Progress Energy

Serial: NPD-NRC-2009-003
January 8, 2009

10CFR52.79

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

SHEARON HARRIS NUCLEAR POWER PLANT, UNITS 2 AND 3
DOCKET NOS. 52-022 AND 52-023
SUPPLEMENT 1 TO RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 021 RELATED TO EMERGENCY PLANNING

References: Letter from Brian C. Anderson (NRC) to James Scarola (PEC), dated September 26, 2008, "Request for Additional Information Letter No. 021 Related to SRP Section 13.3 for the Shearon Harris Units 2 and 3 Combined License Application"

Letter from Garry D. Miller (PEC) to U.S. Nuclear Regulatory Commission (NRC), dated November 17, 2008, "Response to Request for Additional Information Letter No. 021 Related to Emergency Planning", Serial: NPD-NRC-2008-052

Ladies and Gentlemen:

Progress Energy Carolinas, Inc. (PEC) hereby submits a supplemental response to the Nuclear Regulatory Commission's (NRC) request for additional information provided in the referenced letter. This supplemental response provides further information as requested in a December 18, 2008 teleconference between NRC and PEC.

The response is provided in Enclosure 1. Enclosure 1 also identifies changes that will be made in a future revision of the Shearon Harris Nuclear Power Plant Units 2 and 3 (HAR) application.

If you have any further questions, or need additional information, please contact Bob Kitchen at (919) 546-6992, or me at (919) 546-6107.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on January 8, 2009.

Sincerely,

Garry D. Miller
General Manager
Nuclear Plant Development

Enclosure

Progress Energy Carolinas, Inc.
P.O. Box 1551
Raleigh, NC 27602

cc: U.S. NRC Director, Office of New Reactors/NRLPO
U.S. NRC Office of Nuclear Reactor Regulation/NRLPO
U.S. NRC Region II, Regional Administrator
U.S. NRC Resident Inspector, SHNPP Unit 1
Mr. Manny Comar, U.S. NRC Project Manager

**Shearon Harris Nuclear Power Plant Units 2 and 3
Supplemental Response to NRC Request for Additional Information Letter No. 021
Related to SRP Section 13.3 for the Combined License Application,
dated September 26, 2008**

NRC RAI #	Progress Energy RAI #	Progress Energy Response
13.03-1	H-0074 H-0400	November 17, 2008; Serial NPD-NRC-2008-052; Supplemental response enclosed – see following pages
13.03-2	H-0171	November 17, 2008; Serial NPD-NRC-2008-052
13.03-3	H-0172	November 17, 2008; Serial NPD-NRC-2008-052
13.03-4	H-0173	November 17, 2008; Serial NPD-NRC-2008-052
13.03-5	H-0174	November 17, 2008; Serial NPD-NRC-2008-052
13.03-6	H-0175	November 17, 2008; Serial NPD-NRC-2008-052
13.03-7	H-0176	November 17, 2008; Serial NPD-NRC-2008-052
13.03-8	H-0177	November 17, 2008; Serial NPD-NRC-2008-052
13.03-9	H-0178 H-0401 & H-0402	November 17, 2008; Serial NPD-NRC-2008-052; Supplemental response enclosed – see following pages
13.03-10	H-0179	November 17, 2008; Serial NPD-NRC-2008-052
13.03-11	H-0180	November 17, 2008; Serial NPD-NRC-2008-052
13.03-12	H-0181	November 17, 2008; Serial NPD-NRC-2008-052
13.03-13	H-0182	November 17, 2008; Serial NPD-NRC-2008-052
13.03-14	H-0183	November 17, 2008; Serial NPD-NRC-2008-052
13.03-15	H-0184 H-0404	November 17, 2008; Serial NPD-NRC-2008-052; Supplemental response enclosed – see following pages
13.03-16	H-0185	November 17, 2008; Serial NPD-NRC-2008-052
13.03-17	H-0186 H-0405	November 17, 2008; Serial NPD-NRC-2008-052; Supplemental response enclosed – see following pages
13.03-18	H-0187	November 17, 2008; Serial NPD-NRC-2008-052
13.03-19	H-0188	November 17, 2008; Serial NPD-NRC-2008-052
13.03-20	H-0189	November 17, 2008; Serial NPD-NRC-2008-052
13.03-21	H-0190	November 17, 2008; Serial NPD-NRC-2008-052
13.03-22	H-0191	November 17, 2008; Serial NPD-NRC-2008-052
13.03-23	H-0192	November 17, 2008; Serial NPD-NRC-2008-052
13.03-24	H-0193	November 17, 2008; Serial NPD-NRC-2008-052
13.03-25	H-0194	November 17, 2008; Serial NPD-NRC-2008-052
13.03-26	H-0195	November 17, 2008; Serial NPD-NRC-2008-052
13.03-27	H-0196	November 17, 2008; Serial NPD-NRC-2008-052
13.03-28	H-0197	November 17, 2008; Serial NPD-NRC-2008-052
13.03-29	H-0198	November 17, 2008; Serial NPD-NRC-2008-052

NRC RAI #	Progress Energy RAI #	Progress Energy Response
13.03-30	H-0199	November 17, 2008; Serial NPD-NRC-2008-052
13.03-31	H-0200	November 17, 2008; Serial NPD-NRC-2008-052
13.03-32	H-0201	November 17, 2008; Serial NPD-NRC-2008-052
13.03-33	H-0202	November 17, 2008; Serial NPD-NRC-2008-052
13.03-34	H-0203	November 17, 2008; Serial NPD-NRC-2008-052
13.03-35	H-0204	November 17, 2008; Serial NPD-NRC-2008-052
13.03-36	H-0205	November 17, 2008; Serial NPD-NRC-2008-052
13.03-37	H-0206	November 17, 2008; Serial NPD-NRC-2008-052
13.03-38	H-0207	November 17, 2008; Serial NPD-NRC-2008-052
13.03-39	H-0208	November 17, 2008; Serial NPD-NRC-2008-052
13.03-40	H-0209	November 17, 2008; Serial NPD-NRC-2008-052
13.03-41	H-0210	November 17, 2008; Serial NPD-NRC-2008-052
13.03-42	H-0211	November 17, 2008; Serial NPD-NRC-2008-052
13.03-43	H-0212	November 17, 2008; Serial NPD-NRC-2008-052
13.03-44	H-0213	November 17, 2008; Serial NPD-NRC-2008-052
13.03-45	H-0214	November 17, 2008; Serial NPD-NRC-2008-052
13.03-46	H-0215	November 17, 2008; Serial NPD-NRC-2008-052
13.03-47	H-0216	November 17, 2008; Serial NPD-NRC-2008-052
13.03-48	H-0217	November 17, 2008; Serial NPD-NRC-2008-052
13.03-49	H-0218	November 17, 2008; Serial NPD-NRC-2008-052
13.03-50	H-0219	November 17, 2008; Serial NPD-NRC-2008-052
13.03-51	H-0220	November 17, 2008; Serial NPD-NRC-2008-052
13.03-52	H-0221	November 17, 2008; Serial NPD-NRC-2008-052
13.03-53	H-0222	November 17, 2008; Serial NPD-NRC-2008-052
13.03-54	H-0223	November 17, 2008; Serial NPD-NRC-2008-052
13.03-55	H-0224	November 17, 2008; Serial NPD-NRC-2008-052
13.03-56	H-0225	November 17, 2008; Serial NPD-NRC-2008-052
13.03-57	H-0226	November 17, 2008; Serial NPD-NRC-2008-052

NRC Letter No.: HAR-RAI-LTR-021

NRC Letter Date: September 26, 2008

NRC Review of Evacuation Time Estimate Report

NRC RAI #: 13.03-1

Text of NRC RAI:

Population estimates in Section 2, Study Estimates and Assumptions, of the ETE are based on data from the 2000 U. S. census projected to the year 2007. The resident populations presented in the ETE for the year 2000 in Table 3-1, EPZ Permanent Resident Population, differ from those presented in the Harris ER and FSAR (which are consistent). The ETE presents a year 2000 population of 59,285 and the ER/FSAR a population of 55,219. Both numbers are reportedly based on the 2000 census data. There is also a greater difference between the transient populations presented in the ETE on page 3-10 and in the ER/FSAR (14,726 versus 24,365). A portion of this difference is likely because the ETE separates schools and employees from the transient count and the ER/FSAR do not. However, the ER and FSAR also include migrant workers in the transient population but they were not mentioned in the ETE analysis. The peak workforce in the ETE is stated as 3500 on page 3-2 but in the ER it is stated as 3150.

The impacts of population growth beyond the year 2007 apparently were not considered in the ETE other than in Scenario 12, the "special event" scenario. Scenario 12 considers the permanent resident and shadow populations projected to the year 2016, in addition to the peak construction workforce for the two new reactor units. The report does not state if other populations (i.e., transients and employees of other businesses in the EPZ) were considered in Scenario 12, thus allowing for a direct comparison to the 2007 ETE for the other scenarios. The report also does not state if transit-dependent or special facility populations were considered under the 2016 scenario which reflects a larger general population within the EPZ.

a. Clarify the differences in population numbers, including workforce, between the ETE and the ER/FSAR. Explain why there would be a difference in population count if each document used the 2000 census.

b. Clarify if migrant workers were considered in the ETE transient population estimates. If not, explain why.

c. Describe the provisions in the Harris emergency preparedness program for updating the ETE to account for population growth and changes in infrastructure in the EPZ over the life of the NPP.

d. Clarify the specific populations that were considered in the 2016 scenario. If populations different from those in the 2007 ETE were used, explain how the use of different populations allows for meaningful comparison of the 2007 and 2016 ETE results.

PGN RAI ID#: H-0400 (d)

PGN Response to NRC RAI:

a. Response provided in letter dated November 17, 2008; Serial NPD-NRC-2008-052.

b. Response provided in letter dated November 17, 2008; Serial NPD-NRC-2008-052.

c. Response provided in letter dated November 17, 2008; Serial NPD-NRC-2008-052.

d. As stated on Page 3-2, "Permanent resident population and shadow population were extrapolated to 2016 for this scenario." This is reiterated in the footnote to Table 6-4 on Page 6-6. As shown in Table 3-1, population within the EPZ is growing significantly (25% between 2000 and 2007). Given the recent trends in population growth in the EPZ, it would not be realistic to consider the construction scenario in 2016 with a 2007 EPZ population. To provide a valid comparison of the 2016 general population ETE results with the 2007 results, the 2016 scenario must be realistic.

   The population estimates for year 2016 are 93,129 permanent residents in the EPZ and 214,897 permanent residents in the Shadow Region.

   The estimates of employees will be extrapolated in a future revision of the ETE report using county-specific labor growth rates obtained from the US Department of Labor website:

Average Annual Employment	COUNTY			
	Chatham	Harnett	Lee	Wake
Year 2001	16,151	22,082	27,271	385,777
Year 2007	16,936	24,335	27,468	448,826
Annual Growth Rate	0.8%	1.6%	0.1%	2.6%

   Extrapolating the year 2007 employee estimates to year 2016 using these growth rates results in a total of 4,134 employee vehicles.

   The response to RAI 13.03-16 indicates that there are 2,980 transit dependent persons within the Harris EPZ based on the 2007 population estimate. It is assumed that 50% of this population will rideshare with a neighbor or friend, as stated in assumption 10 of Section 2.3 of the ETE report. Thus, 1,490 people will be evacuated using transit dependent buses. This equates to 2.0% (1,490 ÷ 74,097) of the permanent resident population. Applying this same percentage to the year 2016 permanent resident population estimate results in 1,863 transit dependent persons (2% x 93,129). Based on the transit bus occupancy of 30 persons, 62 bus runs will be needed to service this component of the 2016 permanent resident population. As stated in the footnote to Table 6-3, 1 bus is considered as 2 passenger car equivalents (PCEs); thus, 124 vehicles will be included for the construction scenario to represent transit buses. Transit buses will be extrapolated to 2016 using this methodology in a future revision of the ETE report.

External traffic by definition are those vehicles that pass through the EPZ. Thus, growth within the EPZ does not impact the external traffic. Generally speaking, the external traffic should grow as capacity on the major through routes within the EPZ increases. There are no major roadway improvements scheduled for the major roadways traveling through the EPZ; therefore, the current external traffic estimates are retained for the construction scenario.

School enrollment within the EPZ will grow as the EPZ permanent resident population grows. The revised version of Table 6-4 (see next page) indicates that 62 school buses (PCEs) are needed during summer scenarios (construction scenario is a summer scenario) which is 0.2 percent of the 32,314 vehicles needed to evacuate the permanent resident population. There are 44,341 permanent resident vehicles for the construction scenario. It is estimated that 88 (0.2% x 44,341) school buses (PCEs) are needed for the construction scenario and will be included in a future revision of the ETE report. It is assumed that this increase in vehicles is uniformly distributed amongst the existing schools in the EPZ. While new schools may be built as the population grows it is not known at this time where they would be located.

As indicated in the response to part d of RAI 13.03-57, raising the level of the Harris Reservoir by 20 feet would require the reconstruction of two transient facilities. This reconstruction may result in an increased transient presence at these facilities. It is assumed that the total transient vehicles for the 2016 scenario will have the same proportion of the 2016 permanent resident vehicle totals, as the 2007 transient vehicles to the 2007 permanent resident vehicles. As shown in the revision of Table 6-4 (see next page), there are 3,127 transient vehicles and 32,314 permanent resident vehicles for scenario 1 in 2007. Thus, the number of transient vehicles evacuating is 9.7% of the number of permanent resident vehicles evacuating. On this basis, it is estimated that there are 4,291 transient vehicles (9.7% x 44,341) for the construction scenario. Transients will be extrapolated for the construction scenario in a future revision of the ETE report, using this methodology.

A sensitivity study was run for an evacuation of the entire EPZ (Region R03) extrapolating all vehicles to year 2016 for the construction scenario (Scenario 12). The results indicate that the ETE increases by 5 minutes at the 95th and 100th percentiles, while the 50th and 90th percentiles are unchanged.

Associated HAR COL Application Revisions:

- Revise discussion of construction scenario on page 3-2 to indicate that all vehicles were extrapolated to 2016, with the exception of external traffic.
- Update Table 6-4.
- Rerun construction ETE cases and update Tables 7-1 and J-1 accordingly.

Attachments/Enclosures:

None.

Table 6-4. Vehicle Estimates By Scenario

Scenarios	Residents with Commuters	Residents without Commuters	Employees	Transients	Shadow	Special Events	School Buses	Transit Buses	External Traffic	Total Scenario Vehicles
1	22,048	10,266	3,378	3,127	24,750	-	62	100	12,150	75,881
2	22,048	10,266	3,378	3,127	24,750	-	62	100	12,150	75,881
3	2,205	30,109	1,654	6,253	23,555	-	-	100	12,150	76,026
4	2,205	30,109	1,654	6,253	23,555	-	-	100	12,150	76,026
5	2,205	30,109	352	1,563	22,652	-	-	100	7,290	64,271
6	22,048	10,266	3,519	1,563	24,848	-	618	100	12,150	75,112
7	22,048	10,266	3,519	1,563	24,848	-	618	100	12,150	75,112
8	22,048	10,266	3,519	1,563	24,848	-	618	100	12,150	75,112
9	2,205	30,109	1,654	2,501	23,555	-	-	100	12,150	72,274
10	2,205	30,109	1,654	2,501	23,555	-	-	100	12,150	72,274
11	2,205	30,109	352	938	22,652	-	-	100	7,290	63,646
12*	30,219	14,122	4,134	4,291	32,093	3,241	88	124	12,150	100,462

***All vehicles (excluding external traffic) have been extrapolated to Year 2016, which is when construction workforce will be at its peak.**

NRC Letter No.: HAR-RAI-LTR-021

NRC Letter Date: September 26, 2008

NRC Review of Evacuation Time Estimate Report

NRC RAI #: 13.03-9

Text of NRC RAI:

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

a. Only a few underlying algorithms of the system have been included. Provide a general description of other important algorithms used in the PC-DYNEV traffic simulation model, in particular, routines describing traffic control and vehicle routing.

b. For the Section 4 equation for capacity of an approach to intersections on page 4-1, provide the values of the parameters in the equations, where applicable, including Mean Duration of Green Time and Mean Queue Discharge. Were these values estimated or field verified? Discuss if this equation is applicable for manned intersections.

c. Explain how the Capacity Estimate on Approaches to Intersections equation on page 4-1 is affected by traffic control at intersections. Discuss if the modeling addresses traffic through intersections considering traffic control or the equation presented.

d. Discuss the assumptions and inputs for the nodes and segments with respect to the field survey.

e. The definition of "F" on page 4-2 is defined as various known factors influencing "hm". Identify the important "F" factors for the turn movement "hm".

f. Section 1.1, Item 7, states (on page 1-3) that the traffic management strategy is represented in the modeling. Discuss the level of detail to which the traffic management strategy is represented in the modeling.

PGN RAI ID#s: H-0401 (d) and H-0402 (e)

PGN Response to NRC RAI

a. Response provided in letter dated November 17, 2008; Serial NPD-NRC-2008-052.

b. Response provided in letter dated November 17, 2008; Serial NPD-NRC-2008-052.

c. Response provided in letter dated November 17, 2008; Serial NPD-NRC-2008-052.

d. As indicated in the response to RAI13.03-41, a large-scale version of Figure 1-2 with the nodes labeled is provided electronically. The table of link characteristics provided in Appendix K should be cross-referenced with this large-scale map.

KLD personnel drove the entire highway system within the EPZ and for some distance outside. A tablet personal computer equipped with Geographical Information Systems (GIS) software was used during the road survey to acquire and record data. The characteristics of each section of highway were recorded. These characteristics include: number and estimated width of lanes, shoulder type and estimated width, intersection configuration, lane channelization, roadway geometrics, posted speed, actual free speed, abutting land use, traffic control devices, street parking and signage.

In addition, video and audio recording equipment were used to capture a permanent record of the highway infrastructure. No attempt was made to meticulously measure such attributes as lane width and shoulder width; estimates of these measures based on visual observation and recorded images were considered appropriate for the purpose of estimating the capacity of highway sections. For example, Exhibit 20-5 in the Highway Capacity Manual (HCM) indicates that a reduction in lane width from 12 feet (the "base" value) to 10 feet at any shoulder width greater than 6 feet can reduce free flow speed (FFS) by 1.1 mph – not a material difference – for two lane highways. As noted by the NRC, Exhibit 20-5 also indicates that a reduction in lane width from 12 feet to 10 feet coupled with a reduction in shoulder width from 6 feet to less than 2 feet can reduce FFS by 5.3 mph.

Several points must be considered:

1. The FFS estimates presented in Appendix K reflect *observed* FFS during the field study undertaken on the *existing* highway conditions. Thus, any discussion of what the FFS would have been if the pavement and shoulder widths were different that they actually are currently is of academic interest but not relevant to the current need to describe the existing travel environment.

2. As a practical matter, the FFS plays a minor role in influencing ETE for the population within a 10-mile EPZ, for the following reasons:

    a. For low population density EPZs, evacuees would be able to attain FFS since any congestion would likely impact only a few locations and be brief. Consider a 10-mile evacuation trip at a FFS = 45 mph and another at FFS = 40 mph, 5 mph lower due to narrower pavements and shoulders. The travel times of these two hypothetical trips will differ by 1.7 minutes. Since the ETE are rounded to the nearest 5 minutes, the difference of 1.7 minutes would not likely be noticeable. Thus, while a difference in FFS at 5 mph is material, the impact of this difference in ETE is not.

    b. For evacuation traffic environments experiencing pronounced congestion, the FFS is attainable only infrequently, if at all. As shown in Appendix K, FFS ranges from 30 to 65 mph for the roadways in the study area. The PC-DYNEV output indicates that the network wide average speed for an evacuation of the entire EPZ (Region R03) under Scenario 1 conditions (Summer, midweek, midday with good weather) is 23.7 mph. Therefore, a reduction in FFS of 5.3 mph would not affect ETE as average speeds during evacuation are considerably lower than the FFS.

3. The ETE for congested environments primarily reflect the ration of demand (v) to capacity (c): the (v/c) ratio. Capacity is sensitive to the number of lanes available, the effective GREEN:TOTAL time ratio at intersections and the saturation flow rate, none of

which is FFS-dependent. The ETE for uncongested environments reflect mobilization time.

The findings of NUREG/CR-4874 support this conclusion: "Free-flow velocity appears to have minimal effect on the evacuation time estimates." Exhibit 12-15 shows no sensitivity for the estimates of service volumes at LOS E (near capacity), with respect to FFS. The topography of the highway (level, rolling, mountainous) which influences saturation flow rate, is a far more important factor than lane and shoulder width when estimating capacity.

The data from the audio and video recordings were used to create detailed GIS shapefiles and databases of the roadway characteristics and of the traffic control devices observed during the road survey; this information was referenced while preparing the input stream for the IDYNEV system. All of the information obtained during the road survey was input for the links and nodes shown in Figure 1-2 in order to ensure that the link-node analysis network replicates the actual roadway network surrounding the plant.

As documented on page 20-3 of the HCM2000, the capacity of a two-lane highway is 1700 passenger cars per hour for each direction of travel. For freeway sections, a value of 2250 vehicles per hour per lane is assigned. The road survey has identified several segments which are characterized by adverse geometrics which are reflected in reduced values for both capacity and speed. These estimates reflect the service volumes for LOS E presented in HCM Exhibit 12-15. These links may be identified by reviewing Appendix K. Link capacity is an input to IDYNEV which calculates the ETE. The locations of these sections may be identified by reference to the large-scale map showing the link-node diagram with the nodes identified.

e. The variables F1 and F2 formally represent the factors that influence the turn movement specific flow rates through an intersection. These factors are detailed in Chapters 16 and 17 of the 2000 Highway Capacity Manual (HCM); Exhibit 16-7 summarizes the factors influencing saturation flow rate. A further (overlapping) list of factors is presented and identified in Equation 16-4 on page 16-9. These two chapters contain detailed technical discussions which extend over more than 250 pages. This level of detail is not appropriate for inclusion in an ETE report.

The following adjustment factors from Exhibit 16-7 were not considered; that is, no adjustment was made to the "base" estimated mean discharge headway due to these factors:

- Adjustment factor for heavy vehicles in traffic stream;
- Adjustment factor for approach grade;
- Adjustment factor for existence of a parking lane and parking activity adjacent to lane group
- Adjustment factor for blocking effect of local buses that stop within intersection area;
- Adjustment factor for area type;
- Pedestrian adjustment factor for left-turn movements; and pedestrian-bicycle adjustment factor for right-turn movements.

Heavy vehicles in the traffic stream were taken into account by expanding the estimated number of passenger car vehicles to reflect their presence. Specifically, instead of adjusting the mean discharge headway as indicated by the formula in Exhibit 16-7 to account for the presence of heavy vehicles, KLD represented each heavy vehicle as 2 passenger vehicles. This is an equivalent treatment since the above mentioned formula uses a "passenger-car-equivalent (E_T)" of 2.0.

The estimates of saturation flow rate presented in Appendix K take into account observed geometric factors such as grade and lane width. Therefore, no additional factors can subsequently be applied. As noted on page 10-25 of HCM, "the approach grade becomes important only when it is significantly steeper than 4 percent". For this area, grades significantly steeper than 4 percent were not observed.

The remaining factors listed above for parking, local buses, area type (CBD), pedestrians and bicycles do not apply for an evacuation environment.

Other factors are expressly accounted for by the simulation model and its input stream:

- Number of lanes in lane group
- Lane utilization
- Left-turns in lane group
- Right-turns in lane group

The PCDYNEV model includes formulation designed expressly to represent traffic operations including the four factors listed above. These formulations are presented in the references given in the footnote on page 4-2 of the ETE report. The PCDYNEV input stream specifies: (1) number of lanes on each link; (2) lane channelization and length; (3) turn percentages obtained from the TRAD model, and adjusted by PCDYNEV logic if congestion so dictates; (4) effective green time for each approach.

A default value of 2.0 seconds is generally used for intersection "lost time", t_L (see Exhibit 10-9, HCM), but may be specified by the analyst for each approach to an intersection. Delays experienced by turning vehicles are accounted for by the software logic:

- Right-turners and left-turners must slow on the approach to an intersection to execute the turn movement.
- Their headways are longer than those of the through movement, reflecting these lower speeds.

Chapter 31 of the HCM provides further discussion of simulation models and their relationship with the HCM. Note that models such as DYNEV are described as "operational simulation models" in the sense that they do not replicate the procedures of the HCM, but describe the operational performance of traffic in a manner that is consistent with the HCM analysis. Thus, there is no facility-specific Level of Service (LOS) calculation embodied within such simulation models which describe the flow process throughout the analysis network over time and compute flow statistics known as "measures of effectiveness." It is the calibration of these operational models (and of DYNEV, in particular) that relates to the procedures of the HCM. As stated on page 31-2 of the HCM, traffic simulation models use numerical techniques on a digital computer to create a description of how traffic behaves over extended periods of time for a given transportation facility or system.

f. Response provided in letter dated November 17, 2008; Serial NPD-NRC-2008-052.

Associated HAR COL Application Revisions:

No COLA revisions have been identified associated with this response.

Attachments/Enclosures:

None.

NRC Letter No.: HAR-RAI-LTR-021

NRC Letter Date: September 26, 2008

NRC Review of Evacuation Time Estimate Report

NRC RAI #: 13.03-15

Text of NRC RAI:

In Table 8-1, Transit Dependent Population Estimates, the transit dependent population definition does not include any individuals with special needs. The State of North Carolina Radiological Emergency Response Plan, Section IV.H.4.i (page NC-32), states that mobility impaired persons will be identified and provided specialized transportation. According to the plan, these individuals will be identified primarily through the registration cards provided in the Harris Nuclear Power Plant annual public information brochure. Discuss whether data from registration cards was used in the ETE calculation for transit dependent persons.

PGN RAI ID#: H-0404

PGN Response to NRC RAI

Recent communication with the counties has yielded the following data concerning registered homebound special needs population within the Harris EPZ:

Table 1. Registered Special Needs Population within the Harris EPZ

Within EPZ	Chatham	Harnett	Lee	Wake	Total
Registered Special Needs Population	28	13	6	116	163
Bed-ridden	0	1	1	4	6
Wheelchair bound	3	4	2	8	17
Ambulatory	12	5	3	56	76
Total Population Requiring Transportation	15	10	6	68	99

As stated in Section 8.3 of the ETE report, buses can transport 30 ambulatory persons per trip, wheelchair buses can transport 15 persons per trip and wheelchair vans can transport 4 persons per trip. An ambulance can transport 2 bed-ridden persons per trip, as stated on page 8-9 of the ETE report. Based on these capacities, the following transportation resources are needed to evacuate the homebound special needs population residing within the Harris EPZ:

Table 2. Transportation Needs for Evacuation of Special Needs Population within the Harris EPZ					
Within EPZ	Chatham	Harnett	Lee	Wake	Total
Ambulances	0	1	1	2	4
Wheelchair Vans	1	1	1	2	5
Buses	1	1	1	2	5*

*See discussion below

The counties have identified the following transportation resource availability:

Table 3. Transportation Resource Availability					
County-wide	Chatham	Harnett	Lee	Wake	Total
Ambulances	7	25	6	48	86
Wheelchair Vans	12	2	5	31	50
Wheelchair Buses	0	0	0	4	4
Buses	136	100	101	893	1230

Comparison of Tables 2 and 3 indicates that the counties have sufficient resources to evacuate the homebound special needs population. The EPZ counties have adopted the North Carolina state-wide mutual aid agreement which outlines consistent procedures and policies regarding the delivery of local mutual aid resources, including ambulances, wheelchair vans and buses. In the event one of the EPZ counties lacks sufficient transportation resources, those resources will be provided through this state-wide agreement. It is reasonable to expect that the requisite transportation resources would be available within a 90 minute mobilization time. Note that approximately 40% (99 of 163) special needs persons require transportation assistance – see Table 1. Other special needs persons living at home have their transport needs provided by other members of the household and would not require assistance from the county.

<u>ETE for Special Needs Persons</u>

<u>Buses</u>

Assuming no more than one special needs person per household implies that 76 households (HH) need to be serviced. While only 5 buses are needed from a capacity perspective, if 15 buses are deployed to service these special needs HH, then each would require about 5 stops. The following outlines the ETE calculations:

1. Assume 15 buses are deployed, each with 5 stops, to service a total of 76 HH.

2. The ETE is calculated as follows:
   a. Buses arrive at the first pickup location: 90 minutes
   b. Load HH members at first pickup: 5 minutes
   c. Travel to next pickup locations: 4 @ 6 minutes = 24 minutes
   d. Load HH members: 4 @ 5 minutes = 20 minutes
   e. Travel to EPZ boundary (assume 8 miles): 24 minutes.

   ETE: 90 + 5 + 24 + 20 + 24 = 2:45

   Rain ETE: 100 + 5 + 28 + 20 + 28 = 3:00

   The estimated travel time between pickups is based on a distance of 2 miles @ 20 mph = 6 minutes. If planned properly, the pickup locations for each bus run should be clustered within the same general area. The estimated travel time to the EPZ boundary is based on a distance of 8 miles @ 20 mph = 24 minutes. It is assumed that mobilization time to first pickup is 10 minutes longer in rain = 100 minutes. It is further assumed that travel speeds are 10% lower in rain – travel time to the EPZ boundary at free speed from last pickup requires 28 minutes (8 miles @ 18 mph) in rain and that travel time between pickups is 7 minutes (2 miles @ 18 mph). All ETE are rounded to nearest 5 minutes.

Assuming all HH members (avg. HH size equals 3.05 persons) travel with the disabled person yields 5 x 3.05 = 16 persons per bus. From the perspective of bus capacity, fewer buses could be deployed. For example, 10 buses, each servicing 8 HH could accommodate 3.05 x 8 = 25 people, but the additional 3 stops would add 3 x (6 + 5) = 33 minutes to the ETE. The ETE would equal 3:15 with good weather and 3:35 for rain using 10 buses.

Ambulances

It is estimated that 23 ambulance runs will be needed to evacuate the institutionalized bed-ridden population within the EPZ – see Table 8-4 in the ETE report. Table 3 indicates that there is a surplus of ambulances; thus, the institutionalized and homebound bed-ridden populations can be evacuated in a single wave.

As stated on page 8-9 of the ETE report, mobilization time and loading time are assumed to be 30 minutes each. Each ambulance servicing the homebound bed-ridden population will make 2 stops with an estimated distance of 5 miles between stops and an estimated distance of 5 miles to the EPZ boundary after the final stop. It is conservatively assumed that ambulances will travel at 30 mph within the EPZ. Mobilization time is 5 minutes longer and travel speed is 10% less in rain – 27 mph. All ETE are rounded to nearest 5 minutes.

The ETE are computed as follows:

   a. Ambulance arrives at first household: 30 minutes
   b. Loading time at first household: 30 minutes
   c. Ambulance travels to second household: 5 miles @ 30 mph = 10 minutes
   d. Loading time at second household: 30 minutes
   e. Travel time to EPZ boundary: 5 miles @ 30 mph = 10 minutes

ETE: 30 + 30 + 10 + 30 + 10 = 1:50

Rain ETE: 35 + 30 + 11 + 30 + 11 = 2:00

Wheel-Chair Vans

Table 1 indicates that there are 17 homebound wheelchair bound persons in the EPZ, while Table 2 indicates that 5 wheelchair vans are needed to evacuate this population. Assuming one special needs person per household, each wheelchair van will service about 4 households. It is conservatively assumed that the households are spaced 5 miles apart and that van speeds approximate those of school buses = 20 mph between households. It is further assumed that vans travel 5 miles to the EPZ boundary after the last pickup. Mobilization time is 10 minutes longer and travel speed is 10% less in rain.

a. Assumed mobilization time for wheelchair van resources to arrive at first household: 90 minutes
b. Loading time at first household: 15 minutes
c. Travel to next household: 3 @ 15 minutes (5 miles @ 20 mph) = 45 minutes
d. Loading time: 3 @ 15 minutes = 45 minutes
e. Travel time to EPZ boundary: 5 miles @ 20 mph = 15 minutes

ETE: 90 + 15 + 45 + 45 + 15 = 3:30

Rain ETE: 100 + 15 + 51 + 45 + 17 = 3:50

Associated HAR COL Application Revisions:

Add a new subheading "Special Needs Population" to page 8-9 of the ETE report which will consist of the above discussion.

Attachments/Enclosures:

None.

NRC Letter No.: HAR-RAI-LTR-021

NRC Letter Date: September 26, 2008

NRC Review of Evacuation Time Estimate Report

NRC RAI #: 13.03-17

Text of NRC RAI:

The routes for individuals requiring public transit are identified in Figure 8-2, Proposed Transit Dependent Bus Routes. It appears from Figure 8-2, that much of the EPZ is not serviced by bus routes (there are no bus routes serving sub-zones A, B, C, D, J, L, and M), but there is no mention of how transit-dependent individuals get from their residences to these bus routes.

a. Discuss the means by which individuals are assumed to travel to the transit route stops. Discuss how the time required for this activity is included in the ETE.

b. Discuss how the large distances between transit-dependent residents and the bus routes was considered in the ETE calculation.

PGN RAI ID#: H-0405

PGN Response to NRC RAI

a. Given that the evacuees in question have no access to private transportation, then those who are ambulatory and within an accessible distance would be expected to walk to the routes. It is reasonable to expect that the transit-dependent population will be concentrated in the higher population density communities (Apex, Holly Springs and Fuquay Varina) within the EPZ where amenities are available within walking distance. Figure 8-2 in the ETE report indicates that the bus routes circulate within these communities or travel along the major roads servicing lower population areas. It is assumed that transit-dependent persons will have to walk at most one mile to access one of the bus routes. The 2000 Highway Capacity Manual recommends a walking speed of 4.0 ft/sec for pedestrians. Thus, it would take at most 22 minutes (5280ft ÷ 4ft/sec x 1min/60sec) to walk to one of the bus routes. As shown in Table 8-7A of the ETE report, transit dependent buses will not begin their routes until 90 minutes after the advisory to evacuate. This allows the transit dependent population at least 70 minutes to pack their personal items and at most 22 minutes to walk to a bus route. Additional buses are dispatched later (see column 3 of Table 8-7A) in the evacuation which will service those persons who require longer than 70 minutes to pack their personal items. Those persons who are not able to walk to a route are registered as special needs persons with the county; the evacuation of these persons is discussed in the response to RAI 13.03-15.

As indicated in the response to RAI 13.03-16, we estimate a total of 1,490 people and conservatively estimate 50 bus runs (assuming 30 persons will board each bus run on average). See response to RAI 13.03-12 for a discussion of the consideration of passenger pickup time in the transit-dependent ETE.

As shown in Table 8-7A, it is estimated that the first bus will arrive at the start of the routes about 90 minutes after the advisory to evacuate and will take between 40 and 55 minutes to traverse the route. The mobilization time estimates (Table 5-1, Distribution D) indicate that virtually all evacuees will have completed their preparatory activities in that time frame. Therefore, the vast majority of the transit dependent will be able to complete their preparation activities and walk to the routes by the time the first bus on the route arrives. Since there will be multiple bus runs on each route, those who take longer to get to the route will still have the opportunity to board a later bus run.

b. The bus routes were designed to service the populated areas of the EPZ. The few transit-dependent people who will not be able to access a bus route will have to register as "special needs" persons and be picked up at home.

Associated HAR COL Application Revisions:

No COLA revisions have been identified associated with this response.

Attachments/Enclosures:

None.