

March 2, 2006

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SUBJECT: RESULTS OF REVIEW OF THE SUPPLEMENT TO THE EARLY SITE PERMIT  
(ESP) APPLICATION FOR THE NORTH ANNA SITE  
(TAC NOS. MC1126 AND MC 1128)

Dear Mr. Christian:

On January 13, 2006, Dominion Nuclear North Anna, LLC (Dominion) submitted a supplement to its application for an early site permit (ESP) at the North Anna ESP site. The supplement proposes to change the cooling system for proposed Unit 3 and to increase the power level for proposed Units 3 and 4 from 4300 MWt to 4500 MWt. By letter dated February 10, 2006, the staff identified several areas in which the staff needs additional information to complete its review. The staff also stated in the letter that it would identify additional information needs under a separate cover. This letter encloses a list of those additional information needs.

We request that Dominion address these additional issues in its revised application (Revision 6) and submit this revised application with revision bars clearly identifying the changes. This will facilitate staff review. If you have any questions on this matter, please contact the NRC project manager, Nitin Patel, at 301-415-3201 or [nxp1@nrc.gov](mailto:nxp1@nrc.gov).

Sincerely,

**/RA/**

Nitin Patel, Project Manager  
New Reactor Licensing Branch  
Division of New Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 52-008

Enclosure: As stated

cc w/encl: See next page

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ADAMS ACCESSION NO.: ML060610065

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ADDITIONAL INFORMATION NEEDS  
REGARDING SUPPLEMENT TO APPLICATION  
FOR EARLY SITE PERMIT (ESP)  
DOMINION NUCLEAR NORTH ANNA, LLC  
NORTH ANNA SITE  
DOCKET NO. 52-008

The staff has identified the additional information needed in the revised application due to changes made by Dominion to the cooling system for Unit 3 and the increase in power level from 4300 to 4500 Mwt for Units 3 and 4. These changes affected many sections of the environmental report (ER) and the site safety analysis report (SSAR).

The staff's information requests are based on the staff's review guidance contained in RS-002, *Processing Applications for Early Site Permits*. The requests are organized into three general categories: (1) information needed due to the change to the cooling system, (2) information needed due to the power increase, and (3) justification for the sections identified as unaffected. Some requests apply to more than one category or apply to both the SSAR and the ER. The identification of sections affected by the requests is not meant to be exhaustive.

The general areas of the application for which the staff needs additional information are operating description for the Unit 3 wet and dry cooling system, aquatic impacts, wet cooling tower impacts, power increase (specifically the economic simplified boiling water reactor [ESBWR] source term), and areas identified as unaffected.

In several instances, Dominion's January 13, 2006, supplement states that the detailed information is not available and will be provided in a combined license (COL) application. While design level information is not required at the ESP stage, sufficient information is required at the ESP stage for the staff to evaluate the environmental impacts of construction and operation. Where design level information is lacking, the applicant should make reasonable bounding assumptions about the potential design and evaluate the environmental impacts based on those assumptions. In your revised application, provide a table containing the assumptions and the affected sections of the SSAR and the ER. In your revised application, please provide the basis for your answers to the information needs identified below.

## Information Needed Due to the Change to the Cooling System

### Wet Cooling tower

#### 1. Drift

- a. ER Table 3.1-9 — Include a plant parameter envelope (PPE) value related to cooling tower drift for the Unit 3 wet cooling tower.
- b. ER Table 3.3-1 — Include drift estimates for the cooling towers.
- c. ER Sections 3.4.1.1, 3.6.1 — Drift needs to be discussed in these sections.
- d. ER Section 5.1.1 — Drift should be included in the bullet list.
- e. ER Section 5.3.3.2.1 — Provide an evaluation of cooling tower drift and visible plumes.

#### 2. Noise

##### ER Section 5.8.1.2

This section concluded that the noise associated with the new cooling design would not cause adverse offsite impacts and that a noise study would be described in the COL application. Make reasonable assumptions about the design and analyze the environmental impact, if the final design of the cooling system and the associated noise level is not known at ESP stage.

- a. ER Section 3.1.5 states that operation of the cooling fans would produce noise below 60–65 dbA at the exclusion area boundary (EAB). Table 3.1-9 lists this noise level for the Unit 4 dry towers, but does not provide values for the Unit 3 or the Ultimate Heat Sink (UHS) towers. If all of the towers are running (Unit 3 dry and wet, Unit 4 dry, and the UHS towers), would the total noise level still be below 65 dbA at the EAB?
- b. Provide the calculations and assumptions used to estimate noise levels at the EAB and the closest residence. Include initial sound levels (background and cooling towers), the number of sources, distances, and attenuation factors considered in reaching a conclusion but not included in the calculations.

#### 3. ER Section 3.4.1.1

Explain the statement: “The wet towers would incorporate water savings features to reduce evaporative water losses.” Describe the associated design features and how they affect the amount of water used by the cooling towers.

#### 4. Terrestrial Ecosystems

##### ER Section 2.4.1.8, Wetlands

Are there any areas identified as Army Corp of Engineers (ACE) as jurisdictional wetlands under the Clean Water Act? If so, what protection or mitigation measures have been proposed or agreed to?

## 5. Aesthetic

### ER Section 5.8.1.5

Provide an evaluation of the aesthetic impacts of the moisture plumes from the cooling towers. Estimate by season (summer, fall, winter, spring ) the approximate percentage of the time that the plume would be visible above the containment building and would extend more than 0.5 miles. Provide this information for two cases: 1) with the wet cooling towers operating 100% of the time in energy conservation (EC) mode and 2) with the wet cooling towers operating 100% of the time in maximum water conservation (MWC) mode.

## 6. Human Health

### ER Section 5.3.4.1

Recent correspondence with Virginia Department of Health (VDH, September 2005) addressed the health risks associated with exposure to *Naegleria fowleri*. Dominion stated in its supplement that it is working with State agencies to communicate the information related to risk that was provided in the VDH correspondence to residents around the waste heat treatment facility (WHTF).

- a. Provide the details of the plan for communication regarding the risk from thermophilic organisms to the residents around the WHTF.
- b. Provide an evaluation of the thermophilic micro-organisms in the basins below the wet cooling towers.
- c. In view of the fact that the WHTF, although regulated as a private pond with a point of compliance at Dike 3, is also used for water-based recreation (especially swimming), specifically include an analysis of any health impacts of swimming in the WHTF. Include in your analysis the impacts related to the cooling water blowdown from the wet cooling towers that will be regulated as an internal source in accordance with 40 CFR 423.10.

## 7. Meteorology

- a. SSAR Section 2.3.2 and ER Section 2.7.4.1

Describe how potential increases in atmospheric moisture resulting from the operation of a wet cooling tower for proposed Unit 3 would impact onsite humidity data and provide a quantitative analysis for the potential for increased fog formation.

- b. SSAR Section 2.3.2.3

Describe how potential increases in atmospheric temperature and moisture resulting from the operation of a closed-cycle dry and wet cooling tower system for proposed Unit 3 would impact plant design and operation.

c. ER Section 5.3.3.1

1. What is the basis for the statement that “Salt deposition rates would be below the threshold value of 1 kg/ha/month beyond the site boundary at ground levels”?
2. The supplement states: “In a COL application, when a specific reactor design is selected, a more detailed evaluation would be made of the fogging and salt deposition, and specific design consideration would be given to mitigate the effects of these phenomena or to eliminate them from occurring.” Provide the detailed evaluation of fogging and salt deposition, including any assumptions necessary to perform the analysis, so that the staff can reach its conclusion on the impacts of fogging and salt deposition. Include a discussion of mitigation if necessary.
3. What are the “industry standard techniques for limiting fogging?”
4. What is a “reasonable level” for fogging?

d. ER Section 5.3.3.2.1

The first sentence Section 5.3.3.2.1 states: “As concluded in Section 5.3.3.1, steam fog formation, drift and steam-fog-induced icing conditions resulting from operation of the WHTF are very localized and infrequent at the NAPS site.” Provide the justification for the above statement.

**8. Land Use**

a. SSAR Section 2.3.2.4 and ER Section 2.7.4.1.7

A sentence in the last paragraph of SSAR Section 2.3.2.4 and ER Section 2.7.4.1.7 states: “No large-scale cut and fill activities would be needed to accommodate the new units since a large portion of the area to be developed is already relatively level.” Given the additional land area that the wet and dry towers for Unit 3 will use in comparison to a once through cooling system, confirm or revise the above statement.

b. ER Section 4.1

Given the change in cooling system for Unit 3, is the total land area to be used shown in Section 4.1.1.4 and Table 4.1-2 of the ESP environmental report still the same? Will the overall footprint of the cooling towers, including areas that will be cleared to support construction and laydown areas, etc., fit within the 55 acres previously identified as the cooling tower area. If not then, provide updated land use figures.

c. ER Section 5.3.3.2.2

What is the expected atmospheric temperature rise at the vegetation level at the NAPS site boundary?

9. Construction

ER Table 3.1-1 and Table 3.1-9

Confirm that the number of construction personnel (combined maximum of 5000 for two units) is the same as originally stated, the number of operating personnel is still 720 for the two new units, and that the number of additional outage personnel is still 700-1000. If these numbers have changed, provide the new values, and make adjustments to the corresponding values in all of the sections of the ER that depend on these values.

10. Hydrology/Water Use and Quality

- a. PPE Table 3.1-1 includes cooling water temperature rise. Explain why this value is relevant as a PPE value for a cooling tower design.
- b. In Site Characteristics and Design Parameters Table 3.1-9, a 96 percent plant capacity factor was used to define the average evaporation rate. Explain how the average was estimated. What would be the average at 100% load factor? Justify why a load factor of 96% (and 93% for existing units) would be appropriate during critical periods (e.g. dry summers, droughts).
- c. Provide a copy of Dominion's response to the questions regarding water use and quality and aquatic impacts in the Commonwealth of Virginia's January 31, 2006, letter.
- d. Provide a water quality analysis in sufficient detail for the staff to establish the magnitude of potential water quality impacts and weigh the environmental effects of degradation, if any, in water quality as a result of the new cooling systems.
- e. Dominion established 250 mean sea level (MSL) as the lake level setpoint for shifting between energy conservation and water conservation modes. Provide documentation of the basis for selecting this setpoint and the 7 day lag before the shift in modes is implemented. If any studies were conducted to assess the impact of increasing or decreasing this setpoint, provide a description of the studies.
- f. The volume of water in Lake Anna could be reduced due to evaporation from Unit 3's wet tower. This reduction in lake volume could result in less water volume in the lake to disperse the heat from Units 1 and 2 and therefore some increase in lake temperature. This indirect increase in lake temperature would cause some increased evaporation from the lake. Provide documentation demonstrating that this indirect increase in lake temperature and evaporation is insignificant or quantify the increase in temperature and evaporation.



- g. Provide an electronic copy of the analysis spreadsheet used to estimate the lake level and downstream flow impacts.
- h. Quantitatively define the relationship between meteorological conditions and the percent of heat load being dissipated via dry towers in the water conservation mode.
- i. SSAR Section 2.4.11.3 discusses consumption of additional water and outflow from the dam. Provide an analysis of the number of additional days of reduced downstream flow that might result from operation of Unit 3.
- j. Define when the cooling system would be placed into the MWC mode (an example of the time period, "e.g., 7 days," is not sufficient) .
- k. Provide the maximum amount of water Unit 3 would consume when operating at the following lake levels: above 250 MSL, between 248 and 250 MSL, and below 248 MSL. Based on the above water use, evaluate the impact on lake level and downstream users.
- l. Provide further analysis on Unit 3 alternative 6 (dry cooling) in light of the proposed wet and dry hybrid cooling system. Include in your analysis the environmental impacts of the efficiency penalty of dry cooling (increased fuel consumption) versus the base case of combination wet and dry cooling towers.
- m. With respect to SSAR Section 2.4, the ESP application supplement changed the normal plant cooling system for proposed Unit 3 from a once-through system to a wet and dry hybrid cooling tower system.
  - 1. Provide a conceptual description of the hybrid cooling tower system, its interaction with safety-related components, and an assessment of the reliability of this system.
  - 2. Describe how the hybrid cooling towers function for the normal cooling system (NCS) for the plant, and whether or not the NCS draws water from the ultimate heat sink (UHS) underground reservoir. If so, show how the remaining volume of water in the UHS reservoir will be adequate for a 30 day cooling water supply for safety system cooling.
  - 3. In order to show that there is no abrupt or frequent reliance on the UHS, provide an estimate of the frequency of reliance on the UHS due to various failure modes of the hybrid NCS.
  - 4. Any increase of the required lake water surface elevation above 250 ft MSL would necessitate staff re-evaluation of the probable maximum flood elevation at the proposed ESP site. If the lake water surface elevation is increased above 250 ft MSL, identify the increase and provide an analysis of the probable maximum flood (PMF) for the new and increased lake level.

**11. ER-Aquatic Impacts**

- a. Section 5.2.2.2 states that the frequency of reduced flow from the dam would increase. Provide an analysis of the impact on fish and other aquatic communities in the North Anna River downstream of the dam. Specifically, address how the reduced water flow rates would affect environmental conditions at known striped bass spawning habitat areas during the striped bass spawning season.
- b. Dominion's RAI response dated April 12, 2005, stated that Dominion planned to provide assistance to aid the Virginia Department of Game and Inland Fisheries (VDGIF) in development and stocking of a more thermally tolerate species, such as a sterile white bass/striped bass hybrid. Given the change to the cooling system, does Dominion still plan to provide this assistance?

**12 ER-State Permits**

- a. Please confirm that the concerns raised by State agencies have been resolved and that permits for consumptive water use can be obtained.
- b. What is your schedule for obtaining the Coastal Zone Management Act consistency certification?
- c. The Virginia Pollution Discharge Elimination System (VPDES) permits for the existing Units 1 and 2 are undergoing renewal. Because the operating limits in these permits factor into the analysis for proposed Unit 3, as necessary, update the analysis to account for any changes in the permit. Provide within 30 days of issuance of the renewed VPDES permits the updated analysis to the NRC or a justification for why the analysis is not affected.
- d. Provide Clean Water Act (CWA) Section 401 certification or documentation from the Commonwealth of Virginia that Section 401 certification is not needed because Dominion will request a permit condition that will prohibit any activities that could result in discharges to navigable waters until a Section 401 certification is obtained or waived by the Commonwealth of Virginia.

**Information Needed Due to the Power Increase**

**13. SSAR and ER Section 7.1**

Address the following source term related issues for the ESBWR design demonstrating the reactor accident source term PPE values specified in SSAR are still appropriate and that the radiological consequence doses at the proposed ESP site would meet the requirements of 10 CFR 50.34:

- a. Provide ESBWR source terms for a power level at 4590 MWt (102% of requested power level to account for uncertainty). The source terms are expressed as the timing and release rate of fission products to the environment from the proposed ESP site.

- b. Describe your analysis of selected design basis accidents based on the proposed version of the ESBWR design to demonstrate compliance of the proposed ESP site with the dose consequence evaluation factors specified in 10 CFR 50.34(a)(1).
- c. Provide ESBWR design-specific  $\chi/Q$  values used in the ESBWR design and compare them with the site-specific  $\chi/Q$  values at the proposed ESP site.

**14. ER Section 7.2 Severe Accidents**

- a. Include the results of a site-specific assessment of the consequences of severe accidents for air and surface water pathways based on the results of the MACCS2 computer code.
- b. Provide electronic copies of input and output files for the MACCS2 code for an ESBWR at 4500 MWt.
- c. For an ESBWR, provide and justify the accident release categories and the core damage frequency for each release category.

**15. ER-Fuel Transportation**

Provide an assessment of the impacts of the revised power levels on the numbers of shipments of unirradiated fuel, spent fuel, and radioactive waste and the radionuclide inventories of spent fuel assemblies.

**Justification for Sections Identified as Unaffected**

- 16.** Provide justification for the sections identified as unaffected by the change to the cooling system and the increase in power level. For example, why is ER Section 7.2, Severe Accidents, not affected by the increase in power from 4300 - 4500 MWt? Examples of the sections that appear to be affected, (which are not exhaustive) are given below.

a. ER Section 1.2

ER Section 1.2 and the associated table state that a Coastal Zone Management Act (CZMA) consistency determination is not applicable. Given that Dominion has submitted its project to the Commonwealth of Virginia for a consistency determination, justify or revise the first sentence of the first paragraph, the next to last sentence of the third paragraph, and the entry in Table 1.2-1 which lists the CZMA as N/A.

b. ER Sections 2.7.4.1.4 and 2.7.4.1.6

Provide a detail discussion of onsite humidity data as a baseline input for evaluating fogging and increased humidity due to the addition of a wet cooling tower.

c. ER Section 3.6.3.3

Include a discussion of any scale or other waste from the wet cooling tower and potential wastes from cleaning the dry towers.

d. ER Section 5.3.3.1

Because of the addition of a wet cooling tower, include a discussion of humidity on site at the level of the cooling tower exit.

e. ER Section 5.8.1.2

Provide an estimate of the maximum height of trees on the site that may help block the view of new facilities from offsite locations. The location of the cooling towers needs to be clearly identified in Figure 5.8-1.

f. ER Section 5.8.2.3

Discuss the potential impacts of operating Lake Anna above the 250 MSL level.

g. ER Section 6.4.1 and SSAR Section 2.3.3

Section 6.4 of the Environmental Standard Review Plan (NUREG-1555) states that in order to provide an adequate meteorological database for evaluating the effects of plant operation, basic onsite meteorological instrumentation should include atmospheric moisture measurements at a height(s) representative of water-vapor release at sites at which large quantities of water vapor are emitted during plant operation. Likewise, SSAR Section 1.8.2 states that the SSAR conforms to Proposed Revision 1 to Regulatory Guide (RG) 1.23, "Onsite Meteorological Programs." Section C.2 of Proposed Revision 1 to RG 1.23 states "ambient moisture should be monitored at approximately 10 meters and also at a height where the measurements will represent the resultant atmospheric moisture content if cooling towers are to be used for heat dissipation." Provide the additional onsite humidity meteorological information at a height where the measurements will represent the resultant atmospheric moisture content if wet cooling towers are to be used for heat dissipation for Unit 3.

h. ER Sections 7.1.1 and 7.2

Revise these sections of the ER to make them consistent with responses to the questions 13 and 14 of this letter.

i. ER Section 7.1.2

The increase in power level for the ESBWR should result in a revision to the calculated DBA doses. The time-dependent ratios of the LPZ site-to-design certification (site/DC) X/Q values presented in ER Table 7.1-1 are based on (1) four DC 50% X/Q values that are a function of time and (2) one site 50% X/Q value that is time-independent. The ER DBA LPZ dose calculations should be based on 50% LPZ X/Q values that vary throughout the course of each design basis accident in accordance with NRC guidance (e.g., Environmental Standard Review Plan 7.1 and Regulatory Guide 1.145) and the approach used in the SSAR Chapter 15 accident analyses. Therefore, (1) provide 50% LPZ X/Q values that vary as a function of time for AP1000, ABWR and ESBWR, (2) replace the LPZ site/DC X/Q ratios presented in Table 7.1-1 by LPZ site/DC X/Q ratios where both the DC and site LPZ X/Q values are a function of time, and (3) revise Table 7.1-2 accordingly.

j. ER Section 9.3

Justify not reevaluating the North Anna site versus the alternative sites in the light of the changes to the cooling system. Discuss the differences that the cooling system change would have on the North Anna site rating.

NORTH ANNA EARLY SITE PERMIT  
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