DC/COL-ISG-07. SSAR Subsection 2.3.1.5.4 will also be revised to include the extreme winter precipitation load and the two loads used to derive the extreme winter precipitation load in ISG DC/COL-ISG-07.

SSAR Table 2.0-1 will be revised to include the normal winter precipitation load and the extreme frozen winter precipitation load discussed in the revised SSAR Subsection 2.3.1.5.4.

Enclosure 2 includes a markup of the proposed SSAR revisions.

PSEG Letter ND-2012-0011, dated February 16, 2012

ENCLOSURE 2

**Proposed Revisions
Part 2 – Site Safety Analysis Report (SSAR)
Subsection 2.3.1 – Regional Climatology**

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2.0-4

2.3-12

2.3-24

**PSEG Site
ESP Application
Part 2, Site Safety Analysis Report**

**Table 2.0-1 (Sheet 3 of 8)
PSEG Site Characteristics**

Site Characteristic	PSEG Site Value	SSAR Section	Definition
Basic Wind Speed			
3-Second Gust	117.7 mph	2.3.1.5.1	The nominal 3-second gust wind speeds in miles per hour (mph) at 33 ft. above ground associated with a 100-year return period.
Importance Factors	1.15	2.3.1.5.1	Multiplication factor applied to basic wind speed used to assess wind impacts on structures.
Tornado			
Maximum Wind Speed	200 mph	Table 2.3-5	Maximum wind speed resulting from passage of a tornado having a probability of occurrence of 10^{-7} per year.
Maximum Translational Speed	40 mph	Table 2.3-5	Translation component of the maximum tornado wind speed.
Maximum Rotational Speed	160 mph	Table 2.3-5	Rotation component of the maximum tornado wind speed.
Radius of Maximum Rotational Speed	150 ft.	Table 2.3-5	Distance from the center of the tornado at which the maximum rotational wind speed occurs.
Maximum Pressure Drop	0.9 psi	Table 2.3-5	Decrease in ambient pressure from normal atmospheric pressure resulting from passage of the tornado.
Rate of Pressure Drop	0.4 psi/sec	Table 2.3-5	Rate of pressure drop resulting from the passage of the tornado.
Winter Precipitation			
100-year Snowpack	24 lb/ft ²	2.3.1.5.4	The weight of the 100-year return period snowpack (to be used in determining normal precipitation loads for roofs).
48-hour Probable Maximum Winter Precipitation	21 inches of water	2.3.1.5.4	PMP during the winter months (to be used in conjunction with the 100-year snowpack in determining extreme winter precipitation loads for roofs).

ADD INSERT C HERE PER
QUESTION 02.03.01-7.

2.0-4

Rev. 0

**PSEG Site
ESP Application
Part 2, Site Safety Analysis Report**

Historic precipitation measurements at the Salem and Hope Creek (S/HC) sites are based on site measurements during the 32 year period 1977 through 2008. Available site measurements do not include dates of occurrence.

Table 2.3-11 presents and compares measurements for the S/HC site and the regional government stations listed in Tables 2.3-10. As shown in Table 2.3-11, overall historic maximum recorded 24-hour water-equivalent precipitation from records for either the S/HC site or the regional stations is 11.68 in. at Marcus Hook, Pennsylvania on September 16, 1999. That daily rainfall total is associated with Tropical Storm Floyd. Note that the maximum 10.03 in. total at the PSEG Site is also due to Floyd.

As also shown in Table 2.3-11, overall maximum monthly water-equivalent precipitation from records for the S/HC site or the regional stations is 16.13 in. at Marcus Hook, Pennsylvania during September 1999. That monthly precipitation total is primarily due to Tropical Storm Floyd.

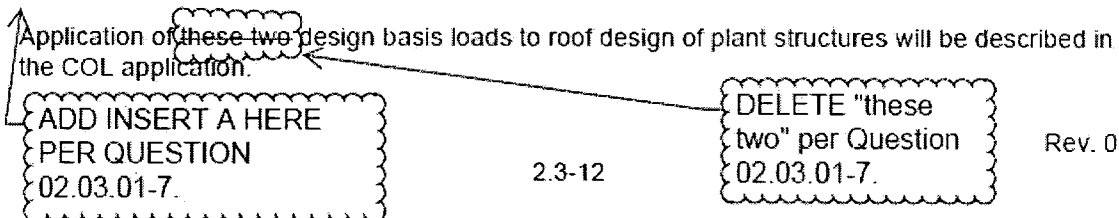
Maximum recorded 24 hour snowfall from records for the regional government stations is 30.7 in. at Marcus Hook, Pennsylvania on January 8, 1996.

Maximum monthly snowfall from records for the regional government stations is 40.0 in. at Hammonton, NJ during February 1899.

As shown by comparison of the statistics in Table 2.3-11, there is considerable variability of extreme rainfall and snowfall events across the site climate region and across the period of record. That is consistent with the explanation of regional climate character as discussed in Subsection 2.3.1.2. That is, distance and direction of a specific monitoring station from the Delaware Bay and from the Atlantic Ocean shoreline significantly affect temperatures and moisture levels during snowstorms. Also, distance and direction of a specific monitoring station from a storm system and its rain cells, including a tropical storm, significantly affect total rainfall amounts. However, some of the precipitation extreme events at different stations are the result of the same individual tropical or winter storms. Overall, the order of magnitude of rainfall and snowfall extremes are similar across the climate region and at the PSEG Site, supporting conclusions regarding climate region representativeness.

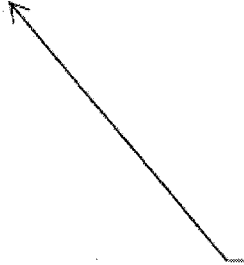
The weight of the 100 year return period ground level snowpack for the PSEG Site is 24 lb/ft². This value is determined as follows. First, a 50 year return value of 20 lb/ft² is obtained from Figure 7 of the ASCE Standard 7-05, *Minimum Design Loads for Buildings and Other Structures* (Reference 2.3.1-38). Second, per directions in "Section C7.3.3 Importance Factor, I" of that standard, the 100 year value is obtained by multiplying the 50 year value by a conversion factor of 1.2.

A highest winter season (December through February) 48 hour PMP value is determined by linear interpolation between 24 hour and 72 hour PMP values for December (based on Figures 35 and 45 of NOAA, *Hydrometeorological Report No. 53* [Reference 2.3.1-44]). The result is a value of 21 in. One inch of liquid water is equivalent to 5.2 lb/ft². Therefore, the weight of the 48 hour probable maximum winter precipitation (PMWP) is 109 lb/ft².



**PSEG Site
ESP Application
Part 2, Site Safety Analysis Report**

- 2.3.1-51 National Climatic Data Center (NCDC), "Divisional Normals and Standard Deviations of Temperature, Precipitation, and Heating and Cooling Degree Days, 1971-2000 (and previous normals periods), Section 2: Precipitation", Climatography of the United States No. 85, published by NCDC Asheville North Carolina, June 2002.
- 2.3.1-52 National Climatic Data Center (NCDC), "TD 3280 - Airways Surface Observations", Surface weather observations in TD 3280 digital format for: Dover Delaware from 1943-2008, for Millville New Jersey from 1973-2008, and for Wilmington Delaware from 1943-2008, data purchased from NCDC, Published by NCDC, Asheville, NC, 2009.



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PER QUESTION
02.03.01-7.

RAI No. 48, Question 02.03.01-7 INSERT A:

The Interim Staff Guidance (ISG) DC/COL-ISG-07, "Interim Staff Guidance on Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures" (Reference 2.3.1-53) defines the extreme frozen winter precipitation event as the higher ground level weight (in lb/ft²) between: (1) the 100-year return period two-day snowfall event; and (2) the historical maximum two-day snowfall event in the area. The 100-year return period two-day snowfall event and the historical maximum two-day snowfall event are available from *United States Snow Climatology* (Reference 2.3.1-54) and TD3200 daily digital data files (Reference 2.3.1-43). The representative climate area is defined in SSAR Section 2.3.1.3.

The maximum 100-year two-day snowfall event in the area was 26.3 in. at Milford 4 SE, Delaware (Reference 2.3.1-54). The historical maximum two-day snowfall in the area was 30.7 in. recorded at Marcus Hook, Pennsylvania and Philadelphia, Pennsylvania on January 7-8, 1996 (Reference 2.3.1-54 and Reference 2.3.1-43).

ISG DC/COL-ISG-07 states that the maximum 100-year two-day snowfall event and the historical maximum two-day snowfall are converted to snow load (in lb/ft²). According to the ISG, the corresponding observed (liquid) precipitation, when available, should be used to determine the snow load for historical maximum snowfall events. Liquid precipitation is converted to a snow load (in lb/ft²) by multiplying the observed (liquid) precipitation (in inches) by 5.2 lb/ft². When the corresponding observed (liquid) precipitation is not available for a corresponding snowfall, the ISG provides the following algorithm for converting a 100-year snowfall event to a snow load (in lb/ft²):

$$L = 0.15 \times S \times 5.2$$

where S is the 100-year snow event (in inches)
5.2 is the weight of one inch of water (in lb/ft²)
 L is the resulting snow load (in lb/ft²)

The maximum 100-year two-day snowfall event (26.3 in.) is a statistically-derived parameter. Therefore, a corresponding observed liquid precipitation measurement is not available. Following this algorithm, the 26.3 in. snowfall is converted to an equivalent weight for the 100-year return period two-day snowfall event of 20.51 lb/ft².

The historical maximum two-day snowfall in the area (30.7 in.) was recorded at Marcus Hook, Pennsylvania and Philadelphia, Pennsylvania on January 7-8, 1996. The observed liquid water equivalent precipitation is not available from Marcus Hook, Pennsylvania for the January 7-8, 1996 snowfall. However, the observed liquid equivalent precipitation is available from Philadelphia, Pennsylvania (1.55 in.). Multiplying the observed liquid precipitation measured at Philadelphia (1.55 in.) by 5.2 lb/ft² produces an equivalent snow weight of 8.06 lb/ft². Since the extreme frozen winter precipitation event is defined as the higher ground-level weight (in lb/ft²) between: (1) the 100-year return period two-day snowfall event; and (2) the historical maximum two-

day snowfall event, the extreme frozen winter precipitation event is the higher of 8.06 lb/ft² and 20.51 lb/ft², or 20.51 lb/ft².

ISG DC/COL-ISG-07 defines the normal winter precipitation event as the highest ground-level weight (in lb/ft²) among: (1) the 100-year return period snowpack; (2) the historical maximum snowpack; (3) the 100-year return period two-day snowfall event; or (4) the historical maximum snowfall event in the site region.

The 100-year return period snowpack (24 lb ft²) is computed from Reference 2.3.1-38 as described in Subsection 2.3.1.5.4.

The historical maximum snowpack for the area is 25 inches, which was observed at Wilmington, Delaware and Dover, Delaware. The historical maximum snowpack at Wilmington had an observed 1.93 in. liquid equivalent and the historical maximum snowpack at Dover had an observed 1.13 in. liquid equivalent (Reference 2.3.1-43). Multiplying the observed liquid precipitation measured at Wilmington (1.93 in.) by 5.2 lb/ft² produces an equivalent weight of 10.04 lb/ft². Multiplying the observed liquid precipitation measured at Dover (1.13 in.) by 5.2 lb/ft² produces an equivalent weight of 5.88 lb/ft². The historical maximum snowpack (in lb/ft²) is the higher of 10.04 lb/ft² and 5.88 lb/ft², or 10.04 lb/ft².

ISG DC/COL-ISG-07 defines the normal winter precipitation load as the highest ground-level weight (in lb/ft²) among: (1) the 100-year return period snowpack [24 lb ft²]; (2) the historical maximum snowpack [10.04 lb/ft²]; (3) the 100-year return period two-day snowfall event [20.51 lb/ft²]; or (4) the historical maximum snowfall event in the site region [8.06 lb/ft²]. Therefore, the normal winter precipitation load is 24 lb/ft².

RAI No. 48, Question 02.03.01-7 INSERT B:

2.3.1-53 U.S. Nuclear Regulatory Commission Interim Staff Guidance, DC/COL-ISG-07, "Assessment of Normal and Extreme Winter Precipitation Loads on Roofs of Seismic Category I Structures." June 23, 2009. Accession Number ML091490565.

2.3.1-54 U.S. Department of Commerce "United States Snow Climatology." National Climatic Data Center, NOAA, available at Internet site: <http://www.ncdc.noaa.gov/ussc/index.jsp>.

RAI No. 48, Question 02.03.01-7 INSERT C:

Site Characteristic	PSEG Site Value	SSAR Section	Definition
Normal winter precipitation event	24 lb/ft ²	2.3.1.5.4	The highest ground-level weight (in lb/ft ²) among: (1) the 100-year return period snowpack; (2) the historical maximum snowpack; (3) the 100-year return period two-day snowfall event; or (4) the historical maximum two-day snowfall event in the site region. (to be used in determining the precipitation load for roofs)
Extreme frozen winter precipitation event	20.51 lb/ft ²	2.3.1.5.4	The highest of (1) the 100-year return period two-day snowfall event; and (2) the historical maximum snowfall event in the site region. (to be used in determining the precipitation load for roofs)

PSEG Letter ND-2012-0011, dated February 16, 2012

ENCLOSURE 3

Summary of Regulatory Commitments

ENCLOSURE 3

SUMMARY OF REGULATORY COMMITMENTS

The following table identifies commitments made in this document. (Any other actions discussed in the submittal represent intended or planned actions. They are described to the NRC for the NRC's information and are not regulatory commitments.)

COMMITMENT	COMMITTED DATE	COMMITMENT TYPE	
		ONE-TIME ACTION (YES/NO)	PROGRAMMATIC (YES/NO)
PSEG will revise SSAR Subsection 2.3.1 to incorporate the changes in Enclosure 2 in response to NRC RAI No. 48, Question 02.03.01-7.	This revision will be included in a future update of the PSEG ESP application.	Yes	No