Exelon.
Generation

NP-11-0017
May 18, 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. 08
NRC Docket No. 52-042

Attached are responses to NRC staff questions included in Request for Additional Information (RAI) Letter No. 08, dated April 19, 2011, related to Early Site Permit Application (ESPA), Part 2, Sections 02.03.02, 02.04.03, 02.04.12, and 02.04.13. NRC RAI Letter No. 08 contained fourteen (14) Questions. This submittal comprises a partial response to RAI Letter No. 08, and includes responses to the following nine (9) Questions:

02.03.02-1	02.04.03-1	02.04.12-1	02.04.13-2
	02.04.03-2	02.04.12-3	
		02.04.12-4	
		02.04.12-7	
		02.04.12-9	

It is noted that NRC RAI 02.04.03-1 was mislabeled as 02.04.03-10 in NRC RAI Letter No. 08 referenced above, and is corrected herein.

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.

The response to RAI Questions 02.04.12-5 and 02.04.12-6 will be provided by June 3, 2011. The response RAI Question 02.04.12-8 will be provided by July 18, 2011. The response to RAI Questions 02.04.12-2 and 02.04.13-1 will be provided by August 17, 2011. These response times are consistent with the response times described in NRC RAI Letter No. 08, dated April 19, 2011.

The response to RAI Question 02.03.02-1 includes electronic data files provided on enclosed CDs. Two copies of the electronic data CDs are enclosed, one CD for submission to the Public Document Room (PDR) and one CD for NRC staff use. Regulatory commitments established in this submittal are identified in Attachment 10.

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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 18th day of May, 2011.

Respectfully,

Marilyn C. Kray

Marilyn C. Kray
Vice President, Nuclear Project Development

Attachments:
1. Question 02.03.02-1
2. Question 02.04.03-1
3. Question 02.04.03-2
4. Question 02.04.12-1
5. Question 02.04.12-3
6. Question 02.04.12-4
7. Question 02.04.12-7
8. Question 02.04.12-9
9. Question 02.04.13-2
10. Summary of Regulatory Commitments
11. CD-R labeled: "Victoria County Station, SSAR RAI 02.03.02-1 Response, Revised NRC Format File, VCS Hourly Met Data – 7.1.07 to 6.30.09" (Two copies)

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 02.03.02-1:

Question:

10 CFR 100.20(c) states, in part, that the staff will take the meteorological characteristics of the site into consideration in determining the acceptability of a site for a stationary power reactor. 10 CFR 100.21(c) further states that site atmospheric dispersion characteristics must be evaluated and dispersion site characteristics so that radiological effluent release limits associated with normal operation and radiological dose consequences of postulated accidents meet regulatory criteria. RG 1.23, Revision 1 provides guidance on how the atmospheric stability classes should be determined. Stability class is an important parameter in evaluating atmospheric dispersion site characteristics.

Using the July 1, 2007 through June 30, 2009 onsite hourly meteorological dataset, the staff calculated the percentage of time local conditions conformed to each of the 7 Pasquill stability classes specified in RG 1.23. The staff found large differences between these calculated percentages and the percentages reported in VCS ESP SSAR Tables 2.3.2-4 and 2.3.2-5, for stability classes A, B, and C.

Please provide a detailed description of how the stability classes presented in the SSAR were determined.

Response:

The response to RAI 2.03.02-1 is presented in two parts. Response Part 1 provides a detailed description of how the stability classes used in the VCS ESP application (ESPA) were determined. Response Part 2 explains the discrepancy between the stability classes used in the ESPA and those contained in the NRC Format files provided to the NRC via Exelon letter NP-10-0005, dated May 4, 2010.

Response Part 1 – Stability Class Determination Methodology

Temperature was measured at 10 meters and 60 meters on the VCS meteorological monitoring tower. Temperature and temperature difference over the 50 meter height differential were measured in degrees Fahrenheit (F). The delta-T temperature was in degrees F over the 50 meter distance between the sensor levels.

The following method was used to convert the delta-T from degrees F per 50 meters to degrees Celcius (C) per 100 meters:

(delta-T in degrees F) (1.111) = Degrees C / 100 meters

The factor 1.111 is the conversion factor used to convert delta-T in degrees F over the 50 meter sensor height difference to degrees C per 100 meters.

The 1.111 factor was calculated using the following formula: (100 meters / 50 meters) (5/9) = 1.111

Where:

100 meters provides the desired height (for degrees C / 100 meters)

50 meters is the actual height difference between the VCS tower temperature sensors

5/9 = (0.5555) is the temperature conversion from F to C

For stability class determination based on tower measurements, the 1.111 conversion factor was multiplied by the tower delta-T value for each hour. The stability class for each hour was determined using Table 1, Classification of Atmospheric Stability from page 8 of NRC Regulatory Guide 1.23, Revision 1, dated March 2007.

Murray and Trettel's NRC_JFT program was used to generate the Joint Frequency Distribution tables in the Victoria County Station SSAR. The NRC_JFT program utilized the conversion factor defined above (i.e., 1.111). The Joint Frequency Distribution tables were designed to closely resemble the example Joint Frequency Distribution table provided as Table 3, page 13 of NRC Regulatory Guide 1.23, Revision 1, dated March 2007. Murray and Trettel's NRC_JFT program uses the same direction and wind speed classes found in Table 3 or Regulatory Guide 1.23, Rev 1 (11 speed classes and 16 wind direction sectors).

<u>Response Part 2 – Explanation of Discrepancy in NRC Formatted Stability Class Files</u>

Comparison of the stability distribution generated by Murray and Trettel's JFT program and that created from the data in the NRC Format files indicated that the data sets do not match. Upon further evaluation, it was concluded that output from Murray and Trettel's JFT program, which is the data set used in the ESPA, is correct. Thus, the discrepancy between the stability distribution data sets is a result of the method by which the NRC Format files were produced.

It was determined that the stability class discrepancies between the Victoria Joint Frequency Distribution tables and the NRC Format files were related to the rounding of the calculated delta-T in degrees C per 100 meters to one decimal by the program creating the NRC formatted data files. In some cases, the rounded value would be associated with incorrect stability. For example, converting -1.5 degrees F over the 50 meter height separation to degrees C over a 100 meter separation produces -1.6665 C / 100 meters (C stability class). In contrast, rounding -1.6665 to one decimal point produces -1.7 C / 100 m (B stability class). This example illustrates how small differences in C / 100 m led to significant differences in some of the stability classes provided in the NRC Format files (i.e., relative to those used in the ESPA).

The rounding mechanism in the program generating the NRC Format files has been reconciled, and two copies of the revised NRC Format file are being provided on compact discs as Attachment 11. Note that two NRC Format files were originally provided to the NRC (via Exelon letter NP-10-0005, dated May 4, 2010), corresponding to the July 2007 to June 2008 and July 2008 to June 2009 periods. The single revised NRC Format file contains the entire period from July 2007 to June 2009 and therefore replaces both of the previously provided files.

<u>Associated ESPA Revision:</u>

No ESPA revision is required as a result of this response.

RAI 02.04.03-1:

Question:

In accordance with 100.20(c) and 52.79(a)(1)(iii), the NRC staff request the applicant provide clarification and details regarding the hydraulic routing of the PMF flood, in particular, regarding the sequencing of the antecedent and maximum events and related initial and boundary conditions boundary

Response:

Information addressing this question was provided as a response to Hydrology Information Need (INH) 5, previously submitted in Exelon letter to the NRC NP-11-0007, dated February 10, 2011.

Associated ESPA Revision:

No ESPA revision is required as a result of this response.

RAI 02.04.03-2:

Question:

In accordance with 100.20(c) and 52.79(a)(1)(iii), the NRC staff request the applicant provide the adopted elevation-capacity curve for the Coleto Creek Dam reservoir.

Response:

Information addressing this question was provided as a response to Hydrology Information Need (INH) 8, previously submitted in Exelon letter to the NRC NP-11-0009, dated February 24, 2011.

Associated ESPA Revision:

No ESPA revision is required as a result of this response.

RAI 02.04.12-1:

Question:

In accordance with the requirements of 10 CFR 100.20(c) "Factors to be considered when evaluating sites" relating to hydrology and, 10 CFR 52.79(a) "Contents of applications; technical information in final safety analysis report" relating to hydrologic characteristics of the proposed site, the NRC Staff requests that the Applicant provide a detailed description of how the previous site model, the existing regional (e.g., TWDB GAM) studies and site specific parameters and data were integrated into the development of the current groundwater flow model for the site.

Response:

Information addressing this question was provided as a response to Hydrology Information Need (INH) 41b, previously submitted in Exelon letter to the NRC NP-11-0013, dated March 21, 2011.

Associated ESPA Revision:

No ESPA revision is required as a result of this response.

RAI 02.04.12-3:

Question:

In accordance with the requirements of 10 CFR 100.20(c) "Factors to be considered when evaluating sites" relating to hydrology and, 10 CFR 52.79(a) "Contents of applications; technical information in final safety analysis report" relating to hydrologic characteristics of the proposed site, and as recommended by SRP 2.4.12 "Groundwater" acceptance criteria, the NRC Staff requests that the Applicant provide a detailed description and justification for the horizontal and vertical hydraulic properties of the construction fill described in FSAR Section 2.4.12.3.2.

Response:

The horizontal hydraulic conductivity (K_h) of the structural fill material used in plant construction is assumed to be that of a clean sand and gravel at 500 feet/day.

Sources and quantities of the proposed structural fill material are discussed in SSAR Subsection 2.5.4.5.1. As described in Subsection 2.5.4.5.1.1.1, the preferred structural fill for the VCS power block area is soil with a Unified Soil Classification System classification of GW-GC, which is well graded gravel with trace amounts of fines. Five samples of proposed structural fill for the VCS power block were obtained from local, off-site suppliers. Particle size distributions of the five samples were determined by sieve analysis, as reported in Part 5 of the ESPA. Three of the samples were determined to be well-graded sand with gravel or well-graded gravel with clay. The two remaining samples were determined to be poorly graded sand. The three samples determined to be well-graded sand with gravel or well-graded gravel with clay most closely approximate the preferred structural fill for the VCS power block.

SSAR Reference 2.4.12-C-18 describes a method for estimating the hydraulic conductivity (K) of different sediment types, using the mean grain size (d_{50}) and the Shepherd equation:

$K = C(d_{50})^j$, in ft/day,

where C is a shape factor and j is an exponent. For texturally immature (poorly sorted, angular) consolidated sediments Shepherd found that C = 100 and j = 1.5. As reported in Part 5 of the ESPA, the mean grain size of the three soil samples that most closely approximate the preferred structural fill for the VCS power block are 1.3858 mm, 4.6823 mm and 3.7716 mm. Using the Shepherd equation for texturally immature consolidated sediments, the estimated hydraulic conductivities of these soils are 163 ft/day, 1013 ft/day and 732 ft/day, respectively. The geometric mean of these three values is 495 ft/day. This value is very similar to that reported in Table 3.3 of SSAR Reference 2.4.12-C-4 for coarse sand and gravel (500 ft/day), which is the value for the horizontal hydraulic conductivity of structural fill assumed in the VCS numerical model.

The anisotropy ratio of horizontal to vertical hydraulic conductivity (K_h/K_v) for the construction fill is estimated in the model to be 10:1. As discussed in SSAR Subsection 2.5.4.5.3 structural fill in the power block will be placed in a series of lifts, with each lift mechanically compacted to a specified range of density and moisture content before placement of the overlying lifts. This process of layering the fill is likely to produce a

K_h/K_v anisotropy ratio greater than that for native sand units because compaction will likely cause rearrangement of soil particles in each layer of fill. In the numerical model the ratio for the construction fill to be placed in the VCS power block reflects anisotropy greater than that of 3:1 for the native sand units (SSAR Subsection 2.4.12-C-3.5).

Associated ESPA Revision:

Section 2.4.12-C-2 of the SSAR is being revised as follows:

2.4.12-C-2 Assumptions

The general assumptions used in the model include:

- Homogeneous conditions are assumed for each material type (sand or clay).
- The flow regime represents a constant density system.
- The flow regime represents an equivalent porous medium based on the granular nature of the materials.
- A single value of hydraulic conductivity is selected for each of the sand units represented in the model.
- For the pre-construction conditions, two zones of recharge are assumed for the model area: Zone 1 represents the uplands, where clay is the dominant surficial material and Zone 2 represents the surface outcrop of sand units, where recharge is interpreted to be higher.
- Review of the Texas Water Development Board (TWDB) well logs and reports suggests that there are no major groundwater extraction areas within the model area. The majority of wells within the model area are domestic, stock watering, and oil and gas rig water supply wells. These types of wells are assumed to have average pumping rates of less than 10 gpm, which would have minimal impact on groundwater levels outside of the immediate area of the well. Therefore, with the exception of the accident analysis particle tracking, pumping from individual wells is not included in the model.
- Simulations are assumed to represent steady-state conditions, since there is little evidence to suggest that time-dependent (transient analysis) is necessary, nor is there sufficient onsite or offsite historical groundwater level data to support transient modeling.

Upon plant completion, the following cooling basin/power block area parameters are assumed:

- The hydraulic conductivity (K_h) of the fill material used in plant construction is assumed to be that of a clean sand and gravel at 500 feet/day (Reference 2.4.12-C-4). A K_h/K_v of 10 was used for the backfill to represent the vertical anisotropy created by compaction of lifts of the fill material.

Samples of proposed structural fill were obtained from local, off-site suppliers, and particle size distributions were determined by sieve analysis as reported in Part 5 of the ESPA. Hydraulic conductivity of the proposed backfill was determined using the mean grain size and the Shepherd equation (Reference 2.4.12-C-18). Using the Shepherd equation for texturally immature (poorly sorted, angular) consolidated sediments, the estimated hydraulic conductivities for the three samples that most closely approximate the preferred structural fill for the VCS site (sample numbers Fordyce Briggs RAW, CWA #4 and CWA #6) are 163 ft/day, 1013 ft/day, and 732 ft/day, respectively. The geometric mean of these three values is 495 ft/day, which substantiates the value assumed in the numerical model for the horizontal hydraulic conductivity of structural fill (500 ft/day).

- Post-construction recharge is represented by: no recharge in the cooling basin and power block building areas, twice the pre-construction Zone 2 recharge is assumed in power block backfill areas, and the pre-construction recharge distribution is assumed for all other model areas. The power block area backfill is assumed to be approximately five times more permeable than the natural sand units, however mitigating surface features such as finish grading to assure overland flow rather than ponding, storm drains to conduct surface drainage, and vegetation control are assumed to reduce the amount of infiltration through the backfill.
- The VCS cooling basin bottom is assumed to be elevation 69 feet.
- The cooling basin dikes are not considered in the seepage analysis due to their small size in relation to the cooling basin area.
- The power block is assumed to be excavated to elevation -15 feet.
- The level for the VCS cooling basin is assumed to be elevation 90.5 feet ± 1 foot.
- The finished plant grade in the power block area is assumed to be elevation 95 feet.

The following references are being added to Section 2.4.12-C-8 of the SSAR:

2.4.12-C-18 Fetter, C.W., Applied Hydrogeology, 3rd Edition, 1994.

RAI 02.04.12-4:

Question:

In accordance with the requirements of 10 CFR 100.20(c) "Factors to be considered when evaluating sites" relating to hydrology and recommended by Standard Review Plan 2.4.12 "Groundwater" acceptance criteria, please describe the effects of well drilling techniques and well testing methods, including slug tests, pumping tests and borehole permeable tests, on the hydrogeologic properties presented in this section. Also, please discuss the role of well construction on the test results, factors that account for the many orders of magnitude difference in aquifer properties, and rationale used to select the parameter values for the site conceptual and numerical model.

Response:

Information addressing this question was provided as a response to Hydrology Information Need (INH) 52a, previously submitted in Exelon letter to the NRC NP-11-0009, dated February 24, 2011.

Associated ESPA Revision:

No ESPA revision is required as a result of this response.

RAI 02.04.12-7:

Question:

In accordance with the requirements of 10 CFR 100.20(c) "Factors to be considered when evaluating sites" relating to hydrology and, 10 CFR 52.79(a) "Contents of applications; technical information in final safety analysis report" relating to hydrologic characteristics of the proposed site, and as recommended by Standard Review Plan 2.4.12 "Groundwater" acceptance criteria,, the NRC Staff requests that the Applicant describe the ground water/surface water interactions in the drainage ditch around the outside of the embankment (FSAR, Rev0, page 2.4.12-12). Also, please exclude descriptions of potential engineering modifications to the cooling basin design in this (2.4.12) section.

Response:

Information addressing this question was provided as a response to Hydrology Information Need (INH) 55, previously submitted in Exelon letter to the NRC NP-11-0007, dated February 10, 2011.

Associated ESPA Revision:

No ESPA revision is required as a result of this response.

RAI 02.04.12-9:

Question:

In accordance with the requirements of 10 CFR 100.20(c) "Factors to be considered when evaluating sites" relating to hydrology and, 10 CFR 52.79(a) "Contents of applications; technical information in final safety analysis report" relating to hydrologic characteristics of the proposed site, and as recommended by Standard Review Plan 2.4.12 "Groundwater" acceptance criteria, the NRC Staff requests that the Applicant discusses the proposed potable water supply wells to be drilled in the Evangeline aquifer and the potential impact of pumping from this well on vertical gradients and groundwater pathways in Section 2.4.12.3 of the FSAR.

Response:

Information addressing this question was provided as a response to Hydrology Information Need (INH) 41b, previously submitted in Exelon letter to the NRC NP-11-0013, dated March 21, 2011.

Associated ESPA Revision:

No ESPA revision is required as a result of this response.

RAI 02.04.13-2:

Question:

In accordance with 10 CFR 100.20(c), 10 CFR Appendix B, 10 CFR 52.79(a) requirements, criteria of SRP 2.4.12 and SRP 2.4.13, the NRC staff request that the applicant provide the following calculation packages:

- Digital copies of files used for radionuclide transport analysis with explanations of data and formats.

Response:

Groundwater flow model input/output files, including files used for radionuclide transport analysis, with explanations of data and formats was previously provided in Exelon letter to the NRC NP-10-0025, dated November 9, 2010.

Associated ESPA Revision:

No ESPA revision is required as a result of this response.

ATTACHMENT 10

SUMMARY OF REGULATORY COMMITMENTS

(Exelon Letter to USNRC, NP-11-0017, dated May 18, 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)
Exelon will revise the VCS ESPA SSAR Section 2.4.12 to incorporate the change shown in the enclosed response to the following NRC RAI: 02.04.12-3 (Attachment 5)	Revision 1 of the ESPA SSAR and ER planned for no later than March 31, 2012	Yes	No

ATTACHMENT 11

CD-R labeled: "Victoria County Station, SSAR RAI 02.03.02-1 Response, Revised NRC Format File, VCS Hourly Met Data – 7.1.07 to 6.30.09"

(Two copies)