13.3C.18 Evacuation Time Estimate (ETE) Analysis

The PSEG Early Site Permit (ESP) Application Part 5, Emergency Plan includes an analysis of the time required to evacuate the plume exposure pathway emergency planning zone (EPZ) for various sectors and distances within the plume exposure pathway EPZ for transient and permanent populations. The report titled "PSEG Site Development of Evacuation Time Estimates," Revision 0, dated August 2009, (ETE Report) was provided as a separate document in the ESP application. The ETE Report is considered to be part of the PSEG Emergency Plan and is incorporated into the Emergency Plan as Attachment 11, "Development of Evacuation Time Estimates." The ETE Report provides the basis for the following discussion and analyses. At the direction of NRC staff, technical experts from Sandia National Laboratories reviewed the ETE Report, references, and supporting information and prepared a technical evaluation report containing the results of their review. The NRC staff and its contractors reviewed the applicants ETE Report for content and conformity to Appendix 4 to NUREG-0654/FEMA REP-1, Revision 1. The ETE Report and the technical evaluation report provide the basis for the following analysis. The NRC staff considered the contractors assessment in findings of acceptability and applicability in determining its conclusions of adequacy and compliance with the regulatory guidance.

The NRC staff reviewed the ETE Report against current NRC requirements and guidance for consistency with other parts of the COL Application, including the Site Safety Analysis Report (SSAR). Citations in the report were verified by comparison to the cited document text. General descriptions of the PSEG region, population, and highways were verified using internet searches and aerial photographs. The designated evacuation routes were reviewed to observe any impediments to evacuation, shoulder and lane width, and general road condition.

13.3C.18.1 Regulatory Basis for the ETE Analysis

The staff considered the following regulatory requirements and guidance in the review of the evacuation time estimate analysis:

10 CFR 52.79(a)(21) refers to Appendix E to 10 CFR 50 Section IV, of which "Content of Emergency Plans," requires, in part, that the nuclear power reactor operating license applicant provide an analysis of the time required to evacuate for various sectors and distances within the plume exposure pathway EPZ for transient and permanent populations.

The staff evaluated the ETE Report against Appendix 4, "Evacuation Time Estimates within the Plume Exposure Pathway Emergency Planning Zone," to NUREG-0654/FEMA-REP-1, Revision 1. Appendix 4 contains detailed guidance that the staff used in determining whether the ETE Report meets the applicable regulatory requirements in Appendix E to 10 CFR 50.

13.3C.18.2 Introductory Materials Related to the ETE Report

Technical Information in the ETE Report: [Section I of Appendix 4] Section 1.2, "The PSEG Site Location," includes a description of the PSEG site which is located on the southern part of Artificial Island on the east bank of the Delaware River in Lower Alloways Creek Township, Salem County, New Jersey. The EPZ consists of parts of Salem and Cumberland Counties in New Jersey and parts of New Castle and Kent Counties in Delaware. Figure 1-1, "PSEG Site Location," shows the plant location, EPZ boundary, and topographical features including the Delaware Bay, major roadways, and county boundaries. Section 1.2 explains that the ETE used the 12 existing Emergency

Response Planning Areas (ERPAs) and combined these, as appropriate, in the analysis into 'Regions' or groups of contiguous ERPAs. Appendix L, "ERPA Boundaries," identifies describes ERPAs 1 through 8 located in New Jersey and ERPAs A through D located in Delaware. The ERPAs are bounded by major roadways, the shoreline of the Delaware River, creeks, canals, railroads, and state and township lines.

Section 1, "Introduction," describes the approach used to develop information and calculate the evacuation times. Section 1 states that meetings were held with Delaware and New Jersey response agencies, and a field survey of the EPZ was conducted and archived. Section 1.1, "Overview of the ETE Process," briefly describes the information gathering process, development of trip generation times, defining of the evacuation scenarios, development of input data for the traffic modeling and explains how the modeling is applied. Section 1.3, "Preliminary Activities," explains that the IDYNEV traffic simulation modeling system was used in the analysis and references NUREG/CR-4873, "Benchmark Study of the IDYNEV Evacuation Time Estimate Computer Code," [2] and NUREG/CR-4874, "The Sensitivity of Evacuation Time Estimates to Changes in Input Parameters for the IDYNEV Computer Code," [3] for additional detail regarding the model. Appendix B, "Traffic Assignment Model," describes the trip assignment and distribution model and provides the algorithm used to compute the link travel time which was based on the Bureau of Public Roads formula. Appendix C, "Traffic Simulation Model: PC-DYNEV," describes the method and computer model used in analyzing the evacuation times and includes a description of histograms developed and used in the analysis. The overall study procedure is outlined in Appendix D, "Detailed Description of Study Procedure," which describes 17 steps that are undertaken in an iterative manner to produce the ETE. These steps are graphically displayed in Figure D-1, "Flow Diagram of Activities," which shows that after the roadway network is surveyed and the modeling network is developed, the trip assignment and distribution model is used to produce a traffic simulation input stream.

Section 2, "Study Estimates and Assumptions," lists assumptions for data estimates, methodology, and general study assumptions used in the development of the ETE. Section 2.1, "Data Estimates," describes the assumptions regarding population estimates which were projected from the 2000 U.S. Census data and states that estimates for special facilities were based on state emergency management information. Section 2.1 states that roadway capacity estimates were based on field surveys and the use of the Highway Capacity Manual [1]. Section 2.1 also explains the process for developing the automobile occupancy factors which used information obtained from a telephone survey of residents of the EPZ. A description of the telephone survey and the results are provided in Appendix F, "Telephone Survey." Section 2.2, "Study Methodological Assumptions," states that the ETE is assumed to begin at the Advisory to Evacuate and describes the assumptions regarding shadow evacuation and voluntary evacuation. A shadow evacuation of 30 percent of the public was assumed for areas beyond the 10 mile EPZ. A voluntary evacuation ranging from 35 percent to 50 percent was assumed for areas within the EPZ, but not under an evacuation order. Section 2.3, "Study Assumptions," states that it is assumed all residents evacuate and describes how the assumptions related to residents evacuating directly or returning home prior to evacuation were developed from the telephone survey. Section 2.3 also describes the assumptions regarding mobilization of schools buses, provisions for evacuating transit dependent persons, and also describes the assumptions regarding adverse weather. Section 2.3 Assumption 6, describes the assumptions regarding traffic control and

explains that the ETE results are conservative because they do not reflect the presence of traffic control. Table 7-1A, "Time to Clear the Indicated Area of *50* Percent of the Affected Population," shows that 50 percent of the entire EPZ can evacuate in about one hour, and the time to evacuate 100 percent of the population is shown to be about 4 hours in Table 7-1D, "Time to Clear the Indicated Area of *100* Percent of the Affected Population." Establishing traffic control throughout the 10 mile EPZ would likely take longer than an hour and would not be in place until the roadway network is loaded with vehicles; therefore, the effects of the traffic control would not be expected to have a significant effect on the ETE.

Adverse weather is considered in the analysis for all scenarios and for the special facility ETEs. Section 2.3 identifies the factors applied to the ETE for rain and snow. For rain, the highway capacity and free flow speed factors are each 90 percent. For snow, the highway capacity and free flow speed factors are each 80 percent. Section 2.3 references "Impacts of Weather on Urban Freeway Traffic Flow Characteristics and Facility Capacity," [4] which describes the affects of rain and snow on highway travel and was the basis for the factors used.

Technical Evaluation: [Section I of Appendix 4] The ETE Report includes a map showing the proposed site and plume exposure pathway EPZ, as well as transportation networks, topographical features, and political boundaries. The boundaries of the EPZ, in addition to the evacuation subareas within the EPZ, are based on factors such as current and projected demography, topography, land characteristics, access routes, and jurisdictional boundaries.

The ETE Report describes the method of analyzing the evacuation times. A general description of the evacuation model was provided including the assumptions used in the evacuation time estimate analysis.

13.3C.18.3 Demand Estimation

Technical Information in the ETE Report: [Section II of Appendix 4] Section 2.1, "Data Estimates," states that the population is based on the 2000 U.S. Census data and population estimates are extrapolated to 2010 using municipality specific data. Table 3.1, "EPZ Permanent Resident Population," presents the 2000 and 2010 populations by ERPA and shows a 26.4 percent growth in population within the EPZ has occurred over this time period. Section 2.1.3.1, "Resident Population within 10 Miles," of the Site Safety Analysis Report (SSAR) states that there were 33,871 people living within 10 miles of the plant in 2000, and the projected 2010 population provided in the SSAR is 42,743. In the ETE Report, Section 3.1, "Permanent Residents," states that the same methodology was used for developing the population values for the Safety Analysis Report and explains that any difference in population values is due to the use of a 10 mile boundary for estimating population in the Safety Analysis Report while the actual ERPA boundaries were used to develop populations for the ETE. Figure 6-1, "PSEG Site EPZ ERPAs," shows that many of the ERPAs include areas beyond 10 miles from the plant.

Section 3, "Demand Estimation," explains that double counting of people and vehicles is considered. Care was taken not to double count a resident who works and shops within the EPZ and not to double count transients who may stay in a hotel, visit a recreational area, or shop. Section 3.1 explains that number of evacuating vehicles was developed using the population information, number of people per household, and number of

evacuating vehicles per household. Table 3-3, "Permanent Resident Population and Vehicles by ERPA," shows a total of 20,801 vehicles needed to evacuate the 2010 population of 45,034. This corresponds to 2.16 persons per vehicle. Figure 3-2, "Permanent Residents by Sector," provides the population distribution using radial sectors projecting out from the plant.

Permanent residents without vehicles were addressed in the ETE Report. Section 8.1, "Transit-Dependent People – Demand Estimate," describes the process for estimating the number of residents who do not have an automobile available for evacuation. The estimate was based on information obtained from the telephone survey. The telephone survey, described in Appendix F, was conducted to obtain demographic data and found that approximately 3.5 percent of households do not have access to an automobile. The ETE also considers households with one vehicle when the commuter would not return prior to evacuating. The survey identified 65 percent of households in the EPZ have at least one commuter and 60 percent of those will await the return of the commuter before evacuating. Table 8-1, "Transit-Dependent Population Estimates," provides the information and calculation to show that 1,029 residents will require transportation.

Section 3, "Demand Estimation," defines transients as people who reside outside of the EPZ, enter the area for a specific purpose, and then leave the area. Section 3.2, "Transient Population," provides a detailed description of the facilities considered in the estimating of the transient population which included lodging facilities, marinas, wildlife areas, Fort Mott State Park, and Fort Delaware State Park. Section 3 explains that lodging facilities were surveyed to determine the number of rooms, percent occupancy, and number of vehicles per room. State parks were assumed to have a vehicle occupancy rate of 2.92 persons per vehicle which is consistent with the average household size within the EPZ. Approximately 30 recreational facilities were identified and are listed in Table E-5, "Recreational Areas within the PSEG Site EPZ." Table 3-4, "Summary of Transients and Transient Vehicles," provides the 2009 transient population and corresponding vehicles in each ERPA and shows a total 3,323 transients within the EPZ. Table 3-5, "Summary of Non-EPZ Employees and Employee Vehicles," provides the 2009 population and vehicles for commuting employees. Figure 3-4, "Transient Population by Sector," and Figure 3-6, "Employee Population by Sector," provide the population values by sector and distance from the plant for each of these demographic groups. Staff requested additional information in **RAI ETE-1** regarding why 2009 population values were used for the transient population. **[Response]** Table E-7, "Major Employers within the PSEG Site EPZ," lists a total of 5,918 employees working for large employers within the EPZ. Estimates of employees who commute into the EPZ to work are based on the state Journey to Work database for 2000, as explained in Section 2.1.

Research shows that the annual Olde Tyme Peach Festival is held in Middletown, Delaware and brings 27,000 people into town for the one day event. **RAI ETE-2** requested the applicant explain whether this event should be added as a special event within the EPZ. **[Response]**

Section 8, "Transit-Dependent and Special Facility Evacuation Time Estimates," describes the process for obtaining data regarding special facilities and schools which was performed on an institution-by-institution basis. The schools are included as a separate analysis. Appendix E, "Special Facility Data," provides information, at the facility level, for special facilities and schools. Table E-1, "Schools within the PSEG Site

EPZ," lists the name of each public and private school and identifies a total of 13,967 students and Table E-2, "Day Care Facilities within the PSEG Site EPZ," shows an enrollment of 1,503 children. Table 8-2, "School Population Demand Estimates," lists 15,059 students and includes all of the schools from Table E-1 and some schools from Table E-2. Staff requested additional information in **RAI ETE-3** regarding why only some of the Table E-2 schools were included. **[Response]** Table 8-2 lists 275 students at St. George's Technical High School, however the school's website shows 1,000 students enrolled at this school. **RAI ETE-4.A** requested clarification regarding the number of students used in the ETE analysis. **[Response]** Research shows St. Mary's School, Bacons Neck School, and Union School are located within the EPZ. **RAI ETE-4.B** requested the applicant explain whether these additional schools should be included in the ETE. **[Response]** Special facilities are shown on Figure E-2, "Day Care Centers, Medical Facilities, and Correctional Facilities within the PSEG Site EPZ." Figure E-2 and the mapping provided throughout the ETE Report are as good or better than USGS 7½-minute series quadrant maps.

Table E-3, "Medical Facilities and Assisted Living Facilities within the PSEG Site EPZ," lists 12 facilities with a total capacity of 463 residents. The number of wheelchair patients, bed-bound patients, and ambulatory patients is provided. Section 8.5, "Special Needs Population," describes the resources available and explains how the number of patients per vehicle was determined for ambulances, wheelchair vans and buses.

Section 8.6, "Correctional Facilities," states that there are two facilities located within the EPZ. Table E-4, "Correctional Facilities within the PSEG Site EPZ," provides information regarding the two correctional facilities and shows a total of 2,750 inmates. The two facilities are located beyond 10 miles from the PSEG site, but are located within ERPA B, in Delaware. Section 8.6 explains that the Standard Operating Procedure 1000-D of the Delaware Radiological Emergency Plan identifies shelter in place as the protective action for these facilities. Section 8.6 states that this protective action was confirmed in discussions with the Delaware Emergency Management Agency.

The subareas for which the ETEs are developed are listed in Section 6, "Demand Estimation for Evacuation Scenarios," and are described in detail in Appendix L. Section 6 describes how the ERPAs are grouped into regions to calculate the ETEs. Figure 6-1, "PSEG Site EPZ ERPAs," identifies the plant location, EPZ boundary and the ERPAs. ERPAs 1 through 8 are located in New Jersey and ERPAs A through D are located in Delaware. The protective action areas, for which evacuation time estimates are provided, encompass the entire area within EPZ and are based upon the same factors as the EPZ boundary. The ETEs were developed considering that evacuation movements are generally outbound relative to the power plant as described in Section 2.2, "Study Methodological Assumptions."

Technical Evaluation: [Section II of Appendix 4] The ETE Report provides an estimate of the number of people who may need to evacuate. Three population segments are considered: permanent residents, transients, and persons in special facilities. The permanent population is adjusted for growth, and the population data is translated into two groups: those using automobiles and those without automobiles. The number of vehicles used by permanent residents is estimated using an appropriate automobile occupancy factor. Evacuation time estimates for simultaneous evacuation of the entire plume exposure pathway EPZ were determined.

Estimates of transient populations are developed using local data including peak tourist volumes and employment data. Estimates for special facility populations are also provided.

The subareas, for which evacuation time estimates were determined, encompass the entire area within the plume exposure EPZ. The maps are adequate for the purpose, and the level of detail is approximately the same as United States Geological Survey (USGS) quadrant maps. The assumptions on evacuation are based on simultaneous evacuation of inner and outer sectors.

The staff has reviewed the PSEG ETE Demand Estimation. Final determination regarding this section will be based on the applicant's response to **RAI ETE-1 through 4.**

13. 3C.18.4 Traffic Capacity

Technical Information in the ETE Report: [Section III of Appendix 4] Section 4, "Estimation of Highway Capacity," describes the method for estimating highway capacity and provides the algorithm and equation used for the lane capacity for the approach to an intersection. Appendix D, "Detailed Description of Study Procedure," identifies the steps to perform the evacuation time estimate calculations. Section 4.1, "Capacity Estimations on Approaches to Intersections," describes the approach to analyzing signalized intersections and provides a description of each of the parameters used in the analysis. Section 5, "Estimation of Trip Generation Time," describes the process of combining distribution functions to establish the time-dependent traffic loading. Together these sections describe how the data obtained in other sections of the ETE Report are integrated into the calculation to produce the ETE.

Evacuation routes are illustrated on Figures 10-2, "Evacuation Route Map for the Northeastern Quadrant of the EPZ (ERPAs 1-5)," and subsequent Figures 10-3 through 10-5. These maps provide roadway level detail of the evacuation routes and show that the entire roadway network was used in the analysis. The maps also show the travel direction of evacuees which is generally away from the plant. Appendix K, "Evacuation Roadway Network," provides legible maps that show the nodal network covering the full EPZ. These maps also show the county and ERPA boundaries.

The nodal network maps in Appendix K are correlated to Table K-1, "Evacuation Roadway Network Characteristics," which lists the upstream and downstream node numbers for each segment, the length of the roadway segment, the number of lanes in the direction of travel, the saturation flow rate, and the free flow speed. The information provided within Table K-1 was reviewed by staff to determine where roadways are not uniform or where impediments may affect the roadway capacity. For instance, from Upstream Node 103 to Downstream Node 99, there are two lanes with a free flow speed of 60 mph and a saturation flow rate of 2250 vehicles per hour. From Upstream Node 103 to Downstream Node 109, there is one lane with a free flow speed of 20 mph and a saturation flow rate of 1200 vehicles per hour. Further review of this node sequence using the nodal maps provided shows that link 103 to 109 is an onramp to a cloverleaf intersection, which explains why the saturation flow and speed changed considerably at this location. There are 5 lanes identified in one direction between nodes 872 and 112. Review of the corresponding mapping shows that there is an acceleration lane on the interstate at this point which is the reason for the number of lanes.

Traffic queuing and congestion areas are presented in Figure 7-3, "Areas of Traffic Congestion *1 Hour* after the Advisory to Evacuate, (Scenario 6, Region 03)," and are presented at 2 hours and 2.5 hours in Figures 7-4 and 7-5 respectively. As indicated in Figure 7-3, the availability of many roadways results in only a few relatively short roadway segments that operate at a Level of Service F. A Level of Service F, which indicates heavy congestion [1] is observed in a few areas dispersed throughout the EPZ. Most of the roadways show little or no congestion throughout the evacuation.

One area where congestion is identified is within Salem City. Section 7.2, "Patterns of Traffic Congestion During Evacuation," explains that congestion builds quickly around concentrations of population and traffic bottlenecks and states that residents of Salem City are limited to two evacuation routes. Figure 10-2, "Evacuation Route Map for the Northeastern Quadrant of the EPZ (ERPAs 1-5)," shows travel along Route 49 coming into Salem City from the East and shows travel exiting Salem City on Route 49 to the north and out of the EPZ. **RAI ETE-5** requested additional information regarding the direction of travel on Route 49. **[Response]**

Appendix G, "Traffic Management Plan," provides a traffic control plan that would be beneficial in the evacuation and states that the traffic management plan should be reviewed by state and county emergency planners with local and state police. Appendix G explains that the State of New Jersey and State of Delaware have existing traffic control plans which would be used in the event of an evacuation. Additional information was requested in **RAI ETE-10** regarding whether the ETE study has been reviewed by local stakeholders and whether comments received have been addressed. **[Response]**

Technical Evaluation: [Section III of Appendix 4] The ETE Report provides a complete review of the evacuation road network. Analyses are made of travel times and potential locations for congestion. The effect of implementation of traffic control plans is described. In addition, all evacuation route segments and their characteristics, including capacity, are described.

A traffic control and management strategy that is designed to expedite the movement of evacuating traffic is described. The applicant also analyzed travel times and potential locations for serious congestion along the evacuation routes.

The staff has reviewed the PSEG ETE Traffic Capacity analysis. Final determination regarding this section will be based on the applicant's response to **RAI ETE-5 and RAI-ETE-10.**

13. 3C.18.5 Analysis of Evacuation Times

Technical Information in the ETE Report: [Section IV of Appendix 4] The methodology employed in the analysis is the summation of distribution functions. Section 5, "Estimation of Trip Generation Time," provides a detailed discussion regarding the development of time dependent traffic loading for population segments and explains that the information required to develop the trip generation times was obtained from the telephone survey conducted of residents within the EPZ. Section 5 describes the time distributions developed for commuters departing place of work, commuters arriving home, residents with commuters leaving home to begin the evacuation trip, and residents without commuters returning home to begin the evacuation trip. Figure 5-3, "Comparison of Trip Generation Distributions," provides the trip generation distributions for employees and transients, residents with commuters,

residents without commuters, residents with no commuters with snow, and residents with commuters with snow. Figure 5-3 is in the form of an S-shape curve and indicates that the trip generation time for residents with commuters is the longest at about 6 hours.

Section 5 identifies fundamental considerations which are identified as event descriptions including Notification, Aware of Situation, Depart Work, Arrive Home, and Depart on Evacuation Trip. Table 5-1, "Event Sequence for Evacuation Activities," relates the events with activities that include Receive Notification, Prepare to Leave Work, Travel Home, Prepare to Leave to Evacuate, and Snow Clearance for selected scenarios. Figure 5-1, "Events and Activities Preceding the Evacuation Trip," shows the relationship and various combinations of these events and activities.

Evacuation time estimates are developed for the 15 scenarios identified in Table 6-2, "Evacuation Scenario Definitions," which also identifies the season, day of week, time of day, weather, and special conditions. The special condition identified is new plant construction. Additional scenarios are developed for a proposed Causeway and for Refueling. The critical assumptions regarding the population and vehicle demand estimates applied to each evacuation scenario are described under Table 6-3, "Percent of Population Groups Evacuating for Various Scenarios." Table 6-3 identifies the population percentage for residents with commuters, residents without commuters, employees, transients and shadow evacuees that evacuate for each of the 15 scenarios. The assumptions identify that 1 bus equals 2 passenger vehicles and external traffic is stopped 90 minutes after the evacuation begins. The evacuation model PC-DYNEV was then used to calculate on road travel and delay times.

Section 8.1, "Transit Dependent People – Demand Estimate," describes the process used to estimate the portion of the population requiring transit service (e.g., non car owning population) and explains why it is appropriate to consider that many non car-owning persons will evacuate by ride sharing. The widely studied Mississauga, Ontario evacuation was referenced as the basis for assuming that 50 percent of non car-owning residents will ride share. During the Mississauga evacuation, which was an urban evacuation, a high number of residents did ride share to evacuate. [5] Section 8.1 then states that other documents report that approximately 70 percent of transit dependent persons were evacuated via ride sharing and references NUREG/CR-6953 Volume 2, "Review of NUREG-0654, Supplement 3, 'Criteria for Protective Action Recommendations for Severe Accidents' – Focus Groups and Telephone Survey." In review of NUREG/CR-6953, Volume 2, [6] staff found a statement that 72 percent of respondents were likely to provide a ride to individuals, but found no indication of an incident in which 70 percent of transit dependent persons were evacuated using ride-share. In **RAI ETE-6**, staff requested clarification regarding the reference to NUREG/CR-6953. **[Response]**

Table 8-1, "Transit-Dependent Population Estimates," provides an analysis of the population requiring public transit and shows that 2,058 residents may need assistance. Assuming that 50 percent rideshare, then 1,029 residents will require public transportation to evacuate. The State of New Jersey Radiological Response Plan for Nuclear Power Plants, Table A-8, "Transit Dependent Population General," also identifies the number of persons without autos and provides a value which is less than that in the ETE Report. The values are not significantly different. The source of the information for the state plan was the 2000 U.S. Census. Section 8.1 includes an algorithm used to calculate the estimated number of bus trips to service the transit

dependent persons based on an occupancy of 30 persons and identifies the need for 34 bus runs. Section 8.4, "Evacuation Time Estimates for Transit-Dependent People," describes the analysis for the transit dependent ETE and explains that school buses will be used to service the transit dependent evacuees. These school buses will be deployed to evacuate the transit dependent people beginning approximately 105 minutes after the advisory to evacuate. A pickup time of 30 minutes is estimated to complete 30 individual bus stops. The travel speed used in the calculation was derived from the model and is 14.72 mph at this time during the evacuation.

The bus routes for the transit dependent population are presented in Appendix M, "Transit-Dependent Bus Routes." The routes for Delaware were obtained from the Delaware State Plan and the New Jersey routes represent the most likely routes to be used. Table 8-8.A, "Transit Dependent Evacuation Time Estimates – Good Weather," provides the ETE for each bus route and shows the average ETE for a single wave is 3 hours, which is less than the ETE for the general public. Table 8-8.B, "Transit-Dependent Evacuation Time Estimates – Rain," provides the ETE for each bus route under adverse conditions.

Section 8.5, "Special Needs Population," discusses the resources and activities needed to evacuate homebound special needs persons. Section 8.5 states there are 16 homebound special needs persons identified within the Delaware portion of the EPZ and 34 people within the New Jersey portion of the EPZ. All of the Delaware special needs residents and 11 of the New Jersey residents require wheelchair van transportation. Two people in New Jersey require an ambulance and 21 require a bus to evacuate. The State of New Jersey Radiological Response Plan, Table B-2, "Non-Institutionalized Special Needs Population within the Emergency Planning Zone by Zip Codes," identifies special needs residents that may need assistance evacuating and lists 21 residents in Lower Alloways Creek, 10 in Elsinboro, 91 in Salem City, 15 in Quinton, 2 in Mannington, and 1 in Pennsville for a total of 140 residents in New Jersey. Table B-2 states that the licensee, in cooperation with State Office of Emergency Management, maintains a computer tracking system of this information provided by annual surveys which are mailed back to the agency. In **RAI ETE-7**, staff requested additional information regarding the special needs population that may need assistance evacuating. **[Response]**

Section 8.4, "Evacuation Time Estimates for Transit-Dependent People," describes the resources and activities considered in development of the ETE for the school population. Loading time distributions for school and special facility analyses included mobilization of resources and considers the traffic on the roadway at the time that these facilities begin evacuating. Table 8-6A, "School Evacuation Time Estimates – Good Weather," provides the ETE for each school on an individual basis. Table 8-6B, "School Evacuation Time Estimates – Rain," provides the ETE under adverse weather conditions. The ETE for this population group does not exceed the ETE for the general population. Section 8.4 explains that the Appoquinimink School District in Delaware and Salem City Schools in New Jersey do not have sufficient bus resources to evacuate school children in a single wave. Section 8.4 explains these schools will be assisted through a Memoranda of Understanding and Mutual Aid Agreements outlined in the State of New Jersey Radiological Emergency Response Plans. The State of Delaware Radiological Emergency Plan identifies a Mutual Aid Agreement with the State of New Jersey. In **RAI ETE-8**, staff requested information regarding whether the mobilization time is the same for buses deployed under the MOU. **[Response]**

A list of special facilities is provided in Table 8-4, "Special Facility Transit Demand." The capacity, current census and types of resource required to evacuate residents is provided. Section 8.4 describes the bus operations and logistics as similar to those for school evacuations except that buses are assigned 30 patients to also accommodate staff, and the passenger loading time is longer. The bus mobilization time, loading time, and travel time are added and an ETE of 3 hours 35 minutes is provided, which is less than the ETE for the general public.

Section 8.6 identifies two correctional facilities within the EPZ located immediately beyond the 10 mile boundary, but within Delaware ERPA B. Section 8.6 states that Standard Operating Procedure 1000-D of the Delaware Radiological Emergency Plan identifies shelter in place as the protective action for these facilities, and that this protective action was confirmed in discussions with the Delaware Emergency Management Agency.

The PSEG ETEs are provided for 15 scenarios and 17 regions in Table 7-1D, "Time to Clear the Indicated Area of *100* Percent of the Affected Population." Table 7-1D includes ETEs for good weather, rain and snow, various times of day, and summer and winter seasons. Table 7-1C, "Time to Clear the Indicated Area of *95* Percent of the Affected Population," shows that the time to evacuate the 5 mile ring is less than the time to evacuate the 2 mile ring. In **RAI ETE-9**, staff requested additional information regarding the evacuation time difference between Region 01 and Region 02. **[Response]** Maximum ETEs are provided for special facilities and schools in Section 8, including the assessment of second waves of evacuation when necessary. The evacuation times for these population groups do not exceed the ETE for the general population.

Technical Evaluation: [Section IV of Appendix 4] A total of 255 evacuation cases were computed for the evacuation of the general public. Each evacuation time estimate quantifies the aggregate evacuation time estimated for the population within one of the 17 evacuation regions to completely evacuate from that area, under the circumstances defined for one of 15 evacuation scenarios (17 x 15 = 255).

Distribution functions for notification of the various categories of evacuees were developed. The distribution functions for the action stages after notification predict what fraction of the population will complete a particular action within a given span of time. There are separate distributions for auto-owning households, school population, and transit-dependent populations. These times are combined to form the trip generation distributions.

On-road travel and delay times are calculated. An estimate of the time required to evacuate a particular segment of the non-auto-owning population dependent upon public transportation is developed.

The staff has reviewed the PSEG ETE Analysis of Evacuation Times. Final determination regarding this section will be based on the applicant's response to **RAI ETE-6 through 9.**

13.3C.18.6 Other Requirements

Technical Information in the ETE Report: [Section V of Appendix 4] Section 12, "Confirmation Time," describes the use of stratified random sample and a telephone survey to confirm the evacuation is complete. Section 12 explains that the confirmation process should start approximately 3 hours after the advisory to evacuate, which is when 90 percent of evacuees would be expected to have completed their mobilization activities. Section 12 states that approximately 7.5 man hours are needed to complete the survey, and this could be completed in about 75 minutes if 6 individuals were assigned to the task.

Appendix I, "Evacuation Sensitivity Studies," includes an ETE that was calculated assuming that an additional travel lane would be added to the existing site access road. An analysis was run for the peak construction scenario, and the results showed that there was no effect on the ETE.

Section 13, "Observations," explains that examination of the general population ETEs shows that the ETE for 100 percent of the population is generally 3 to 3.5 hours longer than the ETE for the 90 percent population. This time difference is due to the lengthy time that residents expect it will take to pack, secure the home, and ready themselves to evacuate. It is suggested in Section 13, that public outreach should emphasize the need for evacuees to minimize the time needed to prepare to evacuate.

Section 1.1, "Overview of the ETE Process," states that local and state police should review all traffic control plans and Section 13, "Observations," states that the traffic management plan should be reviewed by state and county emergency planners and local and state police. Additional information was requested in **RAI ETE-10** regarding whether the ETE Report has been reviewed by local stakeholders and whether comments received have been addressed. **[Response]**

Technical Evaluation: [Section V of Appendix 4] The time required for confirmation of evacuation was estimated. The staff has reviewed the PSEG ETE Other Requirements. Final determination regarding this section will be based on the applicant's response to **RAI ETE-10.**

13.3C.18.7 Conclusions

On the basis of the above information, the ETE Report is unacceptable and does not meet the applicable requirements of 10 CFR 50, Appendix E.IV.

References:

[1] Transportation Research Board (2000). "Highway Capacity Manual," National Research Council. Washington D.C.

[2] NUREG/CR-4873, "Benchmark Study of the IDYNEV Evacuation Time Estimate Computer Code." Washington D.C. NRC.

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