July 7, 2008

Mr. Eugene S. Grecheck Vice President - Nuclear Development Dominion Innsbrook Technical Center 5000 Dominion Boulevard Glen Allen, VA 23060-6711

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 015 (SRP SECTION: 13.03 EMERGENCY PLANNING) RELATED TO THE NORTH ANNA UNIT 3 COMBINED LICENSE APPLICATION

Dear Mr. Grecheck:

By letter dated November 26, 2007, Dominion Virginia Power (Dominion) submitted a combined license application for North Anna Unit 3 pursuant to 10 CFR Part 52. The Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application.

The staff has identified that additional information is needed to continue portions of the review and the request for additional information (RAI) is contained in the enclosure to this letter. To support the review schedule, Dominion is requested to respond within 45 days of the date of this letter. If the RAI response involves changes to application documentation, Dominion is requested to include the associated revised documentation with the response.

Should you have questions, please contact me at (301) 415-0224 or Thomas.Kevern@nrc.gov.

Sincerely,

/**RA**/

Thomas A. Kevern, Senior Project Manager ESBWR/ABWR Projects Branch 1 Division of New Reactor Licensing Office of New Reactors

Docket No. 52-017

Enclosure: Request for Additional Information

July 7, 2008

Mr. Eugene S. Grecheck Vice President - Nuclear Development Dominion Innsbrook Technical Center 5000 Dominion Boulevard Glen Allen, VA 23060-6711

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 015 (SRP SECTION 13.03 – EMERGENCY PLANNING) RELATED TO THE NORTH ANNA UNIT 3 COMBINED LICENSE APPLICATION

Dear Mr. Grecheck:

By letter dated November 26, 2007, Dominion Virginia Power (Dominion) submitted a combined license application for North Anna Unit 3 pursuant to 10 CFR Part 52. The Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application.

The staff has identified that additional information is needed to continue portions of the review and the request for additional information (RAI) is contained in the enclosure to this letter. To support the review schedule, Dominion is requested to respond within 45 days of the date of this letter. If the RAI response involves changes to application documentation, Dominion is requested to include the associated revised documentation with the response.

Should you have questions, please contact me at (301) 415-0224 or Thomas.Kevern@nrc.gov.

Sincerely,

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Docket No. 52-017 Enclosure: Request for Additional Information

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NAME	ERobinson*	KWilliams*	RFoster*	TKevern *
DATE	06/26/2008	06/27/2008	07/01/2008	07/07/2008

*Approval captured electronically in the electronic RAI system. OFFICIAL RECORD COPY

Request for Additional Information North Anna, Unit 3 Dominion Docket Number 52-017 SRP Section: 13.03 – Emergency Planning Application Section: Part 5 – Emergency Plan

QUESTIONS

13.03-1: Evacuation Time Estimates (ETE) Questions (ETE-1 through ETE-45) Regulatory Basis: 10 CFR 52.79(a)(21), 10 CFR 50.47(b)(10), Section IV of Appendix E to 10 CFR Part 50; SRP 13.3, ACCEPTANCE CRITERIA A, B, and E

<u>ETE-1</u>

Geographical Information Systems (GIS) shape files of address points in each EPZ county (provided by the Virginia Department of Emergency Management) were used to determine the number of households in the EPZ. The GIS shape files estimate that the population increased from 20,292 in 2000, to 33,423 in 2008. In contrast, the North Anna Environmental Report (ER) for the combined license application (COLA) references the Final Environmental Impact Statement (FEIS) for the early site permit (ESP) population, which utilized the 2000 Census. The population in 2000 for 0-10 miles was estimated at 15,511, and was projected to be 21,000 by 2010, with average annual increases of about 1.9 percent

- a. Identify which estimate is correct, and clarify why there is a difference.
- b. Describe how population growth beyond 2008 was considered.
- c. Explain how the GIS information and census data were integrated into a single population set.
- d. Explain how GIS address points were generated, and how old the data is.
- e. Explain how residences were distinguished from businesses, using address points from GIS shapefiles.

<u>ETE-2</u>

Section 1-2 states that Figure 1-1, "North Anna Power Station Site Location," identifies communities in the area. Figure 1-1 only shows counties and major roads, and does not show specific communities (by name), other than the City of Richmond. Please clarify.

<u>ETE-3</u>

Guidance in NUREG-0654-FEMA-REP-1 REV. 1, Section I.A, calls for a topographical map which by definition should contain elevations. No information on elevation or land formation, other than water body locations, is provided. Provide a detailed map of the 10-mile plume exposure pathway EPZ, which identifies transportation networks, topographical features (including elevations), and political boundaries.

<u>ETE-4</u>

Section J.10.a of the Emergency Plan (page II-46) states: Appendix 4 of this plan provides maps of the plume exposure pathway EPZ illustrating evacuation routes, evacuation areas, pre-selected radiological sampling and monitoring points, and locations of shelter areas and relocation centers. The only map in Appendix 4 is Figure 3-1, "NAPS Protective Action Zone," which only shows the evacuation areas (i.e., PAZ boundaries). Please clarify.

<u>ETE-5</u>

Figure 3-1, Table 3-1, "Permanent Resident Population and Vehicles by PAZ," and Table 3-2, "Summary of Transients by PAZ," start with PAZ 2, rather than PAZ 1. Is the North Anna Power Station (NAPS) site PAZ 1? Please clarify, and indicate where PAZ 1 is identified in the ETE.

<u>ETE-6</u>

Assumption 3.a in Section 2.3 states that schools may be evacuated prior to notification of the general public. Explain how this would work, if notification takes 10 minutes and mobilization of buses takes 90 minutes. In addition, provide information on the "experience" used to establish the mobilization time of 90 minutes for buses.

<u>ETE-7</u>

Assumption 7 in Section 2.3 states that traffic control point numbers and locations depend on the Region to be evacuated and personnel resources available. Is this variable considered in the ETE calculations? If yes, what is the effect if the traffic control points are not properly staffed?

<u>ETE-8</u>

Assumption 5 in Section 2.2 states that the key-hole region extends to the EPZ boundary. In Figure 2-1, "Voluntary Evacuation Methodology," the key-hole region appears to stop at 5 miles. Was 100 percent of the population considered when calculating ETEs for the 10-mile EPZ; or was a reduction to 35 percent used, as indicated in Figure 2-1?

<u>ETE-9</u>

Assumption 6 in Section 2.2 identifies two "special event" scenarios, consisting of the construction period for a new reactor at the NAPS site, with and without refueling at the existing operating reactors (see also, page 3-2). These two scenarios increase the number of workers and vehicles in the area, which could affect an evacuation. Why are peak tourist populations not listed as a special event scenario? In addition, why is Memorial Day weekend not used as a special event scenario, given that the report states that tourist population peaks on Memorial Day weekend?

<u>ETE-10</u>

Assumption 10 in Section 2.3 states that rain will be used as the adverse weather condition. According to ESP FEIS Section 2.3.1.5, Louisa County experienced 30 snow and ice storms from 1993 to 2003, with the region receiving approximately 16.3 inches of snow annually. Based on these numbers, explain why snow is not considered as the adverse weather condition?

<u>ETE-11</u>

While the algorithm for intersections and a description of variables is provided in Section 4, a description of how the values for each variable were derived is not provided. Address the following questions:

- a. Provide a general description of other important algorithms used in the PC-DYNEV traffic simulation model.
- b. Describe how the values of the variables in the intersection algorithm in Section 4 were derived, such as the mean duration of GREEN time.
- c. The variable F_1 and F_2 are defined as the various known factors that influence the turn-movement-specific mean discharge headway h_m . These various known factors—which relate to be roadway geometrics, turn percentages, the extent of conflicting traffic streams, the control treatment, and others (see page 4-2)—are not specifically provided. Please clarify, and provide actual known factors used.
- d. Explain how the equation used in the intersection algorithm is affected by traffic control at intersections.
- e. Explain how the PC-DYNEV model addresses traffic through intersections, when considering traffic control or the equation presented.

<u>ETE-12</u>

Table F-1, "Survey Sampling Plan," indicates that the EPZ zip code populations total 71,195. The population numbers appear to be by zip code only, and not reflecting only the EPZ population. Please clarify, and explain how the population numbers in Table F-1 relate to the population numbers in Section 3.

<u>ETE-13</u>

In Table 1-1, "ETE Study Comparisons," the transit dependent population definition does not include any individuals with special needs. While there are no special care facilities in the EPZ, there could be people that need special aid to evacuate. Clarify if this subgroup of the population exists.

<u>ETE-14</u>

Section 8 "Transit-Dependent and Special Facility Evacuation Time Estimates", contains information on the process for the evacuation of transit-dependent individuals, but does not discuss how they are expected to get to the pick-up points. Explain how transit

dependent individuals are expected to get from their residences to the bus routes, and if this time was factored into the ETE.

<u>ETE-15</u>

Section 8.1 contains an equation used to calculate the number of persons ("P") requiring public transit or ride-share. Explain why the term " (0.59×0.39) " in the equation is squared.

<u>ETE-16</u>

In Section 8-4, Activity G-C states that for the second wave bus evacuation, the bus travel time back to the EPZ (to the start of the route) is estimated to be 20 minutes for good weather and 25 minutes for rain. What are the bases for these assumptions?

<u>ETE-17</u>

The report states in Section 3 (under Transient Population, page 3-7) that data on the number of transients using the marinas and boat launch site facilities was not available. Further, it assumed 10 vehicles/launch site and 25 vehicles/marina (with 2 people/vehicle); yielding a total of 410 transients in 205 vehicles for marinas and boat launch sites. (See also, Section 2.1, page 2-1.) Please provide a basis for this assumption, and explain why the population for marinas and boat launches used in the report are inconsistent with those presented in the ESP FEIS.

<u>ETE-18</u>

In Section 3 under Transient Population (page 3-7), it states that for Lake Anna State Park there are 1000 people and 400 vehicles (2.5 persons/vehicle) in the park on average during peak season, and the number of transients in the park during peak holiday weekends increases dramatically. Explain why peak transient population for the park at peak times and daily averages are inconsistent with those presented in the ESP FEIS.

<u>ETE-19</u>

Section 5 "Estimation of Trip Generation Times", describes the processes leading up to evacuation for the different population groups. Section 7"General Population Evacuation time Estimates", contains information on evacuation times. There is no discussion in either of these sections on how the transient population on the lake will be evacuated. Describe the logistics associated with evacuation of the lake area.

<u>ETE-20</u>

Figure 5-1 "Events and Activities Preceding the Evacuation Trip" (page 5-5) shows the mobilization for transients goes straight from notification(1-2) to evacuation (5). Explain the reasoning that supports the report's assumption that transients would not return to their "residences" prior to evacuation; e.g., those staying in hotels may return to gather their belongings prior to evacuation. Explain how this would affect the time for the transient population to evacuate.

<u>ETE-21</u>

The report estimates total employment at the North Anna Power Station (NAPS) to be 900 people (see page 3-11). Table 2-10 of the ESP FEIS shows that Dominion Virginia Power (presumably NAPS) employs 1318+. Please clarify.

<u>ETE-22</u>

In Section 3 (page 3-11), data from the three major employers in the NAPS EPZ (with greater than 50 employees) were used to represent the EPZ employee population (i.e., 900+156+210=1266). Clarify whether this number represents the total employee population within the EPZ, and explain how this relates to RAI ETE-21.

<u>ETE-23</u>

Section 8 (page 8-1) states that transit service may be needed for residents, employees, and transients. It appears that only residents have been factored into those who need transit service. Clarify if employees and transients are expected to need transit service.

<u>ETE-24</u>

Section 8.4, "Evacuation Time Estimates for Transit-Dependent People" (page 8-5) states that the dwell time for stop is 5 minutes. Explain the basis for the assumption that it takes the same amount of time to load high school children, elementary school children, and the general population on a bus.

<u>ETE-25</u>

Section 7.4 (page 7-5) states that summer implies that public schools are not in session. In contrast, Table 6-3, "Percent of Population Groups Evacuating for Various Scenarios," shows 10 percent of school buses used for evacuation in scenarios 1 and 2; and in Table 6-4, "Vehicle Estimates By Scenario," shows 25 percent of school buses used for evacuation in scenarios 1 and 2. Please clarify. In addition, explain whether these buses are being used to transport the general population, or some number of summer school children.

<u>ETE-26</u>

Section 7.1 states that the report assumes traffic volumes emitted within the Shadow Evacuation Region correspond to 30 percent of the residents there, plus a proportionate number of employees in that region. An estimate for the population in the Shadow Evacuation Region is given in Appendix I (see Table I-2, "Evacuation Time Estimates for Shadow Sensitivity Study"), without information as to how the shadow population size was determined.

<u>ETE-27</u>

Section 7.3 (page 7-3) states that it is reasonable to expect that some evacuees may delay or lengthen their mobilization activities and evacuate at a later time as a result, and that these ETE estimates do not (and should not) be distorted to account for these relatively few stragglers ["laggards"]. Clarify if the ETE results presented in Table 7-1D,

"Time to Clear the Indicated Area of 100 Percent of the Affected Population," actually includes 100 percent of the population, or whether the evacuation tail was truncated and "laggards" were not included. In addition, it appears the ETE results may have been truncated, because the longest evacuation time in Table 7-1D for 100 percent of the ETE is 5.5 hours. However, Distribution No. 4 in Section 5 (page 5-8) indicates that 360 minutes (6 hours) is the time for 100 percent of the population to prepare to leave home. Please clarify how the maximum evacuation time for 100 percent of the public can be less than the time required to prepare to evacuate.

<u>ETE-28</u>

While Appendix K contains road characteristics for the links and nodes, there is no reference for them on the map in Figure 1-2, "North Anna Link-Node Analysis Network."

- a. Provide a map that includes references for the road characteristic in Appendix K; e.g., additional maps and/or a larger scale map.
- b. Explain why the existing node network on Figure 1-2 is significantly different than the evacuation networks on Figures 10-1 through 10-4.
- c. The evacuation routes shown on Figures 10-1 through 10-4 are not consistent. Clarify which figure(s) is correct.
- d. Explain if and how the evacuation maps on Figures 10-1 through 10-4 were used to develop the nodal network.
- e. Identify the number of bridges used in ETE modeling discussed in Appendix C "Traffic Simulation Model:PCDYNEV".
- f. Explain whether the directions used in the ETE modeling, discussed in Appendix B and C, align with the directions that would be anticipated during an evacuation.
- g. Describe what road width was used for "Full Lanes" on the tables in Appendix K. In addition, address whether lane widths were measured during the field survey; and if so, was there one consistent width identified. If not, explain.

<u>ETE-29</u>

Figure 8-2 "Proposed Transit Dependent Bus Routes" (page 8-9), specify the number of buses on each route, but do not include the number or location of the bus stops along the routes. Provide maps that show the bus stop locations, and describe the effect they have on the ETE calculations.

<u>ETE-30</u>

Explain how the traffic management strategy (plan) identified in Section 9 and Appendix G was integrated into the ETE calculation. Are the evacuation time estimates dependant upon the various traffic control points (TCPs) and access control points (ACPs) being in place? In addition, Appendix G (page G-1) states the following: "Manpower and equipment shortages are likely to arise; as such, prioritization of TCP and ACP was established to make the most efficient use of manpower and equipment in the event of an emergency. The use of ITS [Intelligent Transportation Systems] technologies, as outlined in Section 9, will also aid in overcoming manpower shortages." To what extent have these likely manpower and equipment shortages been reflected in the ETE calculations; and if not, what effect will they have on the ETE calculations?

<u>ETE-31</u>

Appendix 4, "Evacuation Time Estimates (summary)," states on page ES-4 that the (ETE) plan should be reviewed by State and local law enforcement personnel. In addition, the first recommendation in Section 13, "Recommendations," states the following: "The traffic management plan should be reviewed by state and county emergency planners with local and state law enforcement agencies (See Section 9 and Appendix G). Specifically,

- o The number and locations of Traffic Control Points (TCP) and Access Control Points (ACP) should be reviewed in detail.
- o The indicated resource requirements (personnel, traffic control devices) should be reconciled with current assets."

Please identify State and county governmental agencies/officials affected by the ETE that have (and have not) reviewed and concurred with the ETE traffic control and management strategy (plan), including resource and equipment allocations, and locations of traffic control points (TCPs) and access control points (ACPs). For those agencies that have not concurred, describe any effect that the absence of traffic/access control support from those agencies would have on the ETE calculations, including if traffic control associated with those agencies is not in place during the evacuation. Also, identify TCPs and ACPs that would not be staffed as a result of the absence of support from those agencies that have not concurred. (See also, ETE-45.)

<u>ETE-32</u>

Provide congestion points (or bottlenecks) for the maps in Figures 7-2 through 7-6.

<u>ETE-33</u>

Section 1.3 (page 1-5) states that during field surveys of the highway network (both within and outside the EPZ), characteristics of each section of the highway were identified and recorded. These included unusual characteristics, such as narrow bridges, sharp curves, poor pavement, flood warning signs, inadequate delineations, etc. In addition, Section 4 (page 4-4) states that sections of roadway with adverse geometrics are characterized by lower free-flow speeds and lane capacity.

- a. Identify the location and nature of highway sections with unusual characteristics, and describe how this information was reflected in ETE calculations.
- b. Identify where the narrowest roadway sections exist within the roadway network, and describe how this was factored into the ETE calculations.

c. Section 4 (page 4-4) states that "based on empirical data collected on freeways, we have employed a value of R=0.85." Describe the empirical data that supports the value of R=0.85, including how the value was determined. In addition, explain why use of freeway data is applicable to the rural roads of the EPZ.

<u>ETE-34</u>

The text that accompanies the tables in Appendix J provides the assumptions for all 27 regions and 12 evacuation scenarios. The ETEs are presented in time required to evacuate a region of 50, 90, 95, and 100 percent of the population. The same information is included in Section 7, which also includes information on voluntary and shadow evacuations, congestion patterns, and evacuation rates. While the ETE report format is similar to that in Appendix 4 of NUREG-0654/FEMA-REP-1 (Rev. 1), it does not provide separate evacuation times for permanent residents and transients. Please explain the absence of these separate evacuation times.

<u>ETE-35</u>

In Section 5, the time tables included in Distribution No. 2 and Distribution No. 3 (on pages 5-6 and 5-7, respectively) include a NOTE, which says 'The survey data was normalized to distribute the "Don't know" response.' Please explain this note, including the process used to normalize the data.

<u>ETE-36</u>

In Section 5, the table for Distribution No. 2 (page 5-6) shows that for 65 minutes, the cumulative percent employees leaving work is 96 percent. The table also shows 93 percent for 70 minutes, which is less than the percentage of employees leaving work at 65 minutes. Please clarify whether this is an error, or if something happens at 70 minutes to affect this value.

<u>ETE-37</u>

Appendix F, Figure F-5, "School Children in Households" (page F-6), presents the distribution of school children identified by the telephone survey. The percent scale on the "y" (vertical) axis only adds up to 72 percent, rather than 100 percent. Please clarify.

<u>ETE-38</u>

Section 6, Table 6-3, "Percent of Population Groups Evacuating for Various Scenarios" (page 6-5), shows the percent of population groups evacuating for various scenarios, including the shadow population identified in Section 2.2. It does not show the voluntary evacuees, and it is not clear from the table how this group has been addressed. Please describe where those who voluntarily evacuate are included in Table 6-3.

<u>ETE-39</u>

Section 7.2 states that Figures 7-3 through 7-6 illustrate the patterns of traffic congestion that arise for the case when the entire EPZ (Region R03) is advised to evacuate during the summer, weekend, midday period under good weather conditions (Scenario 3). These figures (maps), which show congestion areas in red and the absence of

congestion in white, do not show delay times. Please provide more information on delay times.

<u>ETE-40</u>

Explain how the inbound bus speeds discussed in Section 8.4 (page 8-7) can be achieved when the buses will have to transverse traffic control points and access control points.

<u>ETE-41</u>

Section 8.4 (page 8-4) contains the statement: "In the event dispatch from the depots to the various facilities and to the bus routes is somewhat inefficient, or there is a short fall of available buses or bus drivers, there may be a need for buses to return to the EPZ from the EACs...to complete a second wave..." A similar statement is made in Section 8.4 page 8-7. The ETE does not appear to address whether there are enough buses available to evacuate all schools simultaneously. Please provide information to address this issue. (See also, ETE-13 and ETE-40.)

<u>ETE-42</u>

Figure 7-7, "Evacuation Time Estimates – Summer, Weekend, Midday, Good Weather (Scenario 3)" (page 7-18), which shows ETEs for vehicles evacuating the EPZ in Scenario R03, is similar to the format in Figure 4 of Appendix 4 to NUREG-0654/FEMA-REP-1, Rev. 1. Figure 7-7 does not, however, separate the permanent residents from the transient population. Provide additional information that separately addresses the permanent residents and the transient populations.

<u>ETE-43</u>

Section 12, "Confirmation Time," addresses the time needed to confirm that the evacuation process is effective, i.e., the public is complying with the advisory to evacuate. Please address the following questions:

- a. On page 12-1 it states that "[a]Ithough the counties within the EPZ may use their own procedures for confirmation, we suggest an alternative or complementary approach." This statement suggests that the confirmation process and times discussed in Section 12 are an alternative for other that may be specific to the counties. Discuss whether the counties have agreed with the ETE plans for confirmation of evacuation, including the existence of other county plans. If other county plans exist, discuss how they would work with the ETE plan.
- On page 12-1, it states that "[s]hould the number of telephone responses (i.e., people still at home) exceed 20 percent, then the telephone survey should be repeated after an hour's interval until the confirmation process is completed." Explain what is required if the telephone survey response is less than 20 percent, but still significant.
- c. Provide an estimate of the time needed to confirm that the evacuation is complete as discussed in Section 12 "Confirmation time".

<u>ETE-44</u>

Section 13 provides specific recommendations for actions that could be taken to significantly improve evacuation time. In regard to such recommendations, Section 1.3 (under the subsection entitled "Analytical Tools") discusses execution of the PC-DYNEV simulation model to provide a detailed description of traffic operations on the evacuation network. The ETE further states that "[t]his description enables the analyst to identify bottlenecks and to develop countermeasures that are designed to expedite the movement of vehicles." Please clarify whether this iterative approach was used; and if so, explain how it was used and reflected in the ETE.

<u>ETE-45</u>

Have State and local organizations/personnel—that are involved in emergency response and have responsibilities associated with the ETE—reviewed the entire ETE plan, including the traffic and access control plan? Provide any comments received, and discuss how those comments were resolved and reflected in the ETE document. In addition, Section 13, recommendation 7 states (in bold) that "[t]he decision makers should reference Table J-1C which lists the time needed to evacuate 95 percent of the population, when preparing recommended protective actions." What is the basis for this statement?