Dominion Nuclear North Anna, LLC
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Dominion®

May 7, 2004

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No. 04-157A
ESP/JDH
Docket No. 52-008

DOMINION NUCLEAR NORTH ANNA, LLC
NORTH ANNA EARLY SITE PERMIT APPLICATION
FINAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION NO. 1

In its March 8, 2004 letter titled "Request for Additional Information No. 1," the NRC requested additional information regarding certain aspects of Dominion Nuclear North Anna, LLC's (Dominion) Early Site Permit application. Dominion initially responded on April 7, 2004 to three of the four questions in the NRC's Request for Additional Information (RAI). The fourth and final question--RAI 2.3.1-1, SSAR Section 2.3.1, Regional Climatology--is the subject of this letter.

It is our intent to revise the North Anna ESP application to reflect our response to this and other RAIs to support issuance of the NRC staff's draft safety and environmental evaluations scheduled for later this year.

If you have any questions or require additional information, please contact Mr. Joseph D. Hegner at 804-273-2770.

Very truly yours,

Leslie N. Hartz
Vice President-Nuclear Engineering

Enclosure:

1. Final Response to NRC RAI No. 1

D074

Commitments made in this letter:

1. Revise North Anna ESP application to reflect RAI responses.

cc: U.S. Nuclear Regulatory Commission, Region II
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Serial No. 04-157A
Docket No. 52-008
Final Response to RAI No. 1

COMMONWEALTH OF VIRGINIA

COUNTY OF HENRICO

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Leslie N. Hartz, who is Vice President, Nuclear Engineering, of Dominion Nuclear North Anna, LLC. She has affirmed before me that she is duly authorized to execute and file the foregoing document on behalf of Dominion Nuclear North Anna, LLC, and that the statements in the document are true to the best of her knowledge and belief.

Acknowledged before me this 7TH day of May, 2004.

My Commission expires: May 31, 2006

Vicki L. Hull

Notary Public

(SEAL)

Final Response to NRC
Request for Additional Information No.1

This document provides Dominion's final response to the questions in NRC's March 8, 2004 Request for Additional Information. A partial response was provided April 7, 2004. The NRC question is restated below in italics, followed by the Dominion response.

SSAR Section 2.3.1, Regional Climatology

SSAR Section 2.3.1 provides climatological information. Sections 2.3.1 of Regulatory Guide 1.70 and Review Standard RS-002 describe methods and approaches acceptable to the staff for addressing the regulations. Both these documents state that all the meteorological data used for design basis considerations should be documented and substantiated. Consistent with the guidance in these documents, please provide the site characteristic values listed below. The bases or sources for these site characteristic values should also be provided. These site characteristics represent typical design parameter information for a range of reactor designs.

a) 3-second gust wind speed that represents a 100-year return period.

b) Maximum ambient dry bulb temperature (along with the concurrent wet bulb temperatures) that:
   - *i) will be exceeded no more than 5% of the time seasonally or 2% of the time annually.*
   - *ii) will be exceeded no more than 1% of the time seasonally or 0.4% of the time annually.*
   - *iii) represents a 100-year return period.*

c) Minimum ambient dry bulb temperature that:
   - *i) will be exceeded no more than 5% of the time seasonally or 1% of the time annually.*
   - *ii) will be exceeded no more than 1% of the time seasonally or 0.4% of the time annually.*
   - *iii) represents a 100-year return period.*

d) Maximum ambient wet bulb temperature that:
   - *i) will be exceeded no more than 1% of the time seasonally or 0.4% of the time annually.*
   - *ii) represents a 100-year return period.*

e) Weight of the 100-year return period snow pack and weight of the 48-hour winter Probable Maximum Precipitation, and the resulting maximum ground snow and ice *load (water equivalent) that would be placed on the roofs of structures important to safety.*

f) The ultimate heat sink (UHS) meteorological conditions resulting in the maximum evaporation and drift loss of water from the UHS and minimum cooling by the UHS.

g) The tornado maximum wind speed (translational and rotational), the radius of the maximum rotational wind speed, the maximum pressure drop, and the rate of the maximum pressure drop associated with a probability of occurrence of 10^{-7} per year.

Alternative approaches to evaluating extreme weather phenomena important to design of structures, systems, and components of a nuclear power plant or plants that might be constructed on the site may be used if appropriately justified.

Dominion Response

a) The 3-second gust wind speed that represents a 100-year return period is 96 mph (10 meters above ground). The 96 mph wind speed was determined in accordance with Figure 6-1 and Table C6-3 of Reference 1.

b) The maximum ambient dry bulb temperature (along with the concurrent wet bulb temperatures) that:

i) will be exceeded no more than 2% of the time annually is 90°F (74°F concurrent wet bulb). This temperature is based on Reference 2.

ii) will be exceeded no more than 0.4% of the time annually is 95°F (77°F concurrent wet bulb). This temperature is based on Reference 2.

iii) represents a 100-year return period is 108°F. This temperature is predicted by an extrapolation (using the least-squares, regression method) of actual temperatures from 1973 to 2002 (References 3, 4, and 5). The concurrent wet-bulb temperature is not predictable by the extrapolation. For information, considering the same timeframe and reference data, the 0% exceedance, maximum, dry-bulb temperature is 104.9°F (79°F concurrent wet bulb).

c) The minimum ambient dry bulb temperature that:

i) will be exceeded no more than 1% of the time annually is 18°F. This temperature is based on Reference 2.

ii) will be exceeded no more than 0.4% of the time annually is 14°F. This temperature is based on Reference 2.

iii) represents a 100-year return period is -16°F. This temperature is predicted by use of the same method described in the response to b) iii) for minimum dry-bulb temperatures and References 3, 4, and 5.

d) The maximum ambient wet bulb temperature that:

i) will be exceeded no more than 0.4% of the time annually is 79°F. This temperature is based on Reference 2.

ii) represents a 100-year return period is 87°F. This temperature is predicted by use of the same method described in the response to b) iii) for maximum wet-bulb temperatures and References 3, 4, and 5. For information, the 0% exceedance, maximum, wet-bulb temperature is 84.9°F.

e) The weight of the 100-year return period snow pack is 30.5 pounds per square foot. The snow-pack weight was determined in accordance with Figure 7-1 and Table C7-3 of Reference 1.

The weight of the 48-hour winter Probable Maximum Precipitation is 107.9 pounds per square foot (20.75 inches of precipitation). The amount of 48-hour winter PMP was linearly interpolated from values shown in Figures 35 and 45 of Reference 6, for the 24-hour and 72-hour, respectively, events in December. The month of December has the highest winter PMP values.

If combined, the resultant weight of the combined snow pack/PMP events on the roofs of important-to-safety structures would be 138.4 pounds per square foot. However, the design of roofs and roof scuppers for the new units would be evaluated as part of detailed engineering to preclude such accumulation. As described in Section 2.4.7.6, the detailed engineering results demonstrating acceptable roofing structure performance would be described in the COL application.

f) The evaluation for the meteorological conditions resulting in the maximum evaporation and drift loss of water from and minimum cooling by the Ultimate Heat Sink (UHS) is in accordance with the guidance of RG 1.27 and uses data from References 3, 4, and 5. The controlling parameters for the type of UHS selected for the ESP application (i.e., mechanical draft cooling tower over a buried water storage basin or other passive water storage facility, as required by the reactor design) are the wet-bulb temperature and coincident dry-bulb temperature.

The meteorological conditions resulting in the maximum evaporation and drift loss of water from the UHS are the worst 30-day average combination of controlling atmospheric parameters. The worst 30-day daily average of wet-bulb temperatures and coincident dry-bulb temperatures is 76.3°F and 79.5°F, respectively, considering the referenced data and encompassing a 25-year period from 1978 to 2003. Calculating "running, 30-day," daily averages and selecting the 30-day period with the highest daily average wet-bulb temperature determined the worst 30-day period.

The set of meteorological conditions that result in minimum water cooling is the worst combination of controlling atmospheric parameters, including diurnal variations, where appropriate, for the critical time periods unique to the UHS design. Conservatively, the meteorological conditions took into consideration the worst 1-day and worst 5-day daily average of wet-bulb temperatures and coincident dry-bulb temperatures. The worst 1-day is the day having the highest daily average wet-bulb temperature. The worst 1-day wet-bulb temperature and coincident dry-bulb temperature is 78.9°F and 87.7°F, respectively. The worst 5-day daily average of the wet-bulb temperatures and coincident dry-bulb temperatures is 77.6°F and 80.9°F, respectively. Calculating "running, 5-day," daily averages and selecting the 5-day period with the highest daily average wet-bulb temperature determined the worst 5-day period. Both the worst 1-day and the worst 5-day temperatures were determined using the same reference data and over the same period as the worst 30-day temperatures.

g) The parameters of a site tornado associated with a probability of occurrence of 10^{-7} per year are shown tabulated below.

Parameter	Site Tornado **(10^{-7} per year occurrence)**
Maximum wind speed, mph	206
Maximum translational wind speed, mph	165
Maximum rotational speed, mph	41
Radius of maximum rotational wind speed, feet	150
Pressure drop, psi	0.92
Rate of maximum pressure drop, psi/sec	0.37

These values are essentially identical to those currently listed in SSAR Table 2.3-1. The methods used to estimate the tornado strike probability and define the site tornado parameters in the table above are described in Reference 7. The methods used in calculating the tornado parameters followed those specified in References 7, 8, and 9. Using Reference 10 meteorological data, all reported tornado occurrences over the period from 1950 to 2003 within a "1-degree square" (i.e., an area enclosed by 1-degree longitudinal and latitudinal lines, Reference 7) centered on the ESP site were tabulated and considered in the determination of the site tornado. A total of 24 tornadoes were recorded within the square over the period. The most intense were two classified F3 (71 to 92 meters per second) on the Fujita-Pearson tornado scale. The maximum wind speed at the site associated with a tornado having a probability of occurrence of 10^{-7} per year is slightly less than the upper limit of the F3 wind speed of 92 meters per second (206 miles per hour). However, the upper limit was conservatively selected.

References:

1. *Minimum Design Loads for Buildings and Other Structures*, SEI/ASCE 7-02, Revision of ASCE 7-98, American Society of Civil Engineers (ASCE), and Structural Engineering Institute (SEI), January 2002.

2. Richmond, Virginia, 1973 – 1996, *Engineering Weather Data, Version 1.0, 2000 Interactive Edition*, developed by the Air Force Combat Climatological Center, published by the National Climatic Data Center, NOAA, December 1999.

3. Richmond, Virginia, *Solar and Meteorological Surface Observation Network, 1961-1990, Vol. 1, Eastern U.S., Version 1.0,* National Climatic Data Center and National Renewable Energy Laboratory, September 1993.

4. Richmond, Virginia, *Hourly United States Weather Observations, 1990-1995,* National Climatic Data Center, NOAA.

5. Richmond, Virginia, *Hourly United States Weather Observations, 1996-2003,* National Climatic Data Center, NOAA.

6. NUREG/CR-1486, *Seasonal Variation of 10-Square Mile Probable Maximum Precipitation Estimates, United States East of the 105th Meridian, Hydrometeorological Report No. 53,* U.S. Department of Commerce, National Oceanic and Atmospheric Administration, U.S. Nuclear Regulatory Commission, April 1980.

7. *Technical Basis for Interim Regional Tornado Criteria*, WASH-1300, U.S. Atomic Energy Commission, May 1974.

8. *Extreme Meteorological Events in Nuclear Power Plant Siting, Excluding Tropical Cyclones, A Safety Guide, 1981*: IAEA Safety Guides, Safety Series No. 50-SG-S11A, International Atomic Energy Agency, Vienna.

9. Safety Evaluation by the Office of Nuclear Reactor Regulation of Recommended Modification to the RG 1.76 Tornado Design Basis for the ALWR, U.S. Nuclear Regulatory Commission, March 1988.

10. *Storm Events for Virginia, 01/01/1950 Through 12/31/2003*, National Climatological Data Center, National Oceanic and Atmospheric Administration, Website, www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms, accessed March 2, 2004.