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**Pacific Northwest  
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## Vogtle Electric Generating Plant ETE Analysis Review

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JA Jones

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Vogtle Electric Generating Plant  
ETE Analysis Review

in support of

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“Technical Assistance for Review of the Southern Company Application for an  
Early Site Permit at the Vogtle Site”

TAC No. MD3010

**Submitted by**

**Pacific Northwest National Laboratory  
Richland, Washington**

**December 8, 2006**

## Draft Technical Evaluation Report

# Vogtle Electric Generating Plant ETE Analysis Review

### Introduction

Staff from Pacific Northwest National Laboratory (PNNL) and Sandia National Laboratory (SNL)-Albuquerque reviewed the evacuation time estimate (ETE) analysis dated April 2006 prepared by IEM for the Vogtle Electric Generating Plant (VEGP). The ETE analysis was reviewed for consistency with federal regulations using the Nuclear Regulatory Commission (NRC) guidelines in Review Standard (RS)-002, Supplement 2 and Appendix 4 to NUREG-0654, and NUREG/CR 4831. Additional sources of information referenced in the analysis and used in the review included NUREG/CR-6863 and NUREG/CR-6864.

The ETE analysis document was also reviewed for consistency with other applicable emergency planning documents as well as information provided within the early site permit (ESP) submitted to the NRC by the Southern Nuclear Operating Company (SNC). Citations within the document were verified by comparison to the cited document text. PNNL staff contacted officials with Burke County, the State of Georgia, and the local school to verify or clarify information as presented within the ETE. Information regarding who was contacted and the results of the conversations are provided below. Additional information was gathered by visiting websites of the County and State and other websites that were cited within the ETE document.

### General Comments

- The use of terminology is not consistent throughout the document (evacuation areas, protective action zones, sub-areas, areas, zones, etc.) and leads to reader confusion. Also, the terms are not consistent with the terms as stated in regulations.
- The maps generally lack sufficient detail and only Figure 1 provides a scale. The road networks on most of the maps are too faint to see.
- Information regarding characteristics of the evacuation routes is lacking.
- The basis for information relevant to the ETE analysis is not always stated within the document. Several areas lack sufficient detail regarding assumptions, thought processes, derivation of information, etc.
- The discussions of the different populations are not clear and there is no discussion of the total cumulative population assessed. It is difficult to follow how each population was considered in the analysis and modeling.

- The specific adverse weather condition used in the analysis is never identified. This is a critical piece of the analysis and must be specified.

## Errata

Section 1.2 (page 4), paragraph below table, line five should reference Appendix 5 of the VEGP Emergency Plan, not Appendix 4.

Section 3.2 (page 20), fourth paragraph, end of second line “Table 7 shows the distribution of the *permanent* . . .,” should read *transient*.

Figures 8, 9, 10 and 11 show Grays Landing outside the EPZ. Is this correct?

Section 7.2 (page 53), fourth line of paragraph, “Table 14 and shown *in* graphically Figure 22.” Should read, “Table 14 and shown graphically *in* Figure 22.”

## Data Needs or Clarifications

The following information may overlap to some degree with the information provided in the Regulations and Guidance review. The two sets of comments are not intended to be fully independent and, therefore, should be considered together.

**a) Finding:** *There is no discussion to explain why the years 2006 and 2010 were used for the analysis other than it was requested by SNC. Therefore, the analysis was completed for existing conditions (2006) and the construction phase (2010), but does not include a post-construction operational analysis. The PNNL scope of work for the ETE review states that the analyses should consider information for the “proposed duration of the permit (20 years).”*

**RAI:** *Provide the basis for selection of years 2006 and 2010 for the ETE analysis.*

**b) Finding:** *In several places throughout the document, the authors make the statement that there will be no significant change in the land-use pattern in the next four years, but give no basis for the assumption. PNNL staff spoke with the Burke County Planning Director who verified that this is an accurate statement. There are no plans for significant development of any type in the near future within the vicinity of the VEGP. The majority of growth is occurring in the northern part of the county near Augusta. The County is purposefully not encouraging growth in the VEGP vicinity in order to preserve the rural setting and encourage growth close to major population centers.*

*PNNL staff also contacted the Burke County Public Utilities Director and County Administrator to inquire about future road work that could impact an evacuation from the VEGP. Both confirmed that there are no major road improvements planned in the next five years for the area, nor are there any underground utility projects planned that could impact the roads. The last major road improvement in the area was paving Jack Delaigle Road from Highway 23 to the plant a couple of years ago. The County Administrator did comment that Highway 25 would be heavily used in case of an*

evacuation. It is currently undergoing major construction to upgrade the highway from two to four lanes throughout the county. He felt that residents would not stay at the reception centers, but would instead use Highway 25 to leave the area. Highway 25 is located approximately five miles west of the 10-mile EPZ for the plant.

**RAI:** Provide a physical description of the land uses surrounding the site, and incorporate the information provided above to substantiate the statements that no changes in land uses are anticipated.

**c) Finding:** Section 2.3, Sources of Data, states that the authors contacted “individual facilities” for information regarding population estimates, but nowhere in the document do they specify what facilities were contacted. Section 3.0 states that school data was obtained from GIS data and through contact with “individual facilities.” Again, what facilities? PNNL staff contacted the school regarding their emergency evacuation plan and was told that no one had contacted them for the ETE analysis.

**RAI:** Provide information regarding the facilities that were contacted for the analysis.

**d) Finding:** A review of aerial photographs of the general vicinity of PAZ G-10 reveals what appears to be buildings located at what would be the extension of Brown Road where it crosses railroad tracks. These buildings appear to be associated with the Cowden Plantation. The ETE states that the plantation has “no resident population.” However, the Cowden Plantation has a hunting lodge and these buildings could be associated with the hunting lodge. It is difficult to determine from the aerial photos whether or not the buildings are located within the 10-mile EPZ, but they are very close. The hunting lodge was not mentioned in the ETE. The location relevant to the EPZ should be verified. The plantation should be contacted to determine if anyone resides at the lodge all year and how many hunters/fishermen they have in each sporting season.

**RAI:** Verify the location of the lodge relative to the EPZ. Verify the transient population associated with the hunting lodge, and whether or not there is a resident population.

**e) Finding:** The estimates for the transient population are vague. In the discussion of the recreational population, no mention is made of the hunting lodge at the Cowden Plantation (see discussion above) nor is information provided for the Yuchi Wildlife Management Area (WMA). PNNL contacted the State of Georgia Department of Natural Resources (DNR) and found that during the fall deer hunting season, there could be approximately 30-40 hunters located with the WMA on any given day. The WMA also provides access to the Savannah River for fishing via two boat ramps, has a firearms range and camping facilities. The DNR also manages a boat launch at Brier Creek with parking capacity for 30 vehicles. There is trout fishing all year on the Savannah River, Brier Creek, and Big Brier Creek. Both the Aiken and Barnwell County emergency plans claim to potentially have 200 transient hunters/fishermen within their area at a given time (G-10 and H-10 respectively). The ETE provides no clear accounting of all the sportsmen, how their population numbers were derived or how they are distributed throughout the EPZ.

**RAI:** *Provide a more detailed description of how the transient population numbers were derived. Include in the discussion the specific areas taken into consideration and how this population was mapped for purposes of the analysis.*

**f) Finding:** *The discussion of special facility populations is vague and makes it hard to determine how this population was considered within the evacuation analysis. At the top of page 27, the document states that the ETE estimates “included employment from all businesses for which IEM had relevant information.” Does that mean that these facilities were included in the special facilities count? If there are other large facilities (those with 50 employees or residents, by the document’s definition) within the EPZ, what are they? This section also leads the reader to believe that the 94 temporary workers located in temporary housing would always be evacuating from home. Are they not ever at the plant? According to a conversation between PNNL staff and the school administrator, the school has its own transportation which they would use for an evacuation. They would not be evacuating by county busses as stated in the ETE. The school consists of two facilities: a daycare and a K-12 school. Between the two facilities, there are currently 55 children/students and 16 staff members. The administrator expects a growth rate of 10-15 percent in the next 4-5 years. The school population numbers are consistent with the ETE, but using their own transportation for evacuation changes the analysis.*

**RAI:** *Clarify what businesses were included in the special facilities count. Discuss the other businesses with the appropriate population (transient).*

*Clarify the discussion regarding the 94 temporary workers.*

*Clarify the discrepancy between the ETE assumption that buses will mobilize and drive to the school and the new information that the school will provide transportation.*

**g) Finding:** *Section 5.1.1 states that the alert and notification systems were evaluated based on descriptions found in the “emergency plans.” What emergency plans? The same section, page 42, states that the loading times for the school were modeled differently because they would have to await the arrival of county buses. This should be corrected based on the fact that the school will evacuate using its own transportation, likely resulting in a lower ETE for the school.*

**RAI:** *State which emergency plans were used to evaluate the alert and notification systems.*

*Clarify the expected response for the school based on the method of alert.*

**h) Finding:** *Section 6.1 states that the PAZ were assigned evacuation routes by VEGP planners. Did the counties have input on the designation of evacuation routes or did they just adopt the routes selected by VEGP planners?*

**RAI:** *Clarify the origin of the PAZ as presented in the ETE analysis.*

**i) Finding:** Section 6.2.10 discusses the evacuation of VEGP using the south route. It gives the basis for using this route (wind direction), but does not indicate the probability of this occurrence based on wind direction patterns for the area. In the 2010 scenario, the ETE indicates that the evacuation route would be overloaded due to a portion of this evacuation route being unpaved. Wouldn't the unpaved road be considered an impediment to evacuation? A specific type of adverse weather is never identified in the ETE analysis. How would torrential rain affect the condition of the unpaved road and thus the evacuation? This evacuation route scenario is glossed over in the analysis and needs more attention.

**RAI:** Information should be provided regarding the probability of using this route based on wind direction patterns, why the unpaved road is not considered an impediment and what type of impact different weather conditions would have on the unpaved road.

**j) Finding:** A review of aerial photos of the site and surrounding area reveals numerous creeks and lakes or ponds in addition to the Savannah River. Based on the presence of an abundance of surface water in the area, one could assume that the ground water is relatively shallow. This raises two points of concern that were not covered in the analysis: 1) There is no discussion regarding the presence of bridges on any of the evacuation routes. Bridges have the potential to impede traffic flow during an evacuation. 2) Are any areas within the EPZ prone to flooding during heavy rains? Are any of the evacuation routes affected by flooding? Because the adverse weather condition was never specified, it is not known if heavy rains or flooding were considered in the analysis.

**RAI:** Provide details regarding the physical characteristics of the surrounding area, including a discussion of surface water features and flood-prone areas.

*Provide locations of bridges within the evacuation routes. Discuss the potential impact of the bridges on traffic flow.*

*Describe the adverse weather condition that was used in the analysis and the reasoning behind the selection of that weather condition.*

**k) Finding:** Section 8, Conclusion. The document draws the conclusion that based on data and results of the ETE analysis the existing evacuation strategy is functional "given the lack of severe congestion or very high ETEs." Use of the VEGP south route results in overload of the route. Does that not result in severe congestion? How is the severity of congestion determined? Is it simply professional opinion or is it based on specific parameters?

**RAI:** Discuss the basis for making the determination of level of severity of congestion. This discussion should be provided in Section 6.0, Analysis of Evacuation Times.

**l) Finding:** It is difficult to follow which version of the VEGP Emergency Plan is referenced in the analysis. As noted above, page 4 referenced the incorrect Appendix to the emergency plan. On page 29 of the analysis under the discussion of the evacuation

*roadway network the authors reference Appendix 6 of the emergency plan as a source of additional information regarding the evacuation routes. Appendix 6 of the emergency plan is a brief summary of the ETE analysis.*

**RAI:** *Clarify what version of the emergency plan was used as a reference for the ETE analysis.*

## Sufficiency of VEGP Evacuation Time Estimates (ETEs) in Addressing Applicable Regulations and Guidance

### Regulations

- a) **Existing 10 CFR 52.17(b)(1)** - The application must identify physical characteristics of the proposed site, such as egress limitations from the area surrounding the site, that could pose a significant impediment to the development of emergency plans.

**Finding:** *A physical description of the site and surrounding land characteristics is not provided in the ETE analysis. There is no specific information provided as to the “physical characteristics” causing the egress problem cited in Section 6.2.1. The document does not consider the congestion “severe” even though the 2010 winter weekday, adverse weather scenario will increase the evacuation time for VEGP workers by 40%. (Section 7.1 refers to the congestion as “substantial.”) VEGP evacuation from the south route results in route “overload.” No resolution is provided to address these specific increases, although as stated in the ETE and in Burke County’s Emergency Management Radiological Plan (EMRP), traffic control points will be established and supervised by county and state emergency/law enforcement personnel.*

**RAI:** *Provide a general description of the site, surrounding land uses, and the physical characteristics causing evacuation congestion from the VEGP for both west and south routes.*

- b) **Proposed 10 CFR 52.17(b)(1)** - The site safety analysis report must identify physical characteristics of the proposed site, such as egress limitations from the area surrounding the site, that could pose a significant impediment to the development of emergency plans. If physical characteristics are identified that could pose a significant impediment to the development of emergency plans, the application must identify measures that would, when implemented, mitigate or eliminate the significant impediment. **[Reviewer’s note:** The underlined text identifies changes to the existing regulation above.]

**Finding:** *The VEGP SSAR dated August 2006 states that “there are no physical characteristics, unique to the VEGP site, which poses a significant impediment to development of the revised emergency plans for the VEGP.” However, the ETE analysis identifies two areas where traffic congestion is substantial or results in evacuation route overload. The ETE does not specify the physical characteristics causing the egress problems, other than noting that one of the south evacuation route roads is unpaved.*

**RAI:** *Identify and characterize the physical conditions causing the egress problems. Provide reasoning used in determining if these impediments to evacuation are significant.*

- c) **Section II of Appendix E to 10 CFR 50** - A nuclear power plant applicant shall perform a preliminary analysis of the time required to evacuate various sectors and distances within the plume exposure pathway EPZ for transient and permanent populations, noting major impediments to evacuation or taking of protective actions.

**Finding:** *This section is applicable to the two-step licensing process and not to the ESP process described in Part 52.*

**RAI:** *Not applicable.*

- d) **Section IV of Appendix E to 10 CFR 50** - The nuclear power plant operating license applicant shall also provide an analysis of the time required to evacuate and for taking other protective actions for various sectors and distances within the plume exposure pathway EPZ for transient and permanent populations.

**Finding:** *The portion of the above-referenced CFR that is applicable to the VEGP ETE review is the requirement of the applicant to provide an analysis of the time required to evacuate. An ETE analysis was prepared for the VEGP for years 2006 and 2010.*

**RAI:** *No additional information is required in reference to this regulation.*

## Guidance

- a) **Supplement 2 to NUREG-0654, Section II.A** - The ETE analysis should not focus on the numerical time estimates, but on the site factors that are considered to be impediments to emergency planning and preparedness. The reasons should be given for ETEs that appear unduly high.

**Finding:** *There is no specific discussion regarding impediments to emergency planning and preparedness.*

*The document does not consider the congestion at the VEGP identified in Section 6.2.1 “severe” even though the 2010 winter weekday, adverse weather scenario will increase the evacuation time for VEGP workers by 40%. Section 7.1 refers to this congestion as “substantial.” Evacuation from the south route in 2010 results in an “overload” of the route. This is evidently due to the fact that a portion of this route is unpaved. There is no discussion as to how the determination is made regarding the severity of congestion.*

**RAI:** *State the parameters used to make the determination regarding the severity of congestion. Clarify why the unpaved road used for the plant’s south evacuation route is not considered an impediment. Discuss the impacts adverse weather conditions, such as torrential rain, would have on the usability of the unpaved road.*

**Introduction (Section I of Appendix 4 to NUREG-0654)** - This section of the report (the assessment study) should make the reader aware of the general location of the nuclear power plant and plume exposure pathway emergency planning zone, and generally discuss how the analysis was done.

- b) **Section I.A of Appendix 4 to NUREG-0654, “Site Location and Emergency Planning Zone”** - A vicinity map showing the plant location shall be provided along with a detailed map of the plume exposure pathway emergency planning zone (EPZ). The map shall be legible and identify transportation networks, topographical features and political boundaries.

**NRC finding:** *Figure 1 provides a map showing the general location of the VEGP in Georgia in relation to the five surrounding states. Figure 2 provides a map depicting the EPZ boundary and associated protective action zones. In this figure, the transportation networks are hard to see and are not identified. The Savannah River is the only topographical feature identified. Counties are identified, although the two states (Georgia and South Carolina) are not. The Town of Girard is not identified.*

**RAI:** *Replace Figure 2 with a map that includes the EPZ and associated PAZs, a clear depiction of the transportation networks with identification, significant waterways (large creeks, lakes, etc.), identification of the states, and the Town of Girard.*

- c) **Section I.B of Appendix 4 to NUREG-0654, “General Assumptions”** - All assumptions used in the analysis shall be provided. The assumptions shall include

such things as automobile occupancy factors, method of determining roadway capacities, and method of estimating populations.

**NRC finding:** *Assumptions generally appear consistent with ETE preparation guidelines, emergency evacuation studies, and transportation data.*

**RAI:** *Areas in which the assumptions were not clear or were lacking bases are discussed below in their specific sections.*

**d) Section I.C of Appendix 4 to NUREG-0654, "Methodology"** - A description of the method of analyzing the evacuation times shall be provided. If computer models are used, a general description of the algorithm shall be provided along with a source for obtaining further information or documentation.

**NRC finding:** *Section 2.2 gives a brief description of the computer simulation model used to perform the ETEs (PTV Vision VISUM). A footnote provides a website ([www.ptvamerica.com](http://www.ptvamerica.com)) for additional information on the model. Section 5.2 provides more detailed information regarding how the model uses data to project the ETEs.*

*The VISUM model was developed in Germany and has been used widely in the United States for various applications. Appendix D of the ETE provides a list of transportation departments throughout the United States that have licensed the software. However, it is not possible to determine what aspects of the model are licensed to these agencies and for which applications they are being used.*

*The VISUM model is primarily a transportation management and planning model that is also used for evacuation-time estimating. NUREG/CR-6863 states that the selection of the model used to calculate the ETE depends on the complexity of the EPZ. Although the Vogtle site is not a complex ETE, the underlying algorithms for VISUM have not been provided or discussed. In reviewing literature received from a VISUM distributor, VISUM utilizes TRAFFIX, which calculates level of service at signalized and unsignalized intersections and on arterials using the 2000 Highway Capacity Manual (HCM) or one of the other 17 customizable methods supported. Section 2.3, Methodology, states that the roadway and intersection capacities were calculated using the HCM. Was this performed separately or was the HCM option in VISUM selected for this application?*

*VISUM appears to be an adequate model for use on the Vogtle ETE. However, a general description of the underlying algorithms used in the model is necessary to validate the use of the model.*

**RAI:** *Provide the underlying algorithms used in the model.*

*Clarify how the HCM was used to support the evacuation analyses.*

*Clarify whether VISUM used the HCM application available in the TRAFFIX component of the model.*

**Demand Estimation (Section II of Appendix 4 to NUREG-0654)** - The objective of this section is to provide an estimate of the number of people to be evacuated. Three potential population segments shall be considered: permanent residents, transients, and persons in special facilities. "Permanent residents" includes all people having a residence in the area, but not in institutions. Transients shall include tourists, employees not residing in the area, or other groups that may visit the area. Special facility residents include those confined to institutions such as hospitals and nursing homes. The school population shall be evaluated in the special facility segment. Care should be taken to avoid double counting.

- e) **Section II.A of Appendix 4 to NUREG-0654, "Permanent Residents"** - The number of permanent residents shall be estimated using the U.S. Census data or other reliable data, adjusted as necessary, for growth [See EC 43-2]. This population data shall then be translated into two subgroups: those using autos and those without autos. The number of vehicles used by permanent residents is estimated using an appropriate auto occupancy factor. A range of two to three persons per vehicle would probably be reasonable in most cases.

An alternative approach is to calculate the number of vehicles based on the number of households that own vehicles, assuming one vehicle per household is used in evacuation. Regardless of the approach used, special attention must be given to those households not having automobiles. The public transport-dependent population must, therefore, be considered as a special case.

**NRC finding:** *Permanent resident population data was obtained from Synergos Technologies. Synergos creates population statistics using a methodology that starts with ZIP+4 information and then incorporates U.S. Census Bureau data from local to regional information (block group, tract, County, and State). The information is updated quarterly. The SSAR (submitted with the ESP application) population estimates are based on 1980 and 2000 census data. There is a 155-person difference between the 2010 estimates in the ETE and the SSAR. Though this represents just a 3.9% variance, the numbers in some of the sectors differ by as much as 74% (see Attachment A). Large differences in population by sector can have an impact on loading of the different evacuation routes and change the ETEs. Even if these sectors were not actually used in the ETE model, which is not made clear, it is a discrepancy that should be addressed.*

*Section 3.1.1, Auto-Owning Residents. It was assumed that one vehicle would evacuate from each permanent resident household. Based on population projections and estimates, 92% of the households within the EPZ have at least one vehicle per household. A vehicle occupancy rate of 3.0 was used. It is unclear exactly which population projections and estimates were used to determine vehicle ownership or how that information was used to make the determination of 92% ownership and 8% non-ownership.*

*Section 3.1.2, Non-Auto-Owning Residents. "The population projections and estimates indicate that 8% of the households within the EPZ do not own a vehicle." It is assumed this population will evacuate with friends or relatives or be evacuated through*

*coordinated efforts by state and county emergency management officials. No data is provided on state and county emergency resources (i.e., personnel and vehicles) required to evacuate this population group. No information is provided on the time required to mobilize the state and county resources to evacuate this population group.*

**RAI:** *Describe how the population sectors relate to the evacuation areas. Review discrepancies between the SSAR and ETE with sector population numbers and determine if the differences would impact the ETE analysis.*

*Explain which population projections and estimates were used to determine vehicle ownership and how that information was used to make the determination of 92% ownership, 8% non-ownership.*

*Provide information regarding the State and local resources that will be used to evacuate non-auto-owning residents. Specify the time required to mobilize these resources.*

- f) Section II.B of Appendix 4 to NUREG-0654, “Transient Populations”** - Estimates of transient populations shall be developed using local data such as peak tourist volumes and employment data for large factories. Automobile occupancy factors would vary for different transient groups. Tourists might have automobile occupancy factors in the range of three to four, while a factory would probably have a factor of less than 1.5 persons per vehicle. This population segment, along with the permanent population subgroup using automobiles, constitute the general population group for which an evacuation time estimate shall be made.

**NRC finding:** *The ETE derives the transient population number from “a combination of daytime populations, recreation populations, and employment data.” “The daytime populations incorporate employment and workforce information, such as county working-age population and unemployment statistics.” The recreational population (hunting/fishing) was estimated “through conversations with the SNC emergency planning staff.” The ETE states there are three public boat landings within the EPZ (though Figures 8-11 show Grays Landing as outside the EPZ). A vehicle occupancy rate of 1.0 was used for the transient population.*

*There is no source listed for the employment data (perhaps from Synergos?). Without knowing the source and specificity of the data, it is difficult to ascertain if the workforce population is accurately represented as mapped. Section 3.3 (Special Facilities) of the ETE mentions inclusion of employment data. Discussions in the transient and special facilities populations sections both include information regarding workforce populations. Was the employment data used for transient or special facility population estimates?*

*The Burke County EMRP plan shows four (public and private) boat launches within the EPZ, as opposed to three, and associates 200 transients with these boat launches. Figures in the VEGP emergency plan dated August 2006 show six boat launches within the EPZ. The Aiken and Barnwell emergency plans claim to potentially have 200 transient sportsmen in each of their areas (consistent with what is presented in the ETE).*

None of the documents specify how these population numbers were derived. With the exception of zones G-10 and H-10, it is not clear the total number of sportsmen or their distribution within the EPZ. There is no mention of the Cowden Plantation hunting lodge nor the Yuchi WMA. Comparing the boat launches in the ETE, the emergency plan and the County plan, the names and location of the boat launches do not all match. Using consistent terminology among all emergency planning documents is critical for clear communication during an emergency. What accounts for the two-person change in sectors NW and WSW between 2006 and 2010? It is not significant, but it is there.

No basis was given for the 1.0-person vehicle-occupancy rate.

**RAI:** Provide information regarding the source of employment data and how the data was used in the analysis, including assignment of the employment numbers to sectors. Specify how employment data was used in the actual analysis.

Reconcile the locations and names of boat launches. Specify how the number of sportsmen was determined and ensure that the ETE provides an accurate portrayal of this population.

Provide the basis for the vehicle occupancy rate of 1.0 for the transient population.

**g) Section II.C of Appendix 4 to NUREG-0654, “Special Facility Population”** - An estimate for this special population group shall usually be done on an institution-by-institution basis. The means of transportation are also highly individualized, and shall be described. Schools shall be included in this segment.

**NRC finding:** The ETE identifies two special facilities within the EPZ (VEGP and the Lord’s House of Praise Christian School) but the “modeled population for the ETE estimates were not limited to these large facilities only. It included employment from all businesses for which IEM had relevant information.” The ETE classifies special facilities as “employers, schools, or other facilities with more than 50 employees or residents.” What is the origin of this classification? For which other businesses was information obtained and what are the employee numbers? Were they included in the transient count or in the special facility count? If they were considered in the special facility count, they are not represented in Table 8 or Figure 12.

The 2006 employee population for VEGP is never stated, though it can be extrapolated from Table 8 and is listed in Figure 12 for year 2010. Based on Table 8, one must assume the VEGP population remains the same with the exception of the addition of construction workers (after doing a little math). The VEGP workforce (non-construction) should be discussed in the text.

The ETE makes the distinction of the 94 temporary workers living within the EPZ, but they are not listed in Table 8 as part of the special facility population. Were they included in the ETE analysis as part of the special facility population? Will there not be times when some of the 94 are at VEGP rather than their temporary home? What is their vehicle occupancy rate from “home”?

*According to the ETE analysis, the school consists of approximately 50 students and 20 teachers and staff. Students are assumed to evacuate via two buses, with the remaining school population evacuating in their own cars with an occupancy rate of 1.0. PNNL staff contacted the school director and was told that the school has its own transportation and, in the case of a “catastrophic event,” the school would evacuate the students using school transportation. The director also stated that the school has its own emergency evacuation plan. Did anyone contact the school during the VEGP planning process? The Burke County EMRP does not even recognize the school's existence – it states there are no schools within the 10-mile radius.*

**RAI:** *Provide information regarding the origin of the document’s definition of special facilities.*

*Provide information (name of business, number of employees, location) for the other businesses for which data was obtained and explain how this information was used in the analysis.*

*Provide within the text information for the VEGP employee population for both 2006 and 2010 and assumptions relevant to future employee projections.*

*Clarify the above-stated issues regarding the 94 temporary workers.*

*Provide modeling information or results for evacuation of the school based on the assumption that the school will use its own vehicles for transportation.*

**h) Section II.D of Appendix 4 to NUREG-0654, “Emergency Planning Zone and Sub-Areas”** - The sub-areas, for which evacuation time estimates are required, must encompass the entire area within the plume exposure emergency planning zone (EPZ). Additionally, evacuation time estimates are also required for simultaneous evacuation of the entire plume exposure pathway. The areas to be considered are (approximate radius/area): two miles/four 90 degree sectors, five miles/four 90 degree sectors, 10 miles (EPZ)/four 90 degree sectors, and 10 miles (EPZ)/entire EPZ.

**NRC finding:** *As depicted in maps, the PAZs do not encompass the entire EPZ. There are sections along the 10-mile ring that are not included in any PAZ, yet many of these sections appear to have road networks within them.*

*Section 1.2 of the ETE describes the EPZ and its sub-areas and protective action zones (PAZ). “Based on the geography and political boundaries in the EPZ, one 0-2 mile area, two 0-5 mile areas, and four 0-10 mile areas are defined as sub-areas within the EPZ.”*

**RAI:** *Explain why some areas within the EPZ are not included in a PAZ.*

**i) Section II.D of Appendix 4 to NUREG-0654, “Emergency Planning Zone and Sub-Areas”** - When making estimates for the outer sectors, assume that the inner adjacent sectors are being evacuated simultaneously. The boundaries of the sub-

areas shall be based upon the same factors as the EPZ; i.e., demography, topography, land characteristics, access routes, and local jurisdictions. To the extent practical, the sector boundaries shall not divide densely populated areas. Where meteorological conditions such as dominant wind directions warrant special consideration, an additional sub-area may need to be defined and a separate estimate made for this case. The EPZ and its sub-areas shall be identified by mapping on U.S. Geological Survey (USGS) 7½-minute series quadrant maps, when available. Special facilities shall also be noted on these maps, to the extent that their locations can be geographically specified. Populations shall be provided by evacuation areas specified in planning element J.10.b. **[Reviewer's note:** See NUREG-0654/ template item II.J.10.b.]. For purposes of determining evacuation times, it may also be useful to summarize population data by sector and distance from the plant. **[Reviewer's note:** Figure 1 in App. 4 of NUREG-0654 is an example of such a summary.] Separate totals shall be provided for the three population segments. **[Reviewer's note:** Figure 2 in App. 4 of NUREG-0654 shows the population totals, translated into the number of vehicles estimated to be used in evacuation.]

**NRC finding:** *There is no specific statement that the inner adjacent sectors would evacuate simultaneously with the outer sectors. However, text within the discussion of results leads to the conclusion that it was assumed in the analysis.*

*The sub-areas are further divided by political boundaries and physical features into 13 PAZs, consistent with the VEGP EP, 2006 public outreach calendar, and the Burke County EMRP. ETEs for these areas, as well as the entire EPZ, are provided in Table 11 and discussed in Section 6.2.*

*The majority of scenarios analyzed in the document are based on a wind direction of 325° range between 55° to 20°. An alternative south route evacuation for VEGP would be implemented if the wind direction were within the remaining 35° range from 20° to 55°. There are no maps within the document specifically related to the differing wind-direction scenarios.*

*There is no map that depicts the sub-areas, though they are described in Table 2. Since these sub-areas (called evacuation areas within the ETE) were used for the analysis, they should be depicted on a map. The special facilities are located on a separate map which also includes the PAZs, but not sub-areas. There are no roads identified on this map. Therefore, the facilities are identified only as to their approximate physical location relative to VEGP.*

*Populations by sector (each 22.5°) are depicted in Figures 4, 5, 8, and 9. Information is provided separately for permanent and transient populations for the years 2006 and 2010 (not provided by sector for special facilities). Figures 6, 7, 10, and 11 present population numbers by PAZ for permanent and transient populations for the years 2006 and 2010. Figure 12 presents population numbers for special facilities for the year 2010. The population by sector figures all include a table providing population totals by ring miles and the cumulative population.*

**RAI:** *Provide a map depicting wind directions as applicable to the analysis.*

*Provide a map that depicts the sub-areas. The sub-areas could be incorporated into Figure 2.*

*Figure 12 should include the sub-areas.*

- j) **Section III. of Appendix 4 to NUREG-0654, "Traffic Capacity"** - This section of the report shall show the facilities to be used in evacuation. It shall include their location, types, and capacities. A complete review shall be made of the road network. Analyses shall be made of travel times and potential locations for serious congestion in potential corridors. The analyses may be simplified in extreme rural areas. The entire road network shall be used. Local routes shall be carefully selected and analyzed to minimize their impact on the major routes, should queuing or cross-traffic conflicts occur. Care should be taken to avoid depending only on high-capacity interstate and similar type routes, because of limitations of on-ramp capacities. Alternately, special traffic management plans may be developed to effectively utilize available capacity. Evacuation shall be based on general radial dispersion.

**NRC finding:** Evacuation Facilities - *The addresses and associated evacuation routes of the three reception centers are presented in Table 9 and their locations are shown in Figure 13. Each facility is identified as a high school in the table. There is no information presented as to each facility's capacity nor distance outside of the EPZ other than "well beyond the 10-mile EPZ."*

Road Network - *The evacuation road network is discussed in Sections 4.0-4.3 of the ETE analysis. IEM uses the same evacuation routes as previously established by VEGP and local emergency planning agencies. The document states that IEM drove the evacuation routes to ensure the accuracy of information regarding the physical state of the roads. Differences between information in the calendar, NAVTEQ data, and existing field conditions were noted and incorporated into the analyses as appropriate. The document does not provide specific travel times listed by corridor nor were there any observations made as to potential locations for serious congestion. (Note: the analysis revealed "substantial" congestion evacuating VEGP for year 2010 and route "overload" for the south VEGP evacuation route.) Results of the ETE analysis were presented by PAZs and evacuation areas.*

*Of all the field information reportedly collected during the test driving of the evacuation routes, very little of it is presented in the document. Appendix C provides information for evacuation roads, including the number of links, length, number of lanes, speed limit, and type (evacuation or connector). Information was not provided regarding pavement width, road constraints, shoulder type/width, bridge locations, intersection lane channelization, intersection queuing capacities, specific location of traffic signals and control, location of stop signs, turns, surrounding land use patterns, and changes in highway geometry.*

Traffic Management Plan - Section 7.2 lists traffic control points (TCPs) as described in Burke and Aiken Counties' EMRPs, and Allendale and Barnwell Counties' RERPs. The TCPs are designed to "efficiently promote smooth movement of traffic flow during an evacuation." The TCPs are listed in Tables 13 and 14 and shown in Figure 22. The States' and Counties' emergency management and law enforcement agency personnel will be responsible for supervising the TCPs.

Radial Dispersion - Section 4.1 states, "The evacuation routes were originally developed to permit a general radial travel pattern away from the plant toward the designated reception center."

**RAI:** Provide information regarding each of the evacuation facilities including name, location, type of facility, and capacities. Provide the distance each facility is located outside of the EPZ.

Provide a physical description of congestion areas as relative to the cause of the congestion.

Provide information for evacuation roads including pavement width, road constraints, shoulder type/width, bridge locations, etc., as described above. This information can be incorporated into a table [see NRC finding (l) and RAI, below].

**k) Section III.A of Appendix 4 to NUREG-0654, "Evacuation Roadway Network"** - A map showing only those roads used as primary evacuation routes shall be provided. [Reviewer's note: Figure 3 in App. 4 of NUREG-0654 is an example.] The map need not show local access streets necessary to get to the evacuation routes. Each segment of the network shall be numbered in some manner for reference. The sector and quadrant boundaries shall also be indicated. [Reviewer's note: See template items II.J.10.a and b.]

**NRC finding:** A map of the VEGP evacuation network is provided in Figure 13. However, segments of the network are not numbered and not all of the roads are identified. Sectors are not identified, although the 2-, 5-, and 10-mile rings are shown.

**RAI:** Replace Figure 13 with a map that includes identification of all evacuation roads, numbered segments, and sectors. This will likely require a larger-scale map than the one provided.

**l) Section III.B of Appendix 4 to NUREG-0654, "Roadway Segment Characteristics"** - A table shall be provided indicating all the evacuation route segments and their characteristics, including capacity [see Table 1 in App. 4 of NUREG-0654]. The characteristics of a segment shall be given for the narrowest section (or bottleneck) if the roadway is not uniform in the number of lanes throughout the segment.

**NRC finding:** Appendix C provides a table of information for evacuation roads, including the number of links, length, number of lanes, speed limit, and type (evacuation

or connector). The table does not include information regarding the capacity of each roadway segment nor is the information provided in text. It is not stated if the information is provided for the narrowest section of each roadway or if the road is uniform.

According to Table 1 in Appendix 4 of NUREG-0654, the number of lanes should represent the "total number of through lanes in both directions." The table in Appendix C of the ETE appears to present the lane numbers for one direction only. The "type" of roadway should be stated as freeways and expressways, urban streets, or rural highways. Special conditions that may affect roadway capacity should be noted.

**RAI:** Revise the table in Appendix C to include information regarding the capacity of each roadway segment, as well as roadway characteristics described above in NRC Finding (j) - Road Network. Specify if the information provided is for the narrowest section of each roadway. Correct the "number of lanes" to read "the total of through lanes in both directions." Specify the type of roadway consistent with terminology provided in NUREG-0654. Note special conditions with the potential to affect roadway capacity.

**m) Section IV.A of Appendix 4 to NUREG-0654, "Reporting Format" - [Reviewer's note:** Table 2 in App. 4 of NUREG-0654 shows the desired format for presenting the data and results for each type of evacuation. Each of the evacuation time components is presented along with the total evacuation time. Two conditions—normal and adverse—are considered in the analyses. Adverse conditions would depend on the characteristics of a specific site and could include flooding, snow, ice, fog, or rain.] The adverse weather frequency used in this [ETE] analysis shall be identified, and shall be severe enough to define the sensitivity of the analysis to the selected events. These conditions will affect both travel times and capacity. More than one adverse condition may need to be considered. That is, a northern site with a high summer tourist population should consider rain, flooding, or fog as the adverse condition, as well as snow with winter population estimates.

**NRC finding:** Table 11, "ETEs in minutes," presents results of the analysis according to evacuation area and PAZs impacted. Evacuation times are presented for the years 2006 and 2010, and are analyzed according to day, night, and weekend time periods, and fair and adverse weather conditions per evacuation area.

Table 11 does not present the information as depicted in Table 2 of Appendix 4, with the exception of segregating the data by 2-, 5-, and 10-mile radii and providing data for normal and adverse weather conditions. Results are not differentiated by population group (permanent/transient). Table 11 does not present information regarding evacuation capacity.

The characteristics for the "adverse" weather are never specified. Since the adverse weather conditions are not specified, no adverse weather frequency is identified. Would the adverse weather condition be different in spring or summer as compared to the fall and winter scenario used in the analysis?

**RAI:** *Provide specific information regarding the type of adverse weather condition that was used in the scenarios. Discuss the weather condition's characteristics and how its severity relates to the sensitivity of the analysis. Provide the frequency of the adverse weather as used in the ETE.*

- n) **Section IV.A of Appendix 4 to NUREG-0654, "Reporting Format"** - The text accompanying the table shall clearly indicate the critical assumptions that underlie the time estimates; e.g., day vs. night, workday vs. weekend, peak transient vs. off-peak transient, and evacuation on adjacent sectors vs. non-evacuation. The relative significance of alternative assumptions shall be addressed; especially with regard to time-dependent traffic loading of the segments of the evacuation roadway network. Some modifications of the reporting format may be appropriate, depending on local circumstances.

**NRC finding:** *Section 2.1 identifies the speed limit reduction and road capacity reduction factors which appear to be reasonable for most adverse weather. However, the type of adverse weather (i.e., ice storms, severe rain, etc.) is not mentioned and, thus, the reduction capacities cannot be verified.*

*The ETE includes development of time estimates for winter weekday, winter weeknight, and fall weekend scenarios. There is no discussion on the basis for not assessing a summer scenario when children are not in school which may present some unique considerations.*

*Section 2.4, the winter weekday scenario, states that residents will evacuate from their place of residence. This assumption does not capture the working public who will likely be at work and return home to evacuate as a family unit or those members of the public who are not at home (maybe shopping, etc.) at the time of the warning. Additional information on trip generation times required to get from work to home should be considered. Evacuating as a family unit is assumed in the fifth assumption in Section 2.1.*

*An estimate is necessary for the number of households that have one vehicle that may be at work and would need to return home to evacuate as a family unit. This will affect the total evacuation time estimate.*

*For the winter weekday scenario, it is assumed that school is in session. There is no discussion on the number of students living within the EPZ and whether these students attend school outside of the EPZ. There are 50 students identified for the Lord's House of Praise Christian School, but no discussion on whether these students live within the EPZ.*

*More information is necessary to assess the ETE for the winter weekday scenario where school is in session, people are at work or out of the house, and may need to return home to pack up, secure the home, and then evacuate.*

*It is difficult to discern if the total population, including residents, special facilities, transients, and the construction crew, was all analyzed in total. There is no table referencing the total population assessed, and no related table that identifies the total number of vehicles required for the population.*

**RAI:** *Specify the type of adverse weather so that reduction capacities can be verified. Provide an explanation as to why this specific weather condition was selected.*

*Explain why a summer scenario was not included in the analysis.*

*Provide additional information regarding trip generation time for people at work to go home and evacuate as a family unit.*

*Provide an estimate of the number of households having one vehicle.*

*Provide information on the number of students who reside within the EPZ and whether or not they attend school within the EPZ.*

*Information on the trip generation time is necessary to assess the ETE for the winter weekday scenario where school is in session, people are at work or out of the house, and may need to return home to pack up, secure the home, and then evacuate.*

*Provide a table that references the total population assessed in the ETE.*

*Provide data on the total number of vehicles that are modeled for the ETE.*

- o) Section IV.B of Appendix 4 to NUREG-0654, "Methodology"** - The method for computing total evacuation time shall be specified. Two approaches are acceptable. The simplest approach is to assume that events are sequential. For example, all persons are warned and prepared to leave before anyone starts moving. The time is estimated by simply adding the maximum time for each component. This approach tends to over-estimate the evacuation time. The second approach, which is more complex, is to combine the distribution functions for the various evacuation time components. This second approach may result in reduced time estimates due to more realistic assumptions. The added complexity of analysis, therefore, may be warranted at sites with long evacuation times. When distribution functions are used, estimates are made of the likelihood that each stage in an evacuation sequence will be accomplished within a given period of time. These conditional probabilities depend upon completion of the preceding stage. For example, formulation of family units (or other evacuation groups) do not commence until notification is received. Some of these distribution functions must be based on the judgment of the estimators. Computation of the joint distribution functions of evacuation times are made. Typically, the joint distribution assumes the form of an S-shape curve [see Figure 4 in App. 4 of NUREG-0654]. The evacuation time function is fairly smooth for large homogeneous population segments, such as the general public. Special

facilities, such as hospitals and industrial centers, produce less smooth functions, or discontinuous ones. The assessment of evacuation time may be easily updated should further analyses be conducted, assumptions changed, or new plans developed.

**NRC finding:** *Section 5.2 discusses the evacuation simulation and the modeling components. It is stated that capacity calculations are based on the Transportation Research Board's Highway Capacity Manual.*

*The VISUM model was developed in Germany and has been used widely in the United States for various applications. Appendix D of the ETE provides a list of transportation departments throughout the United States that have licensed the model. However, it is not possible to determine what aspects of the model are licensed to these agencies and for which applications they are being used.*

*The VISUM model is primarily a transportation management and planning model that is also used for evacuation time estimating. NUREG/CR-6863 states that the selection of the model used to calculate the ETE depends on the complexity of the EPZ. NUREG/CR-6863 also states that the selection of parameters and their sensitivity should be discussed in the ETE. There is no data on the parameters selected or their sensitivity. VISUM appears to be an adequate model for use on the Vogtle ETE. However, some discussion should be provided on the underlying algorithms used in the model as well as the parameters used in the calculations.*

**RAI:** *Provide a discussion on the underlying algorithms used in the model as well as the parameters used in the calculations and the sensitivity of the parameters.*

**p) Section IV.B of Appendix 4 to NUREG-0654, "Methodology"** - When distributions are used, distribution functions for notification of the various categories of the evacuee population shall be developed. The distribution functions for the action stages after notification predict what fraction of the population will complete a particular action within a given span of time. There are separate distributions for auto-owning households, school populations, and transit-dependent populations. These distribution functions can be constructed in a variety of ways, depending greatly on the kinds of data available for the actual site being studied. The previously developed conditional distributions are combined to develop the time distributions for the various population segments departing their home or other facility, from which they are being evacuated. For example, for the auto-owning population segment, these vehicles are then loaded onto the roadway network, in order to compute travel times and delays.

**NRC finding:** *For this low-population rural EPZ, separate distribution functions for auto-owning households, school populations, and transit-dependent populations are not necessary. The ETE uses general distribution functions for warning times and mobilization times for the public obtained from Rogers et al., ORNL-6615, which are adequate for this rural EPZ for most of the scenarios.*

*The evacuation times for these population groups are calculated and included in the total ETEs provided.*

**RAI:** *See NRC Finding (n) above, for comments on the winter weekday scenario. See NRC Finding (r) below, for comments on the transit-dependent population.*

**q) Section IV.B of Appendix 4 to NUREG-0654, "Methodology"** - Regardless of the means by which the time and amount of traffic to be loaded on the network is determined (i.e., sequentially or using distribution functions), it is necessary to calculate the on-road travel and delay times. In this step, traffic from each sector is assigned to available evacuation routes, and, if assigned volumes exceed capacity, delay times must be calculated using a queuing analysis. Traffic queue (backup) locations and estimated delay times should be indicated on the area map.

**NRC finding:** *Section 5.2.1 discusses vehicle demand, but does not mention if the roadways are assumed to have vehicles on them when the evacuation begins. What input value was used for the "background traffic" when calculating the ETE? Background traffic refers to vehicular traffic within the network that is not included in the traffic demand from the evacuating EPZ. Traffic congestion (backup) was identified for the VEGP in two scenarios, but neither point of congestion was indicated on a map.*

**RAI:** *Provide the input value used for the background traffic in the ETE analysis.*

*Provide a map that depicts the two points of congestion (backup) identified by the ETE analysis. Include an estimate of delay times.*

**r) Section IV.B of Appendix 4 to NUREG-0654, "Methodology"** - An estimate of the time required to evacuate that segment of the non-car-owning population, which is dependent upon public transport, shall be made in a similar manner to that used for the auto-owning population. This estimate shall include consideration of any special services that might be initiated to serve this population subgroup. Such services might include fixed-route departures from designated assembly points.

**NRC finding:** *No specific ETE is provided for the non-car-owning population. Since they share a vehicle occupancy rate with the car-owning population, it is assumed the evacuation time for the permanent resident population represents both groups, but the text does not state that assumption.*

*The Burke County EMRP states that County school buses will be available for those lacking personal transportation. The County EMRP also makes provisions for handicapped/non-ambulatory persons requiring special modes of transportation. This population is not discussed in the ETE. The County maintains a roster of individuals living within the EPZ and information on special needs persons. Section 3.1.2 of the ETE states that 8% of households within the EPZ do not own a vehicle. What is the basis for the 8% estimate? What is the number of people that is associated with the 8% of households? What is the time required to mobilize the State and County emergency resources required to evacuate this population group?*

*Attachment H of the Burke County EMRP states that special vehicles will be dispatched to the homes of handicapped individuals. No data is provided on the number of these individuals nor on the time required to mobilize these resources and evacuate the individuals. No data is provided to determine if enough vehicles are available such that this evacuation could be conducted in one trip or if specialized vehicles require return trips.*

**RAI:** *Clarify the ETE for the non-car-owning population.*

*Provide the basis for the 8% non-car-owning households. Specify the number of people associated with the 8% value.*

*Specify the time required to mobilize the State and County emergency resources required to evacuate the non-car-owning population.*

*Provide data on the number of non-ambulatory individuals requiring special transportation and the time required to mobilize emergency resources and evacuate the individuals. Determine how many trips would be required to evacuate the non-ambulatory population.*

**s) Section IV.B of Appendix 4 to NUREG-0654, "Methodology"** - Estimates for special facilities shall be made with consideration for the means of mobilization of equipment and manpower to aid in evacuation. This would include the need for designated persons to delay their evacuation, in order to shut down industrial facilities. Each special facility shall be treated on an individual basis. Weather conditions and time of day conditions shall be considered. Consideration shall be given to the impact of peak populations, including behavioral aspects.

**NRC finding:** *Evacuation times for the two special facilities (VEGP and Lord's House of Praise school) are discussed in Section 6.2 of the document. VEGP ETEs are discussed in each of the evacuation scenarios because the plant is located within the center of the 10-mile radius and, therefore, will evacuate under all scenarios. ETEs for the two facilities are not presented individually. ETEs for VEGP include other populations living and working within the 2-mile radius. There is no discussion regarding persons delaying their evacuation to "shut down" or otherwise stabilize the VEGP.*

*Regarding the Christian school, the assumption was made that the student evacuation would require the use of County buses and that they would have to wait 40 minutes for the buses to arrive and be loaded. The teachers would leave in their own vehicles once the buses depart. Because of the delay in evacuation, the school's loading times were modeled differently (Section 5.1.1). In Section 6.2.6, the document states "the school is located just inside the 10-mile boundary, so its evacuees reached the EPZ boundary before some of those from other areas, which had no impact on the ETEs." PNNL staff called the school director and was told that the school has its own transportation and in the case of a "catastrophic event," the school would evacuate the students using school transportation. The director also stated that the school has its own emergency evacuation plan. Did anyone contact the school during the VEGP planning process?*

*The Burke County EMRP does not even recognize the school's existence – it states there are no schools within the 10-mile radius.*

**RAI:** *Provide modeling information or results for evacuation of the school based on the assumption that the school will use its own vehicles for transportation.*

*Clarify how the evacuation time for the special facilities relates to the total evacuation time.*

- t) Section IV.B of Appendix 4 to NUREG-0654, "Methodology"** - All of the results shall be reported in the format previously indicated. This format summarizes the maximum times for each component and for each sector. The components may, or may not, be directly additive, based on the methodology used (and stated) in the report. Where distribution functions are used, the percentage of the population as a function of time should be reported [see Figure 4 in App. 4 of NUREG-0654].

**NRC finding:** *ETEs as reported represent the maximum times to evacuate under each scenario by PAZ and evacuation area. The components (in this case, evacuation zones) are additive because they all include PAZ 2 (0-2 mile) and other PAZs as they move outward. The exceptions are evacuation zones 10-mile 90 north and 10-mile 90 east, which include just one PAZ each (G-10 and H-10). ETEs are not listed according to sector. The ETEs are listed by the sectors (areas) listed in Table 2 of the ETE. However, there is no map that relates this to the EPZ. There is no map that depicts the evacuation areas identified in Table 2 of the ETE.*

**RAI:** *Provide ETEs by sector as identified in Table 2.*

- u) Section V. of Appendix 4 to NUREG-0654, "Other Requirements"** - The time required for confirmation of evacuation shall be estimated. Candidate methods include visual confirmation by aircraft or ground vehicles, and telephone confirmation.

**NRC finding:** *Confirmation of evacuation is discussed in Section 7.1. The document assumes that the confirmation process will be completed concurrently with the evacuation process for the year 2006 analysis. However, due to "substantial" congestion in 2010, it is recommended that confirmation be conducted after the evacuation is complete. As stated in the ETE, the Burke County EMRP states that the "Burke County Sheriffs Department and supporting law enforcement agency personnel" will travel the roadways and use boats along the river and its tributaries in order to ensure that all affected populations have evacuated. There is no time estimate for confirmation. Section 7.1 states that the actual time for confirmation would be dependent on personnel and equipment available at the time and that the resources "may change significantly" under various conditions.*

*Though the document indicates that Burke County will be responsible for confirming evacuation, the Burke County EMRP states that "officials from Plant Vogtle will advise*

*Burke County EOC when evacuation is confirmed at the plant site.” Therefore, VEGP is responsible for confirming evacuation of the plant itself.*

**RAI:** *Provide a general time estimate for confirmation of evacuation.*

*Provide a statement that the VEGP is responsible for confirmation of plant evacuation and how VEGP will notify the County.*

- v) Section V. of Appendix 4 to NUREG-0654, “Other Requirements”** - Specific recommendations for actions that could be taken to significantly improve evacuation time shall be given. Where significant costs may be involved, preliminary estimates of the cost of implementing these recommendations shall be given.

**NRC finding:** *Traffic control points and access control points will be established to facilitate traffic flow and provide feedback regarding evacuation progress. Suggestions are provided to aid with the confirmation of evacuation and thus reduce the overall evacuation time. Those suggestions include having residents leave signs on their doors or windows to indicate they have evacuated, having residents check in at designated reception centers, and telephoning people at their homes to ensure evacuation (though the document did not specify who would be responsible for placing the telephone calls).*

**RAI:** *No additional information is requested at this time.*

- w) Section V. of Appendix 4 to NUREG-0654, “Other Requirements”** - A review of the draft submittal by the principal (state and local) organizations involved in emergency response for the site shall be solicited, with comments resulting from the review included with the submittal.

**NRC finding:** *The document does not state whether State and local agencies have reviewed the ETE analysis.*

**RAI:** *State whether other agencies have reviewed the draft ETE and, if they have conducted reviews, provide the agency comments.*

## Attachment A

**Table 1.** Comparison of 2010 Population Estimates (Resident and Transient)  
SSAR versus ETE Analysis

Sector	SSAR	ETE Analysis	Population Difference	Percent Difference
N	54	46	-8	14.8%
NNE	0	0	0	0
NE	0	0	0	0
ENE	0	0	0	0
E	10	0	-10	100%
ESE	295	275	-20	6.7%
SE	257	258	+1	0.4%
SSE	832	505	-327	39.3%
S	275	289	+14	4.8%
SSW	49	77	+28	36.4%
SW	168	149	-19	11.3%
WSW	716	739	+23	3.1%
W	386	566	+180	31.8%
WNW	326	395	+69	17.5%
NW	393	441	+48	10.9%
NNW	61	237	+176	74.3%
<b>Totals</b>	<b>3822</b>	<b>3977</b>	<b>+155</b>	<b>3.9%</b>

The population estimates in the SSAR were based on 1980 and 2000 county census data to calculate growth rate. Population numbers cited above were derived from Table 2.1-4 of the SSAR section of the ESP application dated August 2006.

ETE analysis residential population estimates were obtained from Synergos Technologies. The population numbers cited above were derived from Tables 5 and 9 of the IEM ETE analysis dated April 2006.