

NP-11-0041
September 21, 2011

10 CFR 52, Subpart A

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

Subject: Exelon Nuclear Texas Holdings, LLC
Victoria County Station Early Site Permit Application
Response to Request for Additional Information Letter No. 11
NRC Docket No. 52-042

Attached is the response to the NRC staff question included in Request for Additional Information (RAI) Letter No. 11, dated August 23, 2011, related to Early Site Permit Application (ESPA), Part 2, Section 02.03.01. NRC RAI Letter No. 11 contained one (1) Question. This submittal comprises the complete response to RAI Letter No. 11, and includes response to the following Question:

02.03.01-1

When a change to the ESPA is indicated by a Question response, the change will be incorporated into the next routine revision of the ESPA, planned for no later than March 31, 2012.

Regulatory commitments established in this submittal are identified in Attachment 2.

If any additional information is needed, please contact David J. Distel at (610) 765-5517.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 21st day of September, 2011.

Respectfully,



Marilyn C. Kray
Vice President, Nuclear Project Development

Attachments:

1. Question 02.03.01-1
2. Summary of Regulatory Commitments

cc: USNRC, Director, Office of New Reactors/NRLPO (w/Attachments)
USNRC, Project Manager, VCS, Division of New Reactor Licensing (w/Attachments)
USNRC Region IV, Regional Administrator (w/Attachments)

RAI 02.03.01-1:**Question:**

10 CFR 52.17(a)(1)(vi) states, in part, that an application must contain 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 time in which the historical data have been accumulated. NUREG-0800, Standard Review Plan (SRP), Section 2.3.1, Regional Climatology, establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations. SRP Section 2.3.1 states that the basic 100-year return period 3-second gust wind speed should be based on appropriate standards, with suitable corrections for local conditions.

VCS SSAR Section 2.3.1.3.1 describes the methodology that was used to derive the site characteristic basic wind speed of 121 mph from Figure 6-1A of ASCE 7-05. According to Table C6-2 of ASCE/SEI 7-05, the 100 year return period 3-second gust basic wind speed site characteristic value of 121 mph is equivalent to a Saffir-Simpson Category 2 hurricane. SSAR Section 2.3.1.3.3 presents information from the NOAA Coastal Service Center (CSC) historical hurricane track database on the number of tropical cyclone storm tracks that have passed within a 100-nautical mile (nm) radius of the VCS site from 1851 through 2008. SSAR Section 2.3.1.3.3 states that there have been five Category 3, four Category 4, and one Category 5 hurricanes to pass within 100 nautical-miles of the VCS site.

Using this same NOAA-CSC database for the same period of record, the staff identified 6 hurricanes that were classified as Saffir-Simpson Category 4 or 5 at the time they made landfall within 100 nm of the VCS site. For each of these 6 major hurricanes, the staff used the sustained wind speeds reported in the NOAA-CSC database at landfall along with information presented in Table C6-2 and Figure 6-1A of ASCE/SEI 7-05 to estimate the corresponding 3-second gust wind speed potential at the VCS site. The staff determined that each of these storms potentially result in a 3-second gust wind speed that exceeds the 3-second gust basic wind speed site characteristic value of 121 mph. The last paragraph in SSAR Section 2.3.1.3.1 states that peak 1-minute wind speeds associated with hurricanes in the site area have reached at least 154 mph on multiple occasions.

Please provide additional justification regarding how the proposed 100-year return period 3-second gust wind speed site characteristic value for safety-related structures suitably accounts for the historically reported hurricanes, or revise the site characteristic value to suitably correct for these local conditions.

Response:

SSAR Section 2.3.1.3.1 identifies the 50-year return period 3-second gust (basic wind speed as identified using ASCE/SEI 7-05) as well as the conversion to the 100-year return period (straight-line) 3-second gust. As discussed in SSAR Section 2.3.1.3.1, the most extreme hurricane wind at landfall that has been observed in the site region in the period of record examined for the Victoria County Site (1851-2008), occurred in 1886. The unnamed hurricane had a 1-minute maximum sustained wind of 155 mph.

To determine the most extreme, historical maximum, wind speed, data was obtained from the National Oceanic and Atmospheric Administration's Coastal Services Center (NOAA-CSC) website. As the data represents a 1-minute sustained wind over water, and the Victoria County Station site is located inland, it is reasonable to account for the change in surface roughness from over water to over land. In order to convert the 1-minute maximum sustained wind value to a 3-second gust a multiplier of 1.03 is used, following the method outlined in Reference 1. This multiplier accounts for the change in surface roughness as the hurricane makes landfall, as well as the conversion of 1-minute sustained wind speed (that is the standard practice for NOAA) to 3-second gust (which is standard for structural design).

As presented in existing SSAR Section 2.3.1.3.1, the most extreme, historical maximum, wind speed that occurred in the site region over the period of record is the historical hurricane of 20 August 1886 (peak wind of 155 mph, 1-minute sustained wind). The existing SSAR section did not include the conversion of the 1-minute sustained wind to the 3-second gust. Converting the 1-minute maximum sustained wind value to a 3-second gust, as detailed above, the site characteristic value for the historical maximum 3-second gust is 160 mph (155 mph x 1.03).

The 50-year return period 3-second gust (basic wind speed as identified using ASCE/SEI 7-05) and the historical maximum 3-second gust (converted from the 1-minute sustained wind) will be added to Table 2.0-1. The historical maximum 3-second gust (160 mph) will be used as the site characteristic wind speed.

Additionally, Exelon reexamined the frequency counts (based on a search performed on in Sept. 2009) for hurricanes in the 100-nautical mile radius centered on the plant (N28.61444°, W97.030556°) for the period of record of 1851-2008. The metadata (Ref. 2 & 3) reveals that there were 5 Category 4 storms (20 August 1886, 9 September 1900, 17 August 1915, 18-19 August 1916, and 26-28 August 1945) along with a single Category 5 storm (Hurricane Carla, 11-12 September 1961). SSAR Section 2.3.1.3.3 will be revised accordingly to reflect the updated frequency count.

Response References:

1. Simiu, E.; Vickery, P.; Kareem, A., Relation Between Saffir-Simpson Hurricane Scale Wind Speeds and Peak 3-s Gust Speeds Over Open Terrain. Journal of Structural Engineering, Vol. 133, No. 7, 1043-1045, July 2007. Accessed on 8/23/2011 at <http://www.fire.nist.gov/bfrlpubs/build07/PDF/b07040.pdf>
2. U.S. Department of Commerce, HURDAT Database, Hurricane Reanalysis, Hurricane Research Division, Tropical Prediction Center, NOAA. Available at http://www.aoml.noaa.gov/hrd/hurdat/metadata_aug11.html, accessed August 25, 2011.
3. U.S. Department of Commerce, HURDAT Metadata, Hurricane Research Division, Tropical Prediction Center, NOAA. Available at http://www.aoml.noaa.gov/hrd/hurdat/metadata_aug11.html accessed August 25, 2011.

Associated ESPA Revisions:

SSAR Table 2.0-1 will be updated in a future revision to the ESPA as follows:

Table 2.0-1 (Sheet 3 of 7) Site Characteristics and Site-Related Design Parameters

Part 1 — Site Characteristics			
Item	Site-Specific Value(a)	Description	References
• Maximum Wind Speed	200 mph	Sum of the maximum rotational and maximum translational wind speed components at the site, due to passage of a tornado having a probability of occurrence of 10 ⁻⁷ per year.	Refer to Subsection 2.3.1.3.2.
• Radius of Maximum Rotational Speed	150 feet	Distance from the center of the tornado at which the maximum rotational wind speed occurs at the site, due to passage of a tornado having a probability of occurrence of 10 ⁻⁷ per year.	Refer to Subsection 2.3.1.3.2.
• Maximum Rate of Pressure Drop	0.4 psi/sec	Maximum rate of pressure drop at the site, due to passage of a tornado having a probability of occurrence of 10 ⁻⁷ per year.	Refer to Subsection 2.3.1.3.2.
Basic Wind Speed	<u>113 mph for a 3-second gust (98 mph fastest mile)</u>	<u>Wind velocity associated with a 50-year return period in the site area.</u>	<u>Refer to Subsection 2.3.1.3.1. Refer to Subsection 2.3.1.5</u>
	121 mph for a 3-second gust (105 mph fastest mile)	Wind velocity associated with a 100-year return period in the site area.	Refer to Subsection 2.3.1.3.1. Refer to Subsection 2.3.1.5.
<u>Historical Maximum Wind Speed</u>	<u>160 mph for a 3-second gust (142 mph fastest mile)</u>	<u>Wind Velocity associated with the most severe hurricane wind that has been historically observed in the site region.</u>	<u>Refer to Subsection 2.3.1.3.1</u>

The 7th to last bullet item in SSAR Subsection 2.3.1.1, Data Sources will be updated in a future revision to the ESPA as follows:

- *Historical Hurricane Tracks Storm Query*, extending from 1851, ~~1851 through 2009~~ (Reference 2.3.1-14)

The last paragraph of SSAR Subsection 2.3.1.3.1, Extreme Winds, will be updated in a future revision to the ESPA as follows:

The National Oceanic and Atmospheric Administration's Coastal Services Center (NOAA-CSC) provides a comprehensive historical database, ~~extending from 1851 through 2009~~, of tropical cyclone tracks, extending from 1851, based on information compiled by the National Hurricane Center. This database indicates that a total of 624 tropical cyclone storm tracks have passed within a 100-nautical-mile radius of the VCS site during this historical period (Reference 2.3.1-14). The maximum wind speed observed in the site region was from an unnamed storm in 1886. The peak 1-minute wind speed for the storm is reported as 155 mph. This was converted, using the method detailed in Reference 2.3.1-38, to an equivalent peak 3-second gust of 160 mph for the VCS site. This wind speed accounts for the change in roughness as the hurricane makes landfall and is representative of the transition that all hurricanes undergo as they move inland. This is similar to peak winds observed inland during Hurricane Carla (September 1961) and Hurricane Celia (180 mph adjusted for increased surface roughness to 154 mph inland, August 1970) (References 2.3.1-14, 2.3.1-17, and 2.3.1-28).

The last paragraph of SSAR Section 2.3.1.3.3, Tropical Cyclones, will be updated in a future revision to the ESPA as follows:

2.3.1.3.3 Tropical Cyclones

Tropical cyclones include not only hurricanes and tropical storms, but systems classified as tropical depressions, subtropical storms, subtropical depressions, and extratropical storms. This characterization considers all "tropical cyclones" (rather than systems classified only as hurricanes and tropical storms) because storm classifications are generally downgraded once landfall occurs and the system weakens, although they may still result in significant rainfall and extreme wind events as they travel through the site region.

The National Oceanic and Atmospheric Administration's Coastal Services Center (NOAA-CSC) provides a comprehensive historical database, ~~extending from 1851 through 2008~~, of tropical cyclone tracks based on information compiled by the National Hurricane Center. This database indicates that a total of 624 tropical cyclone centers or storm tracks have passed within a 100-nautical-mile radius of the VCS site, during this historical period (Reference 2.3.1-14). Storm classifications and respective frequencies of occurrence over this 158-year period of record (1851–2008) are as follows:

- Hurricanes — Category 5 (1), Category 4 (~~5~~4), Category 3 (5), Category 2 (6), Category 1 (16)
- Tropical storms — ~~24~~23
- Tropical depressions — ~~5~~6
- Subtropical storms — 0
- Subtropical depressions — 0
- Extratropical storms — 0

Wind speeds (1-minute average) corresponding to each of the Saffir-Simpson Hurricane Categories are listed below:

Hurricane Classification	Wind Speed (mph)
Category 1	74–95
Category 2	96–110
Category 3	111–130
Category 4	131–155
Category 5	>155

Tropical cyclones within this 100-nautical-mile radius have occurred as early as June and as late as October, with the highest frequency (~~19~~18 out of ~~62~~61 events) recorded during September, including all classifications at and above tropical depression status. June, July, and August account for ~~14~~13, 12, and ~~13~~4 events, respectively. Tropical storms have occurred in all months from June to October. During the months of June through September, hurricanes occur with similar frequency (7, ~~6~~5, ~~8~~7, and ~~9~~8, respectively). The only Category 5 hurricane to track within 100 nautical miles of the VCS site was Hurricane Carla in September 1961. Of the ~~five~~ four Category 4 hurricanes that have occurred within this radial distance, ~~four~~ three were recorded in August and one in September. Two Category 3 hurricanes occurred in September and one each in July, August, and October. Most major hurricanes in the site area have occurred from mid- to late-summer ([Reference 2.3.1-14](#)).

A new reference will be added to SSAR Subsection 2.3.1.8, References, will be updated in a future revision to the ESPA as follows:

2.3.1-38 Simiu, E.; Vickery, P.; Kareem, A., Relation Between Saffir-Simpson Hurricane Scale Wind Speeds and Peak 3-s Gust Speeds Over Open Terrain. Journal of Structural Engineering, Vol. 133, No.7, 1043-1045, July 2007.

In addition, changes will be made to the ER, comparable to those described above for the SSAR. These changes are described below.

The last paragraph of ER Subsection 2.7.3.2, Extreme Winds, will be updated in a future revision to the ESPA as follows:

The National Oceanic and Atmospheric Administration's Coastal Services Center (NOAA-CSC) provides a comprehensive historical database, ~~extending from 1851 through 2009~~, of tropical cyclone tracks, extending from 1851, based on information compiled by the National Hurricane Center. This database indicates that a total of ~~62~~4 tropical cyclone storm tracks have passed within a 100-nautical-mile radius of the VCS site during this historical period (NOAA-CSC Sep 2009). The maximum wind speed observed in the site region was from an unnamed storm in 1886. The peak 1-minute wind speed for the storm is reported as 155 mph. This was converted, using the method detailed in Simiu, Vickery and Kareem, to an equivalent peak 3-second gust of 160 mph for the VCS site. This wind speed accounts for the change in roughness as the hurricane makes landfall and is representative of the transition that all hurricanes undergo as they move inland. This is similar to peak winds observed inland during Hurricane Carla (September 1961) and Hurricane Celia (180 mph adjusted for increased surface roughness to 154 mph inland, August 1970) (NOAA-CSC Sep 2009, NCDC Jun 2004, U.S. Weather Bureau 1961).

ER Subsection 2.7.3.5, Tropical cyclones, will be updated in a future revision to the ESPA as follows:

2.7.3.5 Tropical Cyclones

Tropical cyclones include not only hurricanes and tropical storms, but systems classified as tropical depressions, subtropical storms, subtropical depressions, and extratropical storms. This characterization considers all "tropical cyclones" (rather than systems classified only as hurricanes and tropical storms) because storm classifications are generally downgraded once landfall occurs and the system weakens, although they may still result in significant rainfall and extreme wind events as they travel through the site region. Storm classifications and respective frequencies of occurrence over this 158-year period of record (1851–2008) are as follows:

- Hurricanes: Category 5 (1), Category 4 (~~5~~4), Category 3 (5), Category 2 (6), Category 1 (16)
- Tropical storms: ~~24~~23
- Tropical depressions: ~~5~~6
- Subtropical storms: 0
- Subtropical depressions: 0
- Extratropical storms: 0

Wind speeds (1-minute average) corresponding to each of the Saffir-Simpson Hurricane Categories are listed below:

Hurricane Classification	Wind Speed (mph)
Category 1	74–95
Category 2	96–110
Category 3	111–130
Category 4	131–155
Category 5	>155

Tropical cyclones within this 100-nautical-mile radius have occurred as early as June and as late as October, with the highest frequency (198 out of 624 events) recorded during September, including all classifications at and above Tropical Depression status. June, July, and August account for 143, 12, and 134 events, respectively. Tropical storms have occurred in all months from June to October. During the months of June through September, hurricanes occur with similar frequency (7, 65, 87, and 98, respectively). The only Category 5 hurricane to track within 100 nautical miles of the VCS site was Hurricane Carla in September 1961. Of the five ~~four~~ Category 4 hurricanes that have occurred within this radial distance, ~~four~~ three were recorded in August, and one was recorded in September. Two Category 3 hurricanes have occurred in September and one each in July, August, and October. Most major hurricanes in the site area have occurred from mid- to late-summer (NOAA-CSC Sep 2009).

A new reference will be added to ER Subsection 2.7.8, References, will be updated in a future revision to the ESPA as follows:

NSSL 2006. National Severe Storms Laboratory, *10-Year U.S. Flash Density (1989–1999 Average U.S. Flashes per Square Kilometer per Year)*, prepared by Global Atmospheric, Inc., based on data provided by the National Lightning Detection Network, last modified January 10, 2006, NSSL, NOAA. Available at http://www.nssl.noaa.gov/primer/lightning/images/ltgflash_density.jpg, accessed June 19, 2008.

Simiu, Vickery and Kareem, July 2007. Simiu, E.; Vickery, P.; Kareem, A., Relation Between Saffir-Simpson Hurricane Scale Wind Speeds and Peak 3-s Gust Speeds Over Open Terrain. Journal of Structural Engineering, Vol. 133, No. 7, 1043-1045, July 2007.

USDA Aug 1998. U.S. Department of Agriculture, Rural Utilities Service, *Summary of Items of Engineering Interest*, Page 8, August 1998. Available at www.usda.gov/rus/electric/engineering/en-in-98, accessed April 4, 2008.

ATTACHMENT 2

SUMMARY OF REGULATORY COMMITMENTS

(Exelon Letter to USNRC, NP-11-0041, dated September 21, 2011)

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)
<p>Exelon will revise the VCS ESPA SSAR Sections 2.0, and 2.3.1, and ER Sections 2.7.3, and 2.7.8 to incorporate the change shown in the enclosed response to the following NRC RAI:</p> <p>02.03.01-1 (Attachment 1)</p>	<p>Revision 1 of the ESPA SSAR and ER planned for no later than March 31, 2012</p>	<p>Yes</p>	<p>No</p>