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**Joseph A. Jones**  
Distinguished Member of Technical Staff  
Radiological Consequence Mgmt & Response Technologies

July 29, 2010

Steve LaVie, NRC  
MS: T3B46M  
11555 Rockville Pike  
Rockville, MD 20852

Dear Mr. LaVie,

Subject: JCN No: 4201, (TAC No. ME0853) Q4011 Task Order Number 9, Tennessee Valley  
Authority, Watts Bar Unit 2. Evacuation Time Estimate (ETE) Review

We have completed our review of the applicant's July 15, 2010 response to **ETE RAIs 13 thru 22** regarding the Watts Bar Unit 2 evacuation time estimate and find the additional information and clarifications provided by the applicant in response to **RAI-13 and RAIs 15 thru 22** to be **acceptable**. In response to **RAI-14**, the applicant provided data for residents of special facilities; however, the intent of **RAI-14** was to ascertain information regarding transportation dependent people who do not reside in special facilities. **Open Item RAI ETE-1** was prepared requesting the number of transportation dependent people not residing in special facilities, and the number of buses or additional resources needed to evacuate these people, be provided.

In the response to the RAIs, the applicant clarified that 30 mph was the typical speed used in the analysis. The applicant provided the special facility and school populations, described the transportation resources needed, and described agreements in place for additional resources if needed to support an evacuation. The applicant provided a map of the EPZ that shows the location of special facilities. The applicant provided total vehicle values for the roadway segments and explained that when demand exceeds capacity on a roadway segment, a headway discharge time of 3.5 seconds was applied to those vehicles that form the queue to account for any delay. The applicant explained the difference in ETE information between Tab F, "Distribution Times for EPZ Evacuation," and Tab G, "Summary of Evacuation Time Analysis," is because Tab G values include an additional 120 minutes for residents who work in Chattanooga to drive home. The applicant clarified the routes that evacuate separately (e.g., those near the periphery of the EPZ) and explained the vehicles were not deducted from the total amount used in the ETE. The applicant provided an expanded description of the process used for developing the evacuation times. The applicant clarified the activities for permanent and transient population in Tab G are the same and include preparation time (150 minutes for the permanent population and 30 minutes for the transient population), leaving the sector, and evacuation of the EPZ.

The response to the RAIs discussed above did not result in a change to the time values in the ETE and did not require additional analyses; therefore, no confirmatory actions have been

established. As indicated above, one Open Item remains. A more detailed evaluation of the review of responses to RAIs is attached. Please let me know if you have any questions or need any additional information regarding this project.

Sincerely,

A handwritten signature in black ink, appearing to read "Joe Jones". The signature is fluid and cursive, with the first name "Joe" and last name "Jones" clearly distinguishable.

Joe Jones, Project Manager  
Distinguished Member of Technical Staff  
Radiological Consequence Management  
and Response Department

CC  
Annette Stang, NRC

**Attachment A**  
Technical Evaluation Report Support Information  
Tennessee Valley Authority  
Watts Bar Nuclear Plant - Unit 2, Docket No. 50-391  
SRP Section: 13.03 - Emergency Planning  
Application Section: Part 5: Emergency Planning

In response to **RAI-13** regarding whether different travel speeds were assumed in the analysis, the applicant explained that Section III, "Assumptions," Item D, refers to 20 mile per hour (mph) speeds on major evacuation routes, and the response states this value should read "30 mph." The applicant explained that Section IV, "Methodology," Item C, refers to 30 mph speeds to determine travel times on the major routes and the 30 MPH speed was used in the analysis. The staff finds the additional information provided by the applicant in response to **RAI-13** to be **acceptable**.

The response to **RAI-14** provided the number of transportation dependent people and resources required for evacuation for those people residing in special facilities; however, the intent of **RAI-14** was to ascertain the number of transportation dependent people who do not reside in special facilities. **Open Item RAI ETE-1** requests that the number of transportation dependent people and the resources required to evacuate these people be provided for transportation dependent people who do not reside in special facilities.

In response to **RAI-15.A** which requested information regarding special facilities, the applicant provided the special facility population including:

- Brookwood Nursing Center - 73 residents,
- Spring City Health Care Nursing Home - 126 residents,
- Golden Years Retirement Resort - 12 residents, and
- Meigs County Criminal Detention Center - average of 50 to 60 inmates.

The staff finds the additional information provided by the applicant in response to **RAI-15.A** to be **acceptable**.

In response to **RAI-15.B** which requested a description of transportation resources, the applicant explained that agreements are in place to provide school buses for the Spring City Health Care Nursing Home and Golden Years Retirement Resort in Rhea County. The response states that Rhea County Emergency Medical Services (EMS) also has 8 ambulances available. The response explains that these facilities have a Memorandum of Understanding (MOU) in place with Southeast Tennessee Human Resource Agency for wheel chair vans. The response states that there are 5 wheelchair accessible buses and 2 ambulances available to support evacuation of the Brookwood Nursing Center in Meigs County, and evacuation of the detention facility requires 2 buses. The response explains that Meigs County and Rhea County EMS have MOUs with surrounding EMS units that would provide access to an additional 23 EMS units to move patients, if needed. The staff finds the additional information provided by the applicant in response to **RAI-15.B** to be **acceptable**.

In response to **RAI 15.C**, the applicant provided a map of the EPZ that shows the Brookwood Nursing Center, Spring City Health Care Nursing Home, and Golden Years Retirement Resort. Review of the Meigs County Criminal Detention Center shows that it is located in Decatur. The staff finds the additional information provided by the applicant in response to **RAI-15.C** to be **acceptable**.

In response to **RAI 16.A**, the applicant provided a revised Tab E, "Roadway Characteristics," that clarifies the distances for 0-2 miles, 2-5 miles, and 5-10 miles under the Column "Evac Demand Total Permanent/Transient Vehicles," and provided vehicle values for the roadway segments. The vehicles for the columns are shown as 0-2 miles (730 vehicles), 2-5 miles (7869 vehicles), and 5-10 miles (11958 vehicles) for a total of 20,557 vehicles. The staff finds the additional information provided by the applicant in response to **RAI-16.A** to be **acceptable**.

In response to **RAI 16.B**, the applicant explained how the time delay was calculated when demand exceeds capacity on roadway segments. The response states that when demand exceeds capacity, a headway discharge time is applied to those vehicles that form the queue. For each vehicle in the queue, a headway discharge time of 3.5 seconds is applied to each vehicle to account for delay. The 3.5 second headway is a reasonable value and is slightly less than observed saturation flow rates identified in Chapter 8, "Traffic Characteristics," of the Highway Capacity Manual, 2000<sup>1</sup>. The staff finds the additional information provided by the applicant in response to **RAI-16.B** to be **acceptable**.

In response to **RAI 16.C**, the applicant explained that only one evacuation route was over capacity for a period of 1.5 hours. The capacity for Segment A-2 is 1,437 vehicles for 1.5 hours. Using the information from Tab E, "Roadway Characteristics," the demand for Segment A-1 in the 5-10 Mile area is 2,210 for this 1.5 hour period. The difference between capacity and demand is multiplied by 3.5 seconds which corresponds to 45 minutes which is approximately the delay identified in Tab E. The staff finds the additional information provided by the applicant in response to **RAI-16.C** to be **acceptable**.

In response to **RAI-17**, the applicant explained that there is a difference in ETEs between Tab F, "Distribution Times for EPZ Evacuation," and Tab G, "Summary of Evacuation Time Analysis," because the Tab G ETE assumes some residents work in Chattanooga and an additional time allowance of 120 minutes was included to account for the drive home. The 120 minutes accounts for the difference between the Tab G and Tab F ETE values. The staff finds the additional information provided by the applicant in response to **RAI-17** to be **acceptable**.

In response to **RAI-18.A**, the applicant explained that the routes identified as "OUTSIDE" in Tab E represent the vehicles that were considered to evacuate separately. In response to **RAI-18.B**, the applicant explained that these populations were not deducted from the remaining ETE analysis presented in Tab F. The staff finds the additional information provided by the applicant in response to **RAI-18.A** and **RAI-18.B** to be **acceptable**.

In response to **RAI-19.A**, the applicant explained that Fairview Christian Academy is located outside of the EPZ and is therefore not included in the ETE. The applicant explained that the Spring City Christian Academy has an evacuation plan that utilizes the school multi-passenger van and parents. The response states the school has an MOU with Rhea county for additional buses if necessary. In response to **RAI-19.B** the applicant stated that the Meigs County Schools have 24 buses scheduled for evacuation which would include 8 buses at Meigs North, 9 buses at the High School, and 7 buses at the Middle School. This includes one handicap bus per building for a total of 24 buses. This would leave 4 spare buses at the bus garage. The response states that the County has determined the available buses are more than adequate. The staff finds the additional information provided by the applicant in response to **RAI-19.A** and

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<sup>1</sup> Transportation Research Board (2000). "Highway Capacity Manual," National Research Council, Washington D.C.

**RAI-19.B** to be **acceptable**.

In response to **RAI-20**, the applicant expanded upon the description of the process for developing the evacuation times. The process included a 150 minute preparation time, use of 20 mph for the highest sector evacuation time, and use of 30 mph for major route travel times. For any roadway segment where vehicle demand is greater than roadway capacity, a 3.5 second headway, per vehicle, was applied to account for the delay. The 3.5 second headway is slightly less than observed saturation flow rates identified in Chapter 8, "Traffic Characteristics," of the Highway Capacity Manual, 2000<sup>2</sup>. Use of a 3.5 second headway discharge time for the traffic volumes in the analysis is appropriate and would result in a slightly conservative ETE. The staff finds the additional information provided by the applicant in response to **RAI-20** to be **acceptable**.

In response to **RAI-21**, the applicant explained that for Section III, "Assumptions," Item E, the permanent population preparation time of 105 minutes was incorrect and should read 150 minutes preparation time. The response explains that Tab G, "Summary of Evacuation Time Analysis," used 150 minutes preparation time in the analysis. The staff finds the additional information provided by the applicant in response to **RAI-21** to be **acceptable**.

In response to **RAI-22**, the applicant explained that the activities for the "Permanent Population Response Normal Conditions," and "Transient Population Response Normal Conditions," are the same. These activities include preparation time, leaving the sector, and evacuation of the EPZ by way of a major evacuation route or proceeding directly outside the EPZ. The response states that the preparation time for the permanent population is 150 minutes and for the transient population is 30 minutes. The staff finds the additional information provided by the applicant in response to **RAI 22** to be **acceptable**.

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<sup>2</sup> Transportation Research Board (2000). "Highway Capacity Manual," National Research Council, Washington D.C.