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Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Duke Energy Carolinas, LLC
William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019
AP1000 Combined License Application for the
William States Lee III Nuclear Station Units 1 and 2
Partial Response to Request for Additional Information (RAI No. 50)
Ltr # WLG2008.12-01

Reference: Letter from Brian C. Anderson (NRC) to Peter S. Hastings (Duke Energy), *Request for Additional Information Letter No. 025 Related to SRP Section 13.3 for the William States Lee III Units 1 and 2 Combined License Application*, dated September 26, 2008.

This letter provides the Duke Energy response to the Nuclear Regulatory Commission's (NRC) request for the following additional (RAI) items included in the reference letter:

13.03-26, ETE-26	13.03-41, ETE-41
13.03-30, ETE-30	13.03-42, ETE-42
13.03-31, ETE-31	13.03-43, ETE-43
13.03-35, ETE-35	13.03-46, ETE-46
13.03-39, ETE-39	13.03-53, ETE-53

Responses to the NRC information requests described in the referenced letter are addressed in separate enclosures, which also identify associated changes, when appropriate, that will be made in a future revision of the applicable part of the combined license application.

If you have any questions or need any additional information, please contact Peter S. Hastings at 980-373-7820.

Bryan J. Dolan
Vice President
Nuclear Plant Development

D093
NRO

Enclosures:

1) Duke Energy Response to Request for Additional Information Letter 025, RAI 13.03-26 (ETE-26)
2) Duke Energy Response to Request for Additional Information Letter 025, RAI 13.03-30 (ETE-30)
3) Duke Energy Response to Request for Additional Information Letter 025, RAI 13.03-31 (ETE-31)
4) Duke Energy Response to Request for Additional Information Letter 025, RAI 13.03-35 (ETE-35)
5) Duke Energy Response to Request for Additional Information Letter 025, RAI 13.03-39 (ETE-39)
6) Duke Energy Response to Request for Additional Information Letter 025, RAI 13.03-41 (ETE-41)
7) Duke Energy Response to Request for Additional Information Letter 025, RAI 13.03-42 (ETE-42)
8) Duke Energy Response to Request for Additional Information Letter 025, RAI 13.03-43 (ETE-43)
9) Duke Energy Response to Request for Additional Information Letter 025, RAI 13.03-46 (ETE-46)
10) Duke Energy Response to Request for Additional Information Letter 025, RAI 13.03-53 (ETE-53)

AFFIDAVIT OF BRYAN J. DOLAN

Bryan J. Dolan, being duly sworn, states that he is Vice President, Nuclear Plant Development, Duke Energy Carolinas, LLC, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this supplement to the combined license application for the William States Lee III Nuclear Station and that all the matter and facts set forth herein are true and correct to the best of his knowledge.

Bryan J. Dolan

Bryan J. Dolan

Subscribed and sworn to me on December 9, 2008

Kim N Slays

Notary Public

My commission expires: 4/19/2010

SEAL

KIM N. SLAYS
NOTARY
PUBLIC
NEW HANOVER COUNTY, N.C.

xc (w/o enclosures):

Luis Reyes, Regional Administrator, Region II
Loren Plisco, Deputy Regional Administrator, Region II
Stephanie Coffin, Branch Chief, DNRL

xc (w/enclosures):

Brian Anderson, Project Manager, DNRL
Brian Hughes, Senior Project Manager, DNRL

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 025

NRC Technical Review Branch: Licensing and Inspection Branch (NSIR/DPR/LIB (EP))

Reference NRC RAI Number(s): 13.03-026

NRC RAI:

ETE-26:

Table 8-4, "Special Facility-Transit Demands," does not appear to include all of the special facilities within the EPZ. Discuss why the J. Claude Fort Community Residence; Magnolias of Gaffney Assisted Living; and others were not included in the table. Explain any effect on the ETE if additional facilities are included in the ETE calculation.

Duke Energy Response:

All special needs facilities located within the EPZ were not identified in ETE Report (Rev. 1). Subsequent internet searches (http://www.scdhec.net/health/licen/hrchero.pdf) have been conducted and indicate that there are seven additional medical facilities in the EPZ: Dialysis Clinic Inc., Bethel Senior Day Care Center, Ivy Grove Residential Care Center, Magnolias of Gaffney Assisted Living Community, J Claude Fort Community Residence Building I, J Claude Fort Community Residence Building II and Total Care of North Carolina – Rock Hill.

Phone calls were placed to each of these facilities with the following results: Dialysis Clinic, Inc. is an outpatient facility and not applicable, Total Care of North Carolina – Rock Hill is a home health/send out nurse program and not applicable. Information gathered from the remaining five facilities will be included in a future revision to ETE Report (Rev. 1) as shown in Attachments 1 and 2.

As the data indicates, there are no bed-ridden patients residing in these facilities; therefore, no additional ambulances are needed. Also, each of these facilities indicated during telephone conversations that they have sufficient transportation resources to evacuate all residents and would not have to rely on additional transportation resources to evacuate. Thus, there is no effect on the ETE.

Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and approval.

Associated Revision to the Lee Nuclear Station Evacuation Time Estimate Report:

1. Revise ETE Report (Rev. 1), Table 8-4, Special Facility Transit Demand.
2. Revise ETE Report (Rev. 1), Section 8.3, Special Facility Demand

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report or Emergency Plan:

None

Attachments:

1. Revised ETE Report (Rev. 1) Table 8-4, Special Facility Transit Demand
2. Revised ETE Report (Rev. 1) Affected Portion of Section 8.3

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 1 to RAI 13.03-026

Revised Table 8-4, Special Facility Transit Demand

Table 8-4. Special Facility Transit Demand

ERPA	Distance (miles)	Direction	Facility Name	Municipality	Capacity	Current Census	Ambulatory	Wheel-chair Bound	Bed-ridden	Ambulance Runs	Wheel-chair Bus Runs	Bus Runs
Cherokee County[1]												
H-2	8.2	W	Brookview Healthcare Center	Gaffney	132	120	6	90	24	12	23	1
H-2	7.9	WNW	Peachtree Healthcare Center	Gaffney	145	132	35	97	15	8	25	2
J-2	7.9	WNW	Upstate Carolina Medical Center	Gaffney	125	88	N/A	N/A	N/A	N/A	N/A	N/A
H-2	9.3	W	Magnolias of Gaffney Assisted Living	Gaffney	84	84	84	0	0	Local contract for buses		
H-2	8.6	WNW	Ivy Grove Residential Care	Gaffney	62	47	42	5	0	Buses provided by Providence Baptist Church		
H-2	8.3	WNW	Bethel Senior Day Care Center	Gaffney	0[2]	18	15	3	0	Facility Owned Vans		
H-2	9.0	WNW	J Claude Fort Community Residence Building I	Gaffney	8	7	6	1	0	Facility Owned Vans		
H-2	9.0	WNW	J Claude Fort Community Residence Building II	Gaffney	8	8	7	1	0	Facility Owned Vans		
				Cherokee County Totals:	564	504	195	197	39	20	48	3
				EPZ Totals:	**564**	**504**	**195**	**197**	**39**	**20**	**48**	**3**

NOTES:

[1] There are no facilities within the York County and Cleveland County portions of the EPZ.

[2] This facility does not have overnight accommodations.

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 1 to RAI 13.03-026

Revised ETE Report (Rev. 1), Affected Portion of Section 8.3

8.3 Special Facility Demand

Table 8-4 presents the census of special facilities in the EPZ as of the end of 2006. Approximately ~~252~~ 504 people have been identified as living in, or being treated in, these facilities. This census also indicates the number of wheelchair-bound people and the number of bed-ridden people. The transportation requirements for this group are also presented. The number of ambulance runs is determined by assuming that 2 patients can be accommodated per ambulance trip; the number of wheelchair van runs assumes 4 wheelchairs per trip; and the number of bus runs estimated assumes 30 ambulatory patients per trip.

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 025

NRC Technical Review Branch: Licensing and Inspection Branch (NSIR/DPR/LIB (EP))

Reference NRC RAI Number(s): 13.03-030

NRC RAI:

ETE-30:

Table 8-4, "Special Facility Transit-Demand," indicates that 20 ambulance runs are required. Explain whether this value will increase if additional facilities are included. Identify the assumptions on mobilization time, number of available ambulances, loading time, etc., to support a determination of number of waves needed. Discuss any impact on the ETE.

Duke Energy Response:

As discussed in the response to RAI 13.03-026 (this letter), seven additional medical facilities have been identified within the EPZ. These facilities have been contacted, the applicable information has been obtained and the appropriate revisions to the ETE Report (Rev. 1) identified. The additional information described in the response to RAI 13.3-026 did not have an effect on the overall ETE.

Page 8-8 of the ETE report discusses a single wave evacuation for EMS vehicles and the assumptions made in estimating ETE for EMS vehicles. A 30 minute ambulance mobilization time is assumed which includes travel to the medical facility. Loading time is conservatively assumed at 30 minutes. It is further assumed that if sufficient ambulance resources are not available in the EPZ, they will be provided by neighboring cities.

If there is a need for additional waves due to a shortfall in the availability of ambulances, then it is necessary to estimate their travel time to the host hospital and their return time to the EPZ. Distances to host hospitals of 20 and 40 miles are assumed in the estimation based on the number of available facilities currently operating within that range. For two waves, assuming the distance to the host hospital is either 20 miles or 40 miles away:

First Wave ETE (hr:min)	Distance to Host Hospital (mi)	Travel Time (min)	Unload and Rest (min)	Return Trip Time (min)	Loading Time (min)	Travel out of EPZ (min)	Second Wave ETE (hr:min)
1:05	20	30	15	25	10	4	2:30
1:05	40	60	15	50	10	4	3:25

To calculate travel time from the EPZ boundary to the host hospital and the return trip time, it is assumed that the outbound speed, outside the EPZ, in route to the host hospital will average 40 mph and inbound speed, outside the EPZ, will average 50 mph. All medical facilities identified

within the EPZ are located within close proximity to Gaffney and within approximately 2 miles of the EPZ boundary. The travel time out of the EPZ is computed using the average distance of 2 miles from the medical facilities to the EPZ boundary, and the average speed of 32.1 mph (output of the model) as discussed on Page 8-8 of the ETE report. Load time for the second wave will be 10 minutes since the medical staff will have time to prep the patient and move him/her to the ground floor prior to arrival of the ambulance. All ETE generated for first and second wave (if needed) evacuations are rounded up to the nearest 5 minute increment as a conservative measure.

When evaluated and compared to the ETE generated for evacuation of 95 percent of the affected population as provided in Table 7-1C (R03; entire EPZ), the results demonstrate that if a second wave evacuation becomes necessary it will not impact the overall ETE for the EPZ.

Associated Revision to the Lee Nuclear Station Evacuation Time Estimate Report:

None

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report or Emergency Plan:

None

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 025

NRC Technical Review Branch: Licensing and Inspection Branch (NSIR/DPR/LIB (EP))

Reference NRC RAI Number(s): 13.03-031

NRC RAI:

ETE-31:

In Table 8-5A, "School Evacuation Time Estimates Good Weather," the speed of the outbound school buses is approximately 20 mph. The speed is discussed in Section 8.3 (page 8-5) and use of the model output is an excellent approach for establishing speeds. However, Figures 7-3 thru 7-5 "Areas of Traffic Congestion after Advisory to Evacuate" would indicate a level of service of F for many roadways during this timeframe. It may not be appropriate to use average speeds. Explain why the average speed for the evacuation was used rather than the speeds that would exist during this timeframe for the evacuation.

Duke Energy Response:

The average speeds presented in Section 8 of the ETE report are network-wide average speeds during the previous 10-minute simulation interval. For example, the average speed of 21.2 mph at 90 minutes (bus mobilization time for Cherokee County) after the advisory to evacuate, presented on page 8-5 of the ETE report, is the average speed on all links in the analysis network (see Figure 1-2 in the ETE report) during the 10-minute interval from 80 to 90 minutes after the advisory to evacuate. As indicated by the reviewer, this network-wide average speed may not be suitable for those links in Gaffney which are operating at level of service F at that time, therefore the most likely travel path (series of links traversed) was analyzed for each school.

The buses servicing the schools in Cleveland and York counties are ready to begin their evacuation trips at 45 minutes after the advisory to evacuate – 30 minutes mobilization time plus 15 minutes loading time. The buses servicing the schools in Cherokee County are ready to begin their evacuation trips at 105 minutes after the advisory to evacuate – 90 minutes mobilization time plus 15 minutes loading time. The most likely path (series of links traversed) through the analysis network to the EPZ boundary was selected for each school in the EPZ. The delay on each link over the appropriate 10-minute interval is output by DYNEV and was accessed for each of the links along the path. Data from 40 to 50 minutes after the advisory to evacuate were used for Cleveland and York counties and from 100 to 110 minutes for Cherokee County.

The average speed along the path using these data generated by DYNEV was computed as follows:

$$Average\ speed\left(\frac{mi.}{hr.}\right)=\left(\frac{\sum_{i=1}^{n} length\ of\ link\ i\,(mi)}{\sum_{i=1}^{n} Delay\ on\ link\ i(\min.)+\dfrac{length\ of\ link\ i\,(mi.)}{free\ flow\ speed\ on\ link\ i\left(\dfrac{mi.}{hr.}\right)}\times\dfrac{60\min.}{1\,hr.}}\right)\times\frac{60\min.}{1\,hr.}$$

As the table included as Attachment 1 indicates, the average calculated speeds range from 2.8 to 61.3 mph for good weather and from 2.4 to 51.6 mph for rain. South Carolina State Law governs school buses to a maximum speed of 45 mph, as stated on page 8-5 of the ETE report. As a result, an additional column "Adjusted Bus Speed" has been added which reduces to 45 mph those bus speeds which exceed 45 mph. Based on the analysis, in good weather, the buses servicing 11 of the schools have average speeds exceeding 20 mph, while the buses servicing the other 11 schools have average speeds less than 20 mph. In rain, the buses servicing 10 of the schools have average speeds exceeding 20 mph, while the buses servicing 12 of the schools have average speeds less than 20 mph.

The school ETE have been recomputed based on these revised speed estimates; the results are presented in the revised Tables 8-5A and 8-5B which are included as Attachment 2. Comparison of the revised tables with those presented in the ETE report indicates that the average ETE for schools has increased by 15 minutes (from 2:20 to 2:35) for good weather and by 10 minutes (from 2:40 to 2:50) for rain as a result of the changes to average bus speed.

ETE Report (Rev. 1) Section 8, Table 8-5A and Table 8-5B will be revised as shown in Attachments 2 and 3. Changes to the Tables and associated conforming changes will be made, as necessary, in a future revision to the ETE Report.

Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and approval.

Associated Revision to the Lee Nuclear Station Evacuation Time Estimate Report:

1. Revise ETE Report (Rev. 1), Section 8
2. Replace ETE Report (Rev. 1) Tables 8-5A and 8-5B

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report or Emergency Plan:

None

Attachments:

1. Average Bus Speeds Computed from DYNEV Output
2. Revised ETE Tables 8-5A and 8-5B
3. Markup of Text of Section 8 of the ETE Report

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 1 to RAI 13.03-031

Average Bus Speeds Computed from DYNEV Output

Average Bus Speeds Computed from DYNEV Output				
	Good Weather		Rain	
School	Calculated Bus Speed (mph)	Adjusted Bus Speed (mph)	Calculated Bus Speed (mph)	Adjusted Bus Speed (mph)
CHEROKEE COUNTY				
Blacksburg Middle	53.7	45.0	47.9	45.0
Cherokee Technology Center	23.6	23.6	22.0	22.0
Blacksburg Elementary	53.7	45.0	47.9	45.0
Blacksburg High	53.7	45.0	47.9	45.0
Blacksburg Primary	13.3	13.3	12.1	12.1
Corinth Elementary	17.4	17.4	16.5	16.5
Limestone-Central Elementary	61.3	45.0	51.6	45.0
Limestone College	56.6	45.0	48.4	45.0
Alma Elementary	23.6	23.6	22.0	22.0
B.D. Lee Elementary	4.5	4.5	4.4	4.4
Draytonville Elementary	25.7	25.7	23.9	23.9
Ewing Middle	8.8	8.8	8.6	8.6
Gaffney Christian Academy	4.5	4.5	4.4	4.4
Gaffney High	2.8	2.8	2.4	2.4
Gaffney Middle	5.9	5.9	5.7	5.7
Granard Middle	4.6	4.6	3.9	3.9
Grassy Pond Elementary	7.0	7.0	6.1	6.1
Heritage Christian School	20.4	20.4	19.1	19.1
Luther Vaughn Elementary	13.5	13.5	12.5	12.5
Mary Bramlett Elementary	5.9	5.9	5.2	5.2
CLEVELAND COUNTY				
Grover Elementary	40.2	40.2	37.3	37.3
YORK COUNTY				
Hickory Grove-Sharon Elementary	59.5	45.0	54.9	45.0

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 2 to RAI 13.03-031

Revised ETE Tables 8-5A and 8-5B

Table 8-5A. School Evacuation Time Estimates - Good Weather

School	Driver Mobilization Time(min)	Loading Time (min)	Dist. to EPZ Boundary (mi.)	Travel Time to EPZ Bdry (min)	ETE (hr:min)	Dist. EPZ Bndry to R.C. (mi.)	Travel Time EPZ Bdry to RC (min)	ETE to R.C. (hr:min)
Cherokee County Schools								
Blacksburg Middle	90	15	8.4	~~24~~12	~~2:10~~2:00	14.2	19	~~2:30~~2:20
Cherokee Technology Center	90	15	6.9	~~20~~18	2:05	15.8	22	~~2:30~~2:25
Blacksburg Elementary	90	15	8.3	~~24~~12	~~2:10~~2:00	14.2	19	~~2:30~~2:20
Blacksburg High	90	15	8.2	~~24~~11	~~2:10~~2:00	14.2	19	~~2:30~~2:15
Blacksburg Primary	90	15	5.8	~~17~~27	~~2:05~~2:15	14.2	19	~~2:25~~2:35
Corinth Elementary	90	15	6.4	~~19~~23	~~2:05~~2:10	21.4	29	~~2:35~~2:40
Limestone-Central Elementary	90	15	4.3	~~13~~6	~~2:00~~1:55	21.7	29	~~2:30~~2:20
Limestone College	90	15	4.9	7	1:55	15.8	22	2:15
Alma Elementary	90	15	7.3	~~21~~19	~~2:10~~2:05	15.8	22	2:30
B.D. Lee Elementary	90	15	4.2	~~12~~56	~~2:00~~2:45	20.4	28	~~2:25~~3:10
Draytonville Elementary	90	15	10.5	~~30~~25	~~2:15~~2:10	15.8	22	~~2:40~~2:35
Ewing Middle	90	15	6.8	~~20~~47	~~2:05~~2:35	15.8	22	~~2:30~~2:55
Gaffney Christian Academy	90	15	4.2	~~12~~56	~~2:00~~2:45	20.4	28	~~2:25~~3:10
Gaffney High	90	15	2.2	~~7~~48	~~1:55~~2:35	20.4	28	~~2:20~~3:05
Gaffney Middle	90	15	5.3	~~15~~54	~~2:00~~2:40	15.8	22	~~2:25~~3:05
Granard Middle	90	15	2.9	~~9~~38	~~1:55~~2:25	20.4	28	~~2:25~~2:55
Grassy Pond Elementary	90	15	0.4	~~2~~4	~~1:50~~1:50	25.1	34	~~2:25~~2:25
Heritage Christian School	90	15	9.2	~~27~~28	~~2:15~~2:15	15.8	22	~~2:35~~2:35
Luther Vaughn Elementary	90	15	4.8	~~14~~22	~~2:00~~2:10	20.4	28	~~2:30~~2:35
Mary Bramlett Elementary	90	15	5.8	~~17~~59	~~2:05~~2:45	15.8	22	~~2:25~~3:10
Cleveland County Schools								
Grover Elementary	30	15	1.5	~~2~~3	0:50	9.2	13	~~1:00~~1:05
York County Schools								
Hickory Grove-Sharon Elementary	30	15	0.2	1	0:50	14.3	20	1:10
				Average for EPZ:	~~1:55~~2:10	**Average:**	**24**	~~2:20~~2:35

Table 8-5B. School Evacuation Time Estimates Rain								
School	Driver Mobilization Time(min)	Loading Time (min)	Dist. to EPZ Boundary (mi.)	Travel Time to EPZ Bdry (min)	ETE (hr:min)	Dist. EPZ Bndry to R.C. (mi.)	Travel Time EPZ Bdry to RC (min)	ETE to R.C. (hr:min)
Cherokee County Schools								
Blacksburg Middle	100	20	8.4	~~25~~12	~~2:25~~**2:15**	14.2	22	~~2:50~~**2:35**
Cherokee Technology Center	100	20	6.9	~~21~~19	~~2:25~~**2:20**	15.8	24	~~2:45~~**2:45**
Blacksburg Elementary	100	20	8.3	~~25~~12	~~2:25~~**2:15**	14.2	22	~~2:50~~**2:35**
Blacksburg High	100	20	8.2	~~25~~11	~~2:25~~**2:15**	14.2	22	~~2:50~~**2:35**
Blacksburg Primary	100	20	5.8	~~18~~29	~~2:20~~**2:30**	14.2	22	~~2:40~~**2:55**
Corinth Elementary	100	20	6.4	~~19~~24	~~2:20~~**2:25**	21.4	33	~~2:55~~**3:00**
Limestone-Central Elementary	100	20	4.3	~~13~~6	~~2:15~~**2:10**	21.7	33	~~2:50~~**2:40**
Limestone College	100	20	4.9	7	**2:10**	15.8	24	**2:35**
Alma Elementary	100	20	7.3	~~22~~20	~~2:25~~**2:20**	15.8	24	~~2:50~~**2:45**
B.D. Lee Elementary	100	20	4.2	~~13~~58	~~2:15~~**3:00**	20.4	31	~~2:45~~**3:30**
Draytonville Elementary	100	20	10.5	~~31~~27	~~2:35~~**2:30**	15.8	24	~~2:55~~**2:55**
Ewing Middle	100	20	6.8	~~20~~48	~~2:20~~**2:50**	15.8	24	~~2:45~~**3:15**
Gaffney Christian Academy	100	20	4.2	~~13~~58	~~2:15~~**3:00**	20.4	31	~~2:45~~**3:30**
Gaffney High	100	20	2.2	~~7~~55	~~2:10~~**2:55**	20.4	31	~~2:40~~**3:30**
Gaffney Middle	100	20	5.3	~~16~~56	~~2:20~~**3:00**	15.8	24	~~2:40~~**3:20**
Granard Middle	100	20	2.9	~~9~~45	~~2:10~~**2:45**	20.4	31	~~2:40~~**3:20**
Grassy Pond Elementary	100	20	0.4	~~2~~4	~~2:05~~**2:05**	25.1	38	~~2:40~~**2:45**
Heritage Christian School	100	20	9.2	~~28~~29	~~2:30~~**2:30**	15.8	24	~~2:55~~**2:55**
Luther Vaughn Elementary	100	20	4.8	~~15~~24	~~2:15~~**2:25**	20.4	31	~~2:50~~**2:55**
Mary Bramlett Elementary	100	20	5.8	~~18~~67	~~2:20~~**3:10**	15.8	24	~~2:45~~**3:35**
Cleveland County Schools								
Hickory Grove-Sharon Elementary	35	20	1.5	~~3~~2	**1:00**	9.2	14	**1:15**
York County Schools								
Hickory Grove-Sharon Elementary	35	20	0.2	1	**1:00**	14.3	22	**1:20**
				Average for EPZ:	~~2:15~~**2:25**	**Average:**	**26**	~~2:40~~**2:50**

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 3 to RAI 13.03-031

Markup of Affected Portions of Section 8 of the ETE Report

8. TRANSIT-DEPENDENT AND SPECIAL FACILITY EVACUATION TIME ESTIMATES

8.4 Evacuation Time Estimates for Transit-Dependent People

Activity: Travel to EPZ Boundary (D→E)

School Evacuation

~~The distance from a school to the EPZ boundary is measured using Geographical Information Systems (GIS) software along the most likely route out of the EPZ. The travel times to the EPZ boundary are based on evacuation speeds computed by the model. The average speed for an evacuation of the full EPZ under Scenario 1 (good weather) conditions at 90 minutes (mobilization time) is 21.2 mph, while the average speed for an evacuation of the full EPZ under Scenario 2 conditions (Rain) is 20.4 mph. The average speeds are 47.9 mph and 43.8 mph at 30 minutes (mobilization time – York and Cleveland Counties) for good weather and rain, respectively. South Carolina State Law governs school buses to a maximum speed of 45 mph; this value will be used rather than 47.9 mph. The travel time from the EPZ boundary to the Reception Center was computed assuming an average speed of 45 mph and 40 mph for good weather and rain, respectively. Based on discussions with the counties, there are adequate buses to evacuate the schoolchildren in a single wave.~~

The buses servicing the schools in Cleveland and York counties are ready to begin their evacuation trips at 45 minutes after the advisory to evacuate – 30 minutes mobilization time plus 15 minutes loading time. The buses servicing the schools in Cherokee County are ready to begin their evacuation trips at 105 minutes after the advisory to evacuate – 90 minutes mobilization time plus 15 minutes loading time. The most likely path (series of links traversed) through the analysis network to the EPZ boundary was selected for each school in the EPZ. The delay on each link over the appropriate 10-minute interval is output by DYNEV and was accessed for each of the links along the path. Data from 40 to 50 minutes after the advisory to evacuate were used for Cleveland and York counties and from 100 to 110 minutes for Cherokee County.

The average speed along the path using these data generated by DYNEV was computed as follows:

$$Average\ speed\left(\frac{mi.}{hr.}\right)=\left(\frac{\sum_{i=1}^{n} length\ of\ link\ i\ (mi)}{\sum_{i=1}^{n} Delay\ on\ link\ i(\min.)+\dfrac{length\ of\ link\ i\ (mi.)}{free\ flow\ speed\ on\ link\ i\left(\dfrac{mi.}{hr.}\right)}\times\dfrac{60\min.}{1\,hr.}}\right)\times\frac{60\min.}{1\,hr.}$$

The table below shows the average speed computed (using this methodology) for the buses servicing each of the schools in the EPZ. The travel time to the EPZ boundary was computed for each school using the average speed and the distance to the EPZ boundary along the most likely route out of the EPZ. The travel time from the EPZ boundary to the Reception Center was

computed assuming an average speed of 45 mph and 40 mph for good weather and rain, respectively. South Carolina State Law governs school buses to a maximum speed of 45 mph. Therefore, the 'Adjusted Bus Speed' in the table below reduces to 45 mph those calculated bus speeds which exceed 45 mph.

Average Bus Speeds Computed from DYNEV Output				
	Good Weather		Rain	
School	Calculated Bus Speed (mph)	Adjusted Bus Speed (mph)	Calculated Bus Speed (mph)	Adjusted Bus Speed (mph)
CHEROKEE COUNTY				
Blacksburg Middle	53.7	45.0	47.9	45.0
Cherokee Technology Center	23.6	23.6	22.0	22.0
Blacksburg Elementary	53.7	45.0	47.9	45.0
Blacksburg High	53.7	45.0	47.9	45.0
Blacksburg Primary	13.3	13.3	12.1	12.1
Corinth Elementary	17.4	17.4	16.5	16.5
Limestone-Central Elementary	61.3	45.0	51.6	45.0
Limestone College	56.6	45.0	48.4	45.0
Alma Elementary	23.6	23.6	22.0	22.0
B.D. Lee Elementary	4.5	4.5	4.4	4.4
Draytonville Elementary	25.7	25.7	23.9	23.9
Ewing Middle	8.8	8.8	8.6	8.6
Gaffney Christian Academy	4.5	4.5	4.4	4.4
Gaffney High	2.8	2.8	2.4	2.4
Gaffney Middle	5.9	5.9	5.7	5.7
Granard Middle	4.6	4.6	3.9	3.9
Grassy Pond Elementary	7.0	7.0	6.1	6.1
Heritage Christian School	20.4	20.4	19.1	19.1
Luther Vaughn Elementary	13.5	13.5	12.5	12.5
Mary Bramlett Elementary	5.9	5.9	5.2	5.2
CLEVELAND COUNTY				
Grover Elementary	40.2	40.2	37.3	37.3
YORK COUNTY				
Hickory Grove-Sharon Elementary	59.5	45.0	54.9	45.0

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 025

NRC Technical Review Branch: Licensing and Inspection Branch (NSIR/DPR/LIB (EP))

Reference NRC RAI Number(s): 13.03-035

NRC RAI:

ETE-35:

Section 9, "Traffic Management Strategy," explains the importance of establishing traffic control in a prioritized manner; a Traffic Management Strategy is included in the plan in Section 9. The implementation of this strategy including access control points and traffic control points are included in Appendix G, "Traffic Management Plan". It is not clear how these strategies affect the ETEs or if they are even used in the calculation of evacuation estimates. Assumption #7 in Section 2.3, "Study Assumptions," states the traffic control points are resources and area dependent, but no overall effect is given. Explain any effect on the ETE if traffic control is not placed in the prioritized manner.

Duke Energy Response:

As discussed in ETE Section 2.3, Assumption 5, the ETE calculation assumes that the Access Control Points (ACPs) are staffed 1 to 2 hours after the Evacuation Advisory, thus limiting entry of external traffic into the EPZ. The calculated ETE does not rely upon implementation of the Traffic Control Points (TCPs) outlined in ETE Appendix G. The traffic control measures (ACPs and TCPs) identified in Appendix G would act to reduce the overall evacuation time. The Executive Summary, Section 2, Section 9 and Appendix G of the ETE Report will be revised to clarify that the implementation of TCPs is not considered in calculating the ETE.

The priority given to each TCP will determine the manning sequence. As stated in the ETE Section 9: Application of traffic control at some TCPs will have a more pronounced influence on expediting traffic movements. Thus, during the mobilization of personnel to respond to the emergency situation, those TCPs which are assigned a higher priority will be manned earlier. This setting of priorities has been undertaken with the concurrence of emergency management and law enforcement personnel. These priorities are compatible with the availability of local manpower resources.

As stated on ETE Page 9-1 the functions performed at TCPs are:

(1) facilitate evacuating traffic movements that serve to expedite travel out of the EPZ along routes that the analysis has found to be most effective; and

(2) discourage traffic movements that permit evacuating vehicles to travel in a direction which takes them significantly closer to the power plant, or which interfere with the efficient flow of other evacuees.

While TCPs are considered to have a beneficial effect on the overall evacuation. The TCPs were not credited in the development of the overall ETE. Therefore, there is no impact on the overall ETE if the TCPs are not manned in a prioritized manner.

The operational performance of traffic along the approaches to a signalized intersection is influenced by the signal timing. Traffic engineers develop signal plans to efficiently service traffic demand, by suitably allocating "green time" to the approaches in a manner that is responsive to the competing traffic demand volumes. In recent decades, the increasing use of microprocessor-based signal controller equipment has improved service in the form of "traffic responsive" signal timing plans. Sensors imbedded in the roadway or cameras mounted on signal masts quantify the traffic demand volume on the competing approaches to the intersection and the signal timing is adjusted by the microprocessor to service the demand.

The ETE calculation assumes that the signal timing provides reasonable service to the evacuating traffic consistent with current practice. No attempt is made to optimize this timing to reflect the actions of experienced traffic control personnel at TCPs. For this reason, the ETE are not dependent on any TCP being manned. While the Traffic Management plan could potentially improve upon the published ETE by providing priority treatment, such expectation is not credited given the uncertainties accompanying an emergency situation.

A sensitivity study was conducted to quantify the effect on ETE of an arbitrary and inefficient signal timing plan over the entire link-node analysis network. A 50-50 signal split wherein an equal amount of service green time is allocated to each approach to a signalized intersection, independent of the relative traffic demands along those approaches, is considered a worst case condition for signal timing. This study, documented on page I-4 of the ETE Report (Rev. 1), showed an increase of 20 minutes in ETE. Another study, a 75-25 split, showed a 10 minutes increase in ETE.

To summarize:

1. The signal timing used to calculate the ETE is reflective of current practice.
2. No credit is assumed to reduce ETE due to expert traffic control at TCPs.
3. A study was conducted to quantify the effect on ETE of traffic signal malfunction arising from the accident. The results indicate that the ETE are relatively insensitive to signal timing disruption.

Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and approval.

Associated Revisions to the Lee Nuclear Station Evacuation Time Estimate Report:

1. Revise ETE Report (Rev. 1) Executive Summary as shown in Attachment 1.
2. Revise ETE Report (Rev. 1) Section 2, Study Estimates and Assumptions as shown in Attachment 2.
3. Revise ETE Report (Rev. 1) Section 9, Traffic Management Strategy as shown in Attachment 3.
4. Revise ETE Report (Rev. 1), Appendix G, Traffic Management Plan as shown in Attachment 4.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report or Emergency Plan:

None

Attachments:

1. Revised ETE Report (Rev. 1), Executive Summary Markup
2. Revised ETE Report (Rev. 1), Section 2 Markup
3. Revised ETE Report (Rev. 1), Section 9 Markup
4. Revised ETE Report (Rev. 1), Appendix G Markup

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 1 to RAI 13.03-035

ETE Report (Rev. 1), Executive Summary Markup

The plan is documented in the form of detailed schematics specifying: (1) the directions of evacuation travel to be facilitated, and other traffic movements to be discouraged; (2) the traffic control personnel and equipment needed (cones, barricades) and their deployment; (3) the locations of these "Traffic Control Points" (TCP); (4) the priority assigned to each traffic control point indicating its relative importance and how soon it should be manned relative to others; and (5) the number of traffic control personnel required.

The operation of TCP are expected to have a beneficial impact and are not specifically credited in the ETE evaluation. In calculating ETE, it is assumed that drivers will act rationally, travel in the directions identified in the plan (as documented in the public information material), and obey all control devices and traffic guides. These TCP serve many useful functions, but are not considered in specifying the inputs to the I-DYNEV system used to calculate ETE. Consequently, the results presented in Section 7 and in Appendix J are conservative in that they do not reflect the presence of these TCP.

Selected Results

A compilation of selected information is presented on the following pages in the form of Figures and Tables extracted from the body of the report; these are described below.

- Figure 6-1 displays a map of the WLS site showing the layout of the 14 ERPA that comprise, in aggregate, the EPZ.
- Table 3-1 presents the estimates of permanent resident population in each ERPA based on the 2000 Census data. Extrapolation to the year 2007 reflects population growth rates in each county derived from census data.
- Table 6-1 defines each of the 22 Evacuation Regions in terms of their respective groups of ERPA.
- Table 6-2 lists the Evacuation Scenarios.
- Tables 7-1C and 7-1D are compilations of ETE. These data are the times needed to *clear the indicated regions* of 95 and 100 percent of the population occupying these regions, respectively. These computed ETE include consideration of mobilization time and of estimated voluntary evacuations from other regions within the EPZ and from the shadow region.
- Table 8-5A presents ETE for the schoolchildren in good weather.
- Table 8-7A presents ETE for the transit-dependent population in good weather.

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 2 to RAI 13.03-035

ETE Report (Rev. 1), Markup, Item 6, Section 2.3, "Study Assumptions"

2.3 Study Assumptions

1. The Planning Basis Assumption for the calculation of ETE is a rapidly escalating accident that requires evacuation, and includes the following:
   a. Advisory to Evacuate is announced coincident with the siren notification.
   b. Mobilization of the general population will commence within 10 minutes after siren notification.
   c. ETE are measured relative to the Advisory to Evacuate.
2. It is assumed that everyone within the group of ERPA forming a Region that is issued an Advisory to Evacuate will, in fact, respond and evacuate in general accord with the planned routes.
3. It is further assumed that:
   a. Schools will be given the earliest notification possible so they can begin evacuating prior to notification of the general public, if conditions permit. In the case of a rapidly escalating accident, however, this may not be possible.
   b. 68 percent of the households in the EPZ have at least 1 commuter; 71 percent of those households with commuters will await the return of a commuter before beginning their evacuation trip, based on the telephone survey results.
4. The ETE will also include consideration of "through" (External-External) trips during the time that such traffic is permitted to enter the evacuated Region. "Normal" traffic flow is assumed to be present within the EPZ at the start of the emergency.
5. Access Control Points (ACP) will be staffed within approximately 1 - 2 hours following the siren notifications, to divert traffic attempting to enter the EPZ. Earlier activation of ACP locations would delay returning commuters. It is assumed that no vehicles will enter the EPZ after this 1 – 2 hour time period.
6. Traffic Control Points (TCP) within the EPZ will be staffed over time, beginning at the Advisory to Evacuate. Their number and location will depend on the Region to be evacuated and resources available. It is assumed that drivers will act rationally, travel in the directions identified in the plan, and obey all control devices and traffic guides. The objectives of these TCP are:
   a. Facilitate the movements of all (mostly evacuating) vehicles at the location.
   b. Discourage inadvertent vehicle movements toward the power station.
   c. Provide assurance and guidance to any traveler who is unsure of the appropriate actions or routing.

Act as a local surveillance and communications center. Provide information to the emergency operations center (EOC) as needed, based on direct observation or on information provided by travelers.

In calculating ETE, it is assumed that drivers will act rationally, travel in the directions identified in the plan, and obey all control devices and traffic guides. These TCP serve many useful functions, but are not considered in specifying the inputs to the I-DYNEV system used to calculate ETE. Consequently, the results presented in Section 7 and in Appendix J are conservative in that they do no reflect the presence of these TCP. The time needed to mobilize personnel or equipment to staff the TCP will not influence the ETE results.

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 3 to RAI 13.03-035

ETE Report (Rev. 1), Section 9 Markup

Chapter 2I of the MUTCD presents guidance on Emergency Management signing. Specifically, the Evacuation Route sign, EM-1 on page 2I-3, with the word "Hurricane" removed, could be installed selectively within the EPZ, if considered advisable by local and state authorities. Similar comments apply to sign EM-3 which identifies TCP locations.

As discussed in Section 2.3, these TCP are not credited in calculating the ETE results. Access control points (ACP) are deployed near the periphery of the EPZ to divert "through" trips. The ETE calculations reflect the assumptions that all "external-external" trips are interdicted after 90 minutes have elapsed after the advisory to evacuate (ATE).

All transit trips and other responders entering the EPZ to support the evacuation are assumed to be unhindered by personnel manning TCP.

Study Assumptions 5 and 6 in Section 2.3 discuss ACP and TCP staffing schedules and operations.

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 4 to RAI 13.03-035

ETE Report (Rev. 1), Appendix G Markup

APPENDIX G: TRAFFIC MANAGEMENT PLAN

This appendix presents suggested traffic control measures to facilitate the evacuation of the Lee Nuclear Station EPZ. Pages G-2 through G-36 detail Traffic Control Points (TCP), which are typically intersections within the EPZ; these points are established to facilitate the flow of evacuee traffic from within the EPZ. Figures G-1 through G-3 provide detailed mapping of the location of each traffic control point. Table G-1 summarizes the TCP and the manpower and equipment needs.

Pages G-37 through G-51 detail the Access Control Points (ACP), which are typically on the periphery of the EPZ; these points are established to divert vehicles from entering the EPZ. Doing so provides all of the available roadway capacity within the EPZ to the evacuees. Figure G-4 provides a detailed map of the location of each ACP, while Table G-2 summarizes the ACP and the manpower and equipment needs to establish access control.

This traffic management plan was reviewed with the state and local police who voiced concern over manpower and equipment shortages. The original traffic management plan was modified based on these concerns. The most crucial intersections, as identified in Section 7, are the access ramps to Interstate 85 southbound within Gaffney. These intersections have been given top priority for staffing and equipment needs, as manning them will have the greatest impact on the evacuation process. Several TCP have been included where barricades should be placed to discourage access to Interstate 85 northbound; police officers need not stay at these intersections after barricades have been positioned. The use of ITS technologies, as outlined in Section 9, will also aid in overcoming manpower shortages.

With reference to the discussion of Section 2.3, these TCP serve many useful functions, but are not considered in specifying the inputs to the I-DYNEV system used to calculate ETE. Consequently, the results presented in Section 7 and in Appendix J do not credit the presence of these TCP.

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 025

NRC Technical Review Branch: Licensing and Inspection Branch (NSIR/DPR/LIB (EP))

Reference NRC RAI Number(s): 13.03-039

NRC RAI:

ETE-39:

Section 2.1 (3), "Study Estimates and Assumptions-Data Estimates," of the ETE states that roadway capacity was estimated for each segment based on the field surveys and on the Highway Capacity Manual 2000 (HCM). Section 4, "Estimation of Highway Capacity," (pg. 4-5) states the 2 lane roadway capacity is 1700 pc/hr as identified in Chapter 20 of the HCM. The HCM identifies these capacities for 'ideal conditions' which include physical and operational conditions. Chapter 20 of the HCM does identify 1700 pc/hr as the capacity of a 2 lane roadway when the roadway meets the Base Conditions of Chapter 12 such as 12 foot lane widths and 6 foot shoulders. Operational conditions would include such items as time spent following other vehicles. Clarify if the field survey confirmed that lane widths meet the conditions for 'ideal'. Discuss the operational considerations applied to the roadway capacity estimate. If necessary, explain the affect on the ETE if the capacity is determined to be lower than the value used.

Duke Energy Response:

A detailed road survey of the Lee EPZ and of the Shadow Region was conducted. Roadway characteristics (posted speed, number of lanes, shoulder conditions, free flow speed, terrain, traffic control devices, etc.) were video archived during the survey. These characteristics were documented in GIS shapefiles, which were used in the development of the link-node analysis network shown in Figure 1-2 of the ETE. The capacity of each link was estimated using the procedures outlined in the HCM and the data from the GIS shapefiles. Thus, any unusual roadway characteristics noted during the field survey were included in the estimation of roadway capacity. These capacities were input to the I-DYNEV simulation model to compute ETE as discussed in Appendices B, C and D of the ETE Report.

During preparation of the ETE, the entire highway system within the EPZ and for some distance outside of the EPZ, was driven. A tablet personal computer equipped with Geographical Information Systems (GIS) software was used during the road survey to acquire and record data and 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 can reduce free flow speed (FFS) by 1.1 mph – not a material difference – for two lane highways. Exhibit 12-15 of the HCM shows no sensitivity for the estimates of service volumes at Level of Service (LOS) E (near capacity), with respect to FFS.

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.

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 Exhibit 12-15 of the HCM. 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.

Because the DYNEV model accepts input to one decimal, the capacity estimate of one lane is 1714 pc/hr, as provided in Appendix K, rather that 1700 pc/hr provided in Chapter 20 of the HCM. Where the base conditions are not realized, downward adjustments to the capacity estimate of 1,700 pc/hr/lane were made. These adjustments, which can be viewed in Appendix K, are based on the guidance provided in Exhibit 12-15 of the HCM. Note that the base conditions include a 50/50 directional split. This assumption would not be realized during an evacuation where the flow is primarily outbound, which is a far more favorable condition.

Associated Revision to the Lee Nuclear Station Evacuation Time Estimate Report:

None

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report or Emergency Plan:

None

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 025

NRC Technical Review Branch: Licensing and Inspection Branch (NSIR/DPR/LIB (EP))

Reference NRC RAI Number(s): 13.03-041

NRC RAI:

ETE-41:

Section 3, "Demand Estimation," (page 3-15) indicates that 300 vehicles per lane for major routes and 150 vehicles per lane for minor routes are on the roadway, traveling through for a total of 6,300 vehicles.

a. Explain the calculation including number of lanes assessed such that 300 and 150 vehicles become 6,300 vehicles.

b. Is Floyd Baker Boulevard in Gaffney included in the estimate of through traffic?

c. Discuss if additional vehicles need to be added to Table 6-4, "Vehicle Estimates by Scenario".

Duke Energy Response:

a. The following table identifies the through traffic input to the DYNEV simulation model.

# LANES	FLOW (veh/hr)	ROAD NAME
1	150	ROUTE 97 Northbound
2	600	I-85 Northbound
2	600	I-85 Southbound
1	150	ROUTE 114 Northbound
1	150	ROUTE 18 Northbound
1	150	ROUTE 150 Northbound
1	150	ROUTE 105 Northbound
1	150	ROUTE 322 Westbound
1	150	ROUTE 49 Northbound
1	300	US ROUTE 321 Northbound
1	150	ROUTE 55 Westbound
1	300	US ROUTE 321 Southbound
1	150	ROUTE 161 Westbound

1	150	ROUTE 49 Westbound
1	300	US ROUTE 29 Northbound
1	150	ROUTE 180 Southbound
1	150	ROUTE 11 Eastbound
1	150	ROUTE 150 Southbound
1	150	College Ave Eastbound
1	150	ROUTE 18 Southbound
1	150	ROUTE 226 Eastbound
1	150	ROUTE 161 BYPASS Westbound
2	600	US ROUTE 74 Westbound
1	150	Stony Point Rd Southbound
2	300	Shelby Rd Westbound
2	600	US ROUTE 74 BYPASS Eastbound
TOTAL:	6,300	

b. External traffic is loaded at the periphery of the analysis network (see ETE Figure 1-2). This traffic is generally loaded in directions counter to the flow of evacuating traffic as it is intended to simulate the effect of traffic that is passing through the EPZ at the time of an evacuation.

   Floyd Baker Boulevard (State Route 11) is called Chesnee Hwy further west. As shown in the response to part a, Route 11 was considered as a minor route with 1 lane and 150 vehicles per hour, reflecting the characteristics of Chesnee Hwy at the start of the analysis network. As Chesnee Hwy enters Gaffney, it widens to 2 lanes in each direction and changes name to Floyd Baker Boulevard. Therefore, Floyd Baker Boulevard is included in the estimate of through traffic.

c. The vehicle estimates documented in Table 6-4 were checked against the values input to DYNEV to compute the ETE. Vehicle estimates provided in Table 6-4 of the ETE report for "External Traffic" are actually an hourly volume where all other vehicle estimates are total vehicles. The "External Traffic" vehicle estimates have been revised to provide a total vehicle estimate consistent with the rest of the table. The external traffic is assumed to be diverted at 90 minutes after the advisory to evacuate. Thus, the hourly volume presented should be multiplied by 1.5 hours (90 ÷ 60) to provide total vehicles input as external traffic. The previous data details the estimate of 6,300 vehicles per hour input to DYNEV. Thus, the total external traffic is 6,300 x 1.5 = 9,450 vehicles. It is assumed that external traffic is reduced by 40% for evening scenarios; therefore, there are 5,670 vehicles input as external traffic for Scenarios 5 and 11. The Total Scenario Vehicles have also been revised based on

the changes to external traffic. The ETE computed and presented in Section 7 of the ETE report are not affected by these changes; the vehicle estimates provided in the revised Table 6-4 properly document the values that were input to DYNEV to compute ETE.

Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and approval.

Associated Revision to the Lee Nuclear Station Evacuation Time Estimate Report:

Revise ETE Report (Rev. 1) Table 6-4, "Vehicle Estimates By Scenario", as shown in Attachment 1.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report or Emergency Plan:

None

Attachment:

Revised ETE Report (Rev. 1) Table 6-4
(Note: Table 6-4 was revised in response to RAI 13.3-014; previously transmitted in Duke Energy Ltr# WLG2008.11-09, November 20, 2008, but is duplicated in this response for reference)

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 1 to RAI 13.03-041

Revised ETE (Rev. 1)

Table 6-4

Vehicle Estimates by Scenario

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	18,136	8,384	8,423	1,395	7,768	-	37	84	~~6,300~~9,450	~~50,527~~53,677
2	18,136	8,384	8,423	1,395	7,768	-	37	84	~~6,300~~9,450	~~50,527~~53,677
3	1,814	24,706	4,124	2,790	6,813	-	-	84	~~6,300~~9,450	~~46,631~~49,781
4	1,814	24,706	4,124	2,790	6,813	-	-	84	~~6,300~~9,450	~~46,631~~49,781
5	1,814	24,706	877	1,256	6,091	-	-	84	~~3,780~~5,670	~~38,608~~40,498
6	18,136	8,384	8,774	837	7,847	-	368	84	~~6,300~~9,450	~~50,730~~53,880
7	18,136	8,384	8,774	837	7,847	-	368	84	~~6,300~~9,450	~~50,730~~53,880
8	18,136	8,384	8,774	837	7,847	-	368	84	~~6,300~~9,450	~~50,730~~53,880
9	1,814	24,706	4,124	1,674	6,813	-	37	84	~~6,300~~9,450	~~45,552~~48,702
10	1,814	24,706	4,124	1,674	6,813	-	37	84	~~6,300~~9,450	~~45,552~~48,702
11	1,814	24,706	877	698	6,091	-	-	84	~~3,780~~5,670	~~38,050~~39,940
12	18,618*	8,616*	8,423	1,395	~~7,768~~8,151*	2,525	37	84	~~6,300~~9,450	~~54,149~~57,299

* The peak construction year estimated by Duke Energy is 2011. The permanent resident population and shadow population have been extrapolated to 2011 using the estimated average yearly percentage growth provided by the US Census for each county.

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 025

NRC Technical Review Branch: Licensing and Inspection Branch (NSIR/DPR/LIB (EP))

Reference NRC RAI Number(s): 13.03-042

NRC RAI:

ETE-42:

Regarding "shadow evacuation:

a. For the shadow evacuation values used in Table 6-4, "Vehicle Estimates by Scenario," provide the assumptions with regard to trip generation times and loading of the transportation network.

b. For Appendix I, "Evacuation Sensitivity Studies", provide population values for the percent shadow evacuation in Table I-2, "Evacuation Time Estimates for Shadow Sensitivity Study".

c. In Table I-3, "Evacuation Time Estimates for Trip Generation Sensitivity Study," explain how the 30% increase of vehicles was distributed throughout the EPZ. Was this uniform or based on the current population densities?

d. Provide the basis for the population used to calculate the shadow evacuation vehicles identified in Table 6-4, "Vehicle Estimates by Scenario."

Duke Energy Response:

a. The shadow vehicles shown in Table 6-4 are loaded on the transportation network using the same trip generation times as EPZ residents with Commuters – Distribution C in Table 5-8. The response to part c of this RAI discusses how resident and shadow vehicles are loaded on to the roadways within the analysis network.

b. Table I-2 will be revised to provide population values for the percent shadow evacuation.

c. Table I-3 is actually "Evacuation Time Estimates for Evacuating Vehicles per Household Sensitivity Study".

   The population loading is done using GIS software and Census block data. The Census block data is overlaid with the roadway system within the study area. Population is then distributed to the nearest accessible roadway section. The population on each link is then converted to households using the average household size of 2.62 persons. Finally, the number of households is multiplied by the number of evacuating vehicles per household to determine how many vehicles are loaded on each roadway section. The value of 1.44 vehicles per household (obtained from the telephone survey, Appendix F) was used to calculate the base ETE presented in Tables 7-1A, B, C, and D. For the sensitivity study, the same methodology was used, however, the households were multiplied by 2.08 vehicles in the final step, rather than 1.44. Therefore, the 30% increase in vehicles was distributed according to the current population densities, just as was done for the base ETE.

d. The shadow population is estimated using the same methodology used for the permanent resident population, as outlined on Page 3-2. It is assumed that the demographics in the shadow region are similar to those in the EPZ; therefore the telephone survey results are valid in the shadow region. Thus, the average household size (2.62 persons) and the number of evacuating vehicles per household (1.44 vehicles) are used in the shadow region to convert from people to vehicles. There are a total of 35,768 people residing in the shadow region, evacuating in 19,653 vehicles. Section 7.1 and Appendix I will be revised to provide the basis for the number of shadow evacuation vehicles.

Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and approval.

Associated Revision to the Lee Nuclear Station Evacuation Time Estimate Report:

1. Revise ETE Report (Rev. 1) Section 7.1 as shown in Attachment 1.
2. Revise ETE Report (Rev. 1) Appendix I as shown in Attachment 2.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report or Emergency Plan:

None

Attachments:

1. Revised ETE Report (Rev. 1), Section 7.1
2. Revised ETE Report (Rev. 1), Appendix I

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 1 to RAI 13.03-042

Revised ETE Report (Rev. 1)
Section 7.1

7.1 Voluntary Evacuation and Shadow Evacuation

We define "voluntary evacuees" as people who are within the EPZ in ERPAs for which an Advisory to Evacuate *has not* been issued, yet who nevertheless elect to evacuate. We define "shadow evacuation" as the movement of people from areas *outside* the EPZ for whom no protective action recommendation has been issued. Both voluntary and shadow evacuations are assumed to take place over the same time frame as the evacuation from within the impacted Evacuation Region.

The ETE for WLS addresses the issue of voluntary evacuees in the manner shown in Figure 7-1. Within the circle defined by the farthest radial distance of the Evacuation Region, 50 percent of those people located in ERPAs not advised to evacuate, are assumed to do so. Within the annular ring extending from the furthest distance of the Evacuation Region (if less than 10 miles), to the EPZ boundary, it is assumed that 35 percent of the people located there will elect to evacuate.

Figure 7-2 presents the area identified as the Shadow Evacuation Region. This region extends radially from the plant to a distance of 15 miles. The population and number of evacuating vehicles in the Shadow Evacuation Region were estimated using the same methodology that was used for permanent residents within the EPZ (see page 3-2). It is estimated that 35,768 people reside in the Shadow Evacuation Region and that they will evacuate in 19,653 vehicles.

Traffic generated within this Shadow Evacuation Region, traveling away from the WLS location, has a potential for impeding evacuating vehicles from within the Evacuation Region. We assume that the traffic volumes emitted within the Shadow Evacuation Region correspond to 30 percent of the residents there plus a proportionate number of employees in that region. **All ETE calculations include this shadow traffic movement.**

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 2 to RAI 13.03-042

Revised ETE Report (Rev. 1)
Appendix I

A sensitivity study was conducted to determine the effects on Evacuation Time Estimates (ETE) of changes in the percentage of people who decide to relocate from the Shadow Region. The movement of people in the shadow region has the potential to impede vehicles evacuating from an Evacuation Region within the EPZ. As discussed on page 7-1, it is estimated that 35,768 people reside in the Shadow Evacuation Region and that they will evacuate in 19,653 vehicles.

Table I-2 presents the evacuation time estimates for each of these cases. The ETE for the 2 mile and 5 mile Regions do not change as the percentage of people who decide to relocate from areas within the shadow region increases from 15% to 60%. The Entire EPZ, however, does change as the percentage of shadow evacuees varies. The ETE for the Entire EPZ increases by 20 minutes as the percent of shadow evacuees changes from 30% to 60%. The roads within and leading out of Gaffney are highly congested during an evacuation. The additional shadow vehicles outside of Gaffney further delay those trying to evacuate.

Table I-2. Evacuation Time Estimates for Shadow Sensitivity Study

Shadow Data			Evacuation Region		
Percent Shadow Evacuation	**Number of Shadow Residents**	**Number of Shadow Resident Vehicles**	**2-Mile Region (R01)**	**5-Mile Region (R02)**	**Entire EPZ (R03)**
15	5,365	2,948	4:00	4:05	4:10
30 (Base)	10,730	5,896	4:00	4:05	4:20
60	21,460	11,792	4:00	4:05	4:40

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 025

NRC Technical Review Branch: Licensing and Inspection Branch (NSIR/DPR/LIB (EP))

Reference NRC RAI Number(s): 13.03-043

NRC RAI:

ETE-43:
Section 4, Estimation of Highway Capacity," describes the modeling of intersections and states on page 4-1 that critical intersections will often be provided by traffic control personnel. Explain how are intersections that are controlled by traffic personnel modeled? Explain any assumptions on traffic speed, service flow, capacity, and queue discharge through a manned intersection.

Duke Energy Response:

Traffic control points are modeled as traffic signals with a reasonable (for evacuation purposes) allocation of effective green time to each of the competing traffic streams. The "Mean Duration of Green Time", G_m in the equation on page 4-2, is the amount of time per signal cycle, C, that the signal indication is "green" and services vehicles entering the intersection to perform movement, m, from an approach to the intersection. The signals were modeled in the analysis network with 75-second cycle lengths. The mean duration of green time ranged from 12 seconds to 57 seconds, depending on the signal and the approach being serviced. Two seconds of yellow and one second of all red were included for each phase of the signal.

"Mean queue discharge headway" ("h_m" in equation on page 4-2) as defined on page 7-8 of the Highway Capacity Manual 2000 (HCM2000), is "the time between the passage of the front axle of one vehicle and of the front axle of the next vehicle over a given cross-section of the roadway" (e.g. at a stop-bar). The mean queue discharge headway ranged from 1.6 seconds (interstate links) to 3.0 seconds (inter-city roadways). The mean "lost time" ("L" in equation on page 4-2) is defined on page 10-12 of HCM 2000 as "the time during which an intersection is not used effectively by any movement; it is the sum of clearance lost time plus start-up lost time." Clearance lost time is "the time between signal phases during which an intersection is not used by any traffic," and start-up lost time is "the additional time consumed by the first few vehicles in a queue at a signalized intersection above and beyond the saturation headway, because of the need to react to the initiation of the green phase and to accelerate." The mean lost time was 2.0 seconds for each intersection in the analysis network.

The headway, h, is definitionally related to the saturation flow rate, s, by equation (7-9) of HCM2000: $s = 3600 \div h$, where h is in seconds per vehicle and s is in vehicles per hour. The values of s were estimated (see Appendix K) from the field survey (Section 1.3 of the ETE report), and h was computed using equation (7-9). The saturation flow rate ("capacity") ranged from 1200 vehicles per hour per lane to 2250 vehicles per hour per lane.

The green times for each approach and for each intersection are input to DYNEV to represent the reasonable responses of evacuees on the competing approaches. These green times are adjusted

during the iterative procedure described above until the queues on the competing approaches dissipate at comparable times; no attempt is made to "optimize" these inputs.

This adjustment of green times was undertaken by applying the I-DYNEV system as an analysis tool rather than as a single "pass-through" calculation of an ETE. This tool was used to identify points of congestion and locations where traffic control points (TCPs) could be helpful to the evacuating public. Detailed results of the simulation were analyzed to identify locations where the green time was specified to realistically service the competing traffic volumes under evacuation conditions. The model was executed iteratively to provide assurance that the allocation of "effective green time" appropriately represents the operating conditions of an evacuation.

The establishment of a TCP at an intersection could well provide greater operational performance than is represented by the calibrated DYNEV model. Thus, if all TCPs are manned in a timely manner by experienced personnel, it is possible that the ETEs predicted by the model and shown in Tables 7-1A, B, C, D of Section 7, may be somewhat longer than is achievable under these ideal circumstances. The ETEs represent reasonable, but not optimal expectations. Therefore, no allowance is made for TCP operations. The access control points (ACPs) are assumed to restrict and divert travelers who wish to travel through the EPZ, after 90 minutes following the Advisory to Evacuate (traffic along Interstate-85 is not stopped).

When there are competing traffic movements at an intersection or juncture, the real estate within the intersection must be time shared by these competing movements in order to afford safe passage. This is the situation during normal conditions as well. This process is implemented in the simulation model based in part on the allocation of effective green time as described above. Thus, depending upon circumstances, one or more of the competing traffic flows may be delayed at the intersection as it would be in the real world, thereby influencing the travel time of evacuees.

Associated Revision to the Lee Nuclear Station Evacuation Time Estimate Report:

None

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report or Emergency Plan:

None

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 025

NRC Technical Review Branch: Licensing and Inspection Branch (NSIR/DPR/LIB (EP))

Reference NRC RAI Number(s): 13.03-046

NRC RAI:

ETE-46:

For the trip generation time events and activities in Figure 5-1, "Events and Activities Preceding the Evacuation Trip," it appears that for scenarios (b) and (d), the assumption is 100% of the public is at home when the sirens sound. These scenarios correspond to weekend, midday, summer and evening, non-summer. The "trip generation time distribution" of Figure 5-3, "100% of Residents with Commuters," is about 230 minutes (3 hours and 50 minutes) [a similar result is given in Table 5-8]. Many of the ETE results presented in Table 7-1D, "Time to Clear The Indicated Area of 100 Percent of the Affected Population," are between 3:00 and 3:50 – these are all for weekend scenarios; Table 6-3, "Percent of Population Groups for Various Scenarios," indicates that 10% of households have commuters even on weekends. Explain the basis for not having a 'prepare to leave activity' and 'travel home' sequence for these scenarios.

Duke Energy Response:

The diagrams for scenarios (b) and (d) did not include those households with employees who work at those times. Figure 5-1 has been revised accordingly and is included as Attachment 1 to this response.

The basis for not having a 'prepare to leave activity' and 'travel home' sequence for several regions, for the weekend scenarios, was investigated. The very low number of vehicles generated over the last hour, were "lost" when converting to integer values used in the spreadsheet that compiles the DNYEV output. As an illustration, consider Region 1 and Scenario 3. For this case, two vehicles were generated during the final hour (3:00-4:00) at each of two origins. Since the model executed time-steps of 75 seconds, each time-step processed $1/24^{th}$ of a vehicle (75 sec/TS x 1 hr/3600 sec x 2 veh/hr = 1/24 veh per TS). This translates to $1/3^{rd}$ of a vehicle every 10 minutes (1/24 veh/TS x 1 TS/75sec x 60sec/1min x 10 min = 1/3 veh), which is the length of time that data are aggregated in the spreadsheet. Rounding $1/3^{rd}$ to the nearest integer yields zero.

To check this, a sensitivity study was conducted where the trips generated over the final hour were doubled. This produced 2/3 of a vehicle per 10 minutes, which was rounded to 1 vehicle. This sensitivity reflects the "trickle" of vehicles over the final period of evacuation. This difficulty is generally not present at the 90th and 95th percentile times. As a result, there is no need to modify the sequences.

The changes to Figure 5-1 will be included in a future revision to the ETE report.

Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and approval.

Associated Revision to the Lee Nuclear Station Evacuation Time Estimate Report:

Revise ETE Report (Rev. 1) Figure 5-1 "Events and Activities Preceding the Evacuation Trip"

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report or Emergency Plan:

None

Attachment:

Revised ETE Report (Rev. 1), Figure 5-1

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 1 to RAI 13.03-046

Revised ETE Report (Rev.1), Figure 5-1

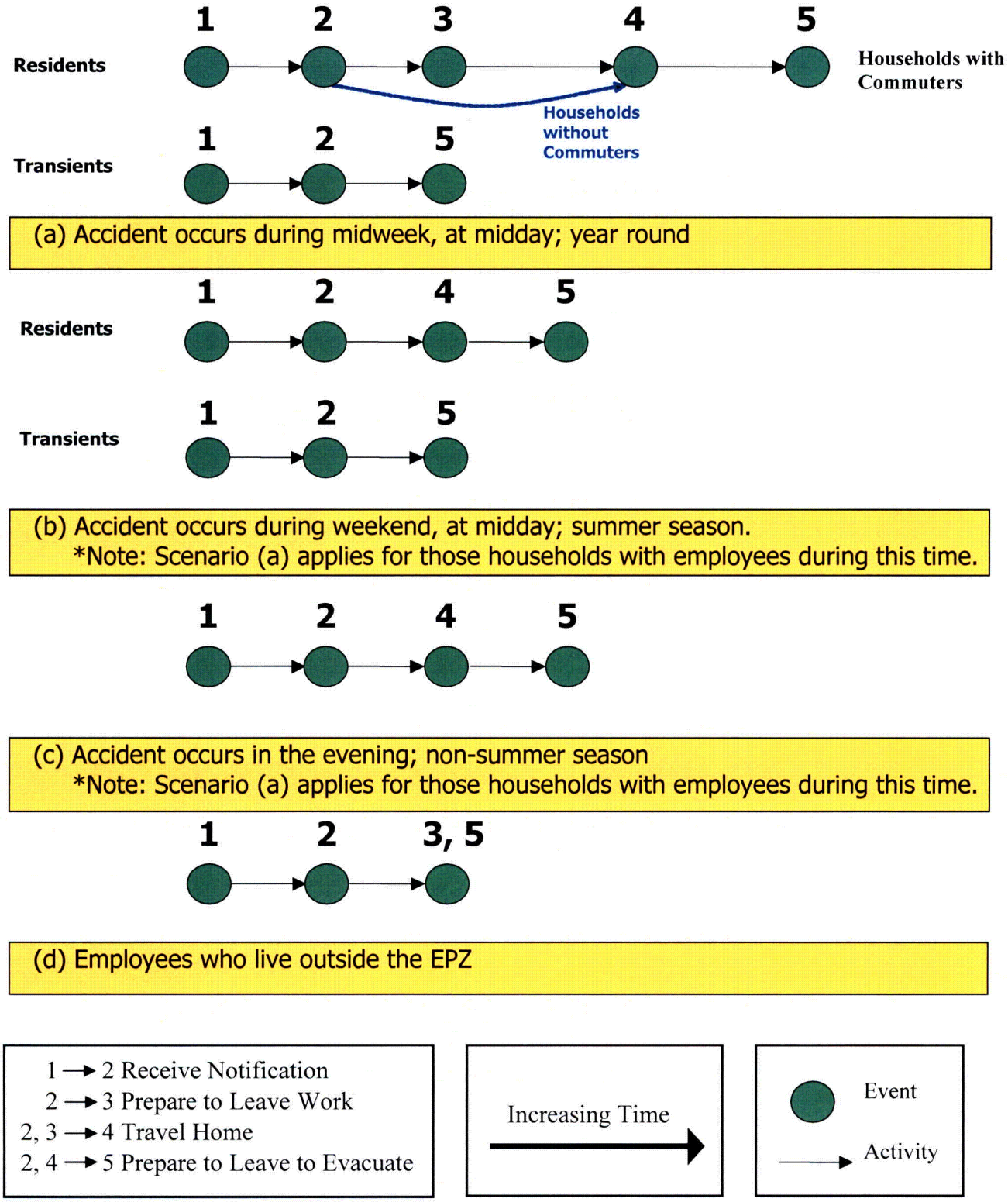

Figure 5-1. Events and Activities Preceding the Evacuation Trip

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 025

NRC Technical Review Branch: Licensing and Inspection Branch (NSIR/DPR/LIB (EP))

Reference NRC RAI Number(s): 13.03-053

NRC RAI:

ETE-53:

Appendix G, "Traffic Management Plan," refers to Table G-1 that summarizes the Traffic Control Points and the manpower and equipment needs. Explain why Table G-1, "*Tile Unknown*" was not included in the ETE submission.

Duke Energy Response:

ETE Table G-1 was not included in the submittal. The ETE Report (Rev. 1) calculations do not rely upon any traffic control measures described in Appendix G. The traffic control measures identified in Appendix G would act to reduce the overall evacuation time. While these measures are available, they were not credited in the determination of the ETE to ensure a conservative result. Table G-1, "Lee Traffic Control Point Summary," is included as Attachment 1 to this response.

Additionally, the title bars in Table G-2, "Traffic Control Points," have been revised and the modified table is included as Attachment 2 to this response.

Associated Revision to the Lee Nuclear Station Evacuation Time Estimate Report:

1. Revise ETE Report (Rev. 1) to add Table G-1 "Lee Traffic Control Point Summary"
2. Revise ETE Report (Rev. 1) Table G-2 "Access Control Points"

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report or Emergency Plan:

None

Attachments:

1. New ETE Report (Rev.1) Table G-1
2. Revised ETE Report (Rev. 1) Table G-2

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 1 to RAI 13.03-053

ETE Report (Rev. 1) Table G-1
Lee Traffic Control Point Summary

Table G-1. Lee Traffic Control Point Summary								
Cherokee County Traffic Control Points								
ERPA	TCP ID	Intersection Location	Town	Jurisdiction	Priority	# of Guides	# of Cones	# of Bar-ricades
H-2	H2-23	State Hwy 11 & I-85-South On/Off Ramps	Gaffney	City Police	1	2	0	12
H-2	H2-26	State Hwy 105 & I-85-South On/Off Ramps	Gaffney	S.C.H.P.	1	2	0	8
H-2	H2-27	State Hwy 105 & Peachoid Rd	Gaffney	S.C.H.P.	1	2	3	0
N/A	NW-06	US Hwy 11 & Old Post Rd	Gaffney	S.C.H.P.	1	2	4	0
A-2	A2-01	US Hwy 29 & N Charlestown St	Blacksburg	City Police	2	1	6	0
A-2	A2-02	US Hwy 29 & State Hwy 5	Blacksburg	City Police	2	1	6	0
A-2	A2-03	US Hwy 29 & State Hwy 5	Blacksburg	City Police	2	2	15	0
H-2	H2-01	State Hwy 18 & State Hwy 105	Gaffney	City Police	2	1	3	0
H-2	H2-03	State Hwy 18 & E Buford St	Gaffney	City Police	2	1	9	0
H-2	H2-06	E Frederick St & Petty St	Gaffney	City Police	2	1	6	0
H-2	H2-07-N	State Hwy 150 & W O'Neal St	Gaffney	City Police	2	1	3	0
H-2	H2-07-S	State Hwy 150 & E O'Neal St	Gaffney	City Police	2	1	3	0
H-2	H2-08	State Hwy 150 & E Buford St	Gaffney	City Police	2	2	6	0
H-2	H2-09	State Hwy 150 & E Floyd Baker Blvd	Gaffney	City Police	2	1	3	0
H-2	H2-10	State Hwy 150 & State Hwy 18	Gaffney	City Police	2	1	3	0
H-2	H2-11	US Hwy 29 & State Hwy 5	Gaffney	City Police	2	3	15	16
H-2	H2-12	US Hwy 29 & Buford St	Gaffney	City Police	2	2	9	0
H-2	H2-13	US Hwy 29 & Floyd Baker Blvd	Gaffney	City Police	2	2	6	0
H-2	H2-14	US Hwy 29 & State Hwy 18	Gaffney	City Police	2	2	6	0
H-2	H2-15	N Logan St & W Floyd Baker Blvd	Gaffney	City Police	2	1	9	0
H-2	H2-16	W Floyd Baker Blvd & W Frederick St	Gaffney	City Police	2	2	6	0
H-2	H2-21	State Hwy 11 & Ellis Ferry Ave	Gaffney	City Police	2	0	6	4
H-2	H2-22	State Hwy 11 & I-85-North On/Off Ramps	Gaffney	City Police	2	0	0	6
H-2	H2-25	State Hwy 105 & I-85-North On/Off Ramps	Gaffney	S.C.H.P.	2	0	0	12
H-2	H2-30	US Hwy 29 & State Hwy 18/150	Gaffney	City Police	2	2	6	0
H-2	H2-33	N Logan St & State Hwy 150	Gaffney	City Police	2	1	6	0
H-2	H2-35	N Logan St & State Hwy 18	Gaffney	City Police	2	2	15	0
H-2	H2-36	US Hwy 29 & State Hwy 329	Gaffney	S.C.H.P.	2	2	6	0
N/A	NE-01	Park Rd & State Hwy 161	Clover	S.C.H.P.	2	1	3	0
N/A	NW-04	S Green River Rd & Cannon Campground Rd	Gaffney	S.C.H.P.	2	1	6	0
N/A	NW-05	Old Post Rd & Nancy Creek Rd	Gaffney	S.C.H.P.	2	0	0	4
					Total Manpower/Equipment Needed:	42	169	62

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 2 to RAI 13.03-053

Revised ETE Report (Rev. 1) Table G-2
Traffic Control Points

Table G-2. Lee Access Control Point Summary						
Cheorkee County Access Control Points						
ACP ID	**Location**	**Town**	**Jurisdiction**	**Priority**	**No. of Guides**	**No. of Barricades**
Q4-01	Interstate 85-North & S Green River Rd	Macedonia	S.C.H.P.	2	0	8
Q3-04	US Hwy 29 & S Green River Rd	Thicketty	S.C.H.P.	2	2	2
Q3-03	State Hwy 150 & State Hwy 211	Pacolet Mills	S.C.H.P.	2	1	2
Cherokee County Total Manpower/Equipment Needed:					3	12
Gaston County Access Control Points						
Q1-02A	US Hwy 74-East & Interstate 85-South	Kings Mountain	S.C.H.P.	2	0	2
Q1-02B	Interstate 85-South (Exit 10A) & US Hwy 74-East	Kings Mountain	S.C.H.P.	2	0	0
Gaston County Total Manpower/Equipment Needed:					0	2
York County Access Control Points						
Q1-03	US Hwy 321 & State Hwy 55	Clover	City Police	2	2	2
Q1-04	US Hwy 321 & State Hwy 161	York	S.C.H.P.	2	2	8
Q2-01	State Hwy 161 Bypass & State Hwy 5	York	S.C.H.P.	2	2	4
York County Total Manpower/Equipment Needed:					6	14
Cleveland County Access Control Points						
Q1-01	US Hwy 29 & Margrace Rd	Archdale	S.C.H.P.	2	2	4
Q4-03	Main St & College Ave	Boiling Springs	City Police	2	1	2
Q4-04	State Hwy 18 & State Hwy 180	Earl	S.C.H.P.	2	1	4
Q4-05	State Hwy 180 & State Hwy 198	Patterson Springs	S.C.H.P.	2	1	2
Q4-06	State Hwy 180 & State Hwy 226	Patterson Springs	City Police	2	2	4
Cleveland County Total Manpower/Equipment Needed:					7	16
EPZ Total Manpower/Equipment Needed:					**16**	**44**