



Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

March 4, 2013

10 CFR 50.4  
10 CFR 50, Appendix E

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

Browns Ferry Nuclear Plant, Units 1, 2, and 3  
Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68  
NRC Docket Nos. 50-259, 50-260, and 50-296

Subject: Evacuation Time Estimates Checklist

Reference: 1. Tennessee Valley Authority (TVA) letter to NRC, "Evacuation Time Estimates," dated December 18, 2012  
2. NUREG/CR-7002, "Criteria for Development of Evacuation Time Estimate Studies," published November 2011

The purpose of this correspondence is to provide supplemental information regarding evacuation time estimates previously provided by TVA as requested by the Nuclear Regulatory Commission (NRC).

By letter dated December 18, 2012 (Reference 1), TVA provided the analysis supporting Evacuation Time Estimates (ETE) for Browns Ferry Nuclear Plant (BFN). In a telephone call on February 1, 2013, the NRC requested copies of the checklist from Appendix B of NUREG/CR-7002 (Reference 2), "Criteria for Development of Evacuation Time Estimate Studies," associated with the analysis. In addition, the NRC requested confirmation that the analysis does not include information subject to withholding from public disclosure in accordance with Title 10 of the Code of Federal Regulations (10 CFR), Section 2.390, "Public inspections, exemptions, requests for withholding."

The enclosure to this letter provides a copy of the completed checklist. Additionally, TVA confirms that the information provided in the ETE analysis for BFN is not exempt from public disclosure in accordance with 10 CFR 2.390.

AK45  
HRR

U.S. Nuclear Regulatory Commission

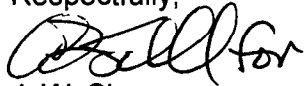
Page 2

March 4, 2013

TVA informed the NRC that this information will be provided within 30 days. Accordingly, the due date for this submittal is March 4, 2013, since March 3 falls on a Sunday and the next business day is March 4.

There are no new regulatory commitments in this letter. Should you have any questions or if additional information is needed regarding this submittal, please contact Mr. Walter H. Lee, Senior Emergency Preparedness Manager, at (423) 751-8577.

Respectfully,



J. W. Shea

Vice President, Nuclear Licensing

Enclosure:

Table B-1 Evacuation Time Estimate (ETE) Review Criteria Checklist - Browns Ferry

cc (Enclosure):

NRC Regional Administrator - Region II

NRC Senior Resident Inspector - Browns Ferry Nuclear Plant

**Enclosure 1  
Tennessee Valley Authority  
Browns Ferry Nuclear Plant  
Units 1, 2, and 3**

**Table B-1 Evacuation Time Estimate (ETE) Review Criteria Checklist - Browns Ferry**

---

(See Attached)

Table B-1 ETE Review Criteria Checklist

Browns Ferry

	Criterion Addressed in ETE Analysis (Yes/No)	Comments
<b>1.0 Introduction</b>		
a. The emergency planning zone (EPZ) and surrounding area should be described.	yes	Sect 1.2
b. A map should be included that identifies primary features of the site, including major roadways, significant topographical features, boundaries of counties, and population centers within the EPZ.	yes	Figures 1-1,1-2, and 1-3
c. A comparison of the current and previous ETE should be provided and includes similar information as identified in Table 1-1, "ETE Comparison," of NUREG/CR-7002.	yes	Table 1-3
<b>1.1 Approach</b>		
a. A discussion of the approach and level of detail obtained during the field survey of the roadway network should be provided.	yes	Section 4.3 and Appendix D
b. Sources of demographic data for schools, special facilities, large employers, and special events should be identified.	yes	Sect. 2.1, Sect. 3
c. Discussion should be presented on use of traffic control plans in the analysis.	yes	Sect 2.1
d. Traffic simulation models used for the analyses should be identified by name and version.	yes	Sect 5.5.2 and Table 1-3
e. Methods used to address data uncertainties should be described.	yes	Sect 2.1, 6.5, and 6.6
<b>1.2 Assumptions</b>		
a. The planning basis for the ETE includes the assumption that the evacuation is ordered promptly and no early protective actions have been implemented.	yes	Sect 2.1, 3, 5.4
b. Assumptions consistent with Table 1-2, "General Assumptions," of NUREG/CR-7002 should be provided and include the basis to support their use.	yes	Sect 2.1
<b>1.3 Scenario Development</b>		
a. The ten scenarios in Table 1-3, Evacuation Scenarios, should be developed for the ETE analysis, or a reason should be provided for use of other scenarios.	yes	AYCA Soccer Tournament as "Special Event" Sect 6.8

B-1

	Criterion Addressed in ETE Analysis (Yes/No)	Comments
<b>1.3.1 Staged Evacuation</b>		
a. A discussion should be provided on the approach used in development of a staged evacuation.	yes	Sect 6.4
<b>1.4 Evacuation Planning Areas</b>		
a. A map of the EPZ with emergency response planning areas (ERPAs) should be included.	yes	Figure 1-2
b. A table should be provided identifying the ERPAs considered for each ETE calculation by downwind direction in each sector.	yes	Table 5-1
c. A table similar to Table 1-4, "Evacuation Areas for a Staged Evacuation Keyhole," of NUREG/CR-7002 should be provided and includes the complete evacuation of the 2, 5, and 10 mile areas and for the 2 mile area/5 mile keyhole evacuations.	yes	Table 5-1
<b>2.0 Demand Estimation</b>		
a. Demand estimation should be developed for the four population groups, including permanent residents of the EPZ, transients, special facilities, and schools.	yes	Table 3-1 thru 3-4
<b>2.1 Permanent Residents and Transient Population</b>		
a. The US Census should be the source of the population values, or another credible source should be provided.	yes	Sect 2.1, 3
b. Population values should be adjusted as necessary for growth to reflect population estimates to the year of the ETE.	yes	2010 Census released in Oct 2011 and is most recent
c. A sector diagram should be included, similar to Figure 2-1, "Population by Sector," of NUREG/CR-7002, showing the population distribution for permanent residents.	yes	Appendix C
<b>2.1.1 Permanent Residents with Vehicles</b>		
a. The persons per vehicle value should be between 1 and 2 or justification should be provided for other values.	yes	Sect 3.1.1 (2.06 person per vehicle)
b. Major employers should be listed.	yes	Table B-1
<b>2.1.2 Transient Population</b>		
a. A list of facilities which attract transient populations should be included, and peak and average attendance for these facilities should be listed. The source of information used to develop attendance values should be provided.	yes	Table B-2, B-3
b. The average population during the season should be used,	yes	Sect 3.2

	Criterion Addressed in ETE Analysis (Yes/No)	Comments
itemized and totaled for each scenario.		
c. The percent of permanent residents assumed to be at facilities should be estimated.	yes	Sect 3.3
d. The number of people per vehicle should be provided. Numbers may vary by scenario, and if so, discussion on why values vary should be provided.	yes	Sect 2.1, 3.3, Tables B-1, B-2, B-3
e. A sector diagram should be included, similar to Figure 2-1 of NUREG/CR-7002, showing the population distribution for the transient population.	yes	Table 3-2
<b>2.2 Transit Dependent Permanent Residents</b>		
a. The methodology used to determine the number of transit dependent residents should be discussed.	yes	Sect 3.1.2
b. Transportation resources needed to evacuate this group should be quantified.	yes	Sect 3.1.2
c. The county/local evacuation plans for transit dependent residents should be used in the analysis.	yes	Sect 3.1.2
d. The methodology used to determine the number of people with disabilities and those with access and functional needs who may need assistance and do not reside in special facilities should be provided. Data from local/county registration programs should be used in the estimate, but should not be the only set of data.	yes	Sect 3.1.2
e. Capacities should be provided for all types of transportation resources. Bus seating capacity of 50% should be used or justification should be provided for higher values.	yes	Sect 3.1.2
f. An estimate of this population should be provided and information should be provided that the existing registration programs were used in developing the estimate.	yes	Sect 3.1.2
g. A summary table of the total number of buses, ambulances, or other transport needed to support evacuation should be provided and the quantification of resources should be detailed enough to assure double counting has not occurred.	yes	Sect 3.1.2
<b>2.3 Special Facility Residents</b>		
a. A list of special facilities, including the type of facility, location, and average population should be provided. Special facility staff should be included in the total special	yes	Table B-6

	Criterion Addressed in ETE Analysis (Yes/No)	Comments
facility population.		
b. A discussion should be provided on how special facility data was obtained.	yes	Sect 3.4
c. The number of wheelchair and bed-bound individuals should be provided.	yes	Table B-6
d. An estimate of the number and capacity of vehicles needed to support the evacuation of the facility should be provided.	yes	Table B-6
e. The logistics for mobilizing specially trained staff (e.g., medical support or security support for prisons, jails, and other correctional facilities) should be discussed when appropriate.	N/A	Part of offsite agency planning process
<b>2.4 Schools</b>		
a. A list of schools including name, location, student population, and transportation resources required to support the evacuation, should be provided. The source of this information should be provided.	yes	Sect 3.4.2, Table 3-3 & Table B-4
b. Transportation resources for elementary and middle schools are based on 100% of the school capacity.	yes	Sect 3.4.2, Table B-4
c. The estimate of high school students who will use their personal vehicle to evacuate should be provided and a basis for the values used should be provided.	yes	Sect 3. adjustment for personal vehicles N/A
d. The need for return trips should be identified if necessary.	yes	Sect 6.7 (no return trips)
<b>2.5.1 Special Events</b>		
a. A complete list of special events should be provided and includes information on the population, estimated duration, and season of the event.	yes	Sect 6.8
b. The special event that encompasses the peak transient population should be analyzed in the ETE.	yes	Sect 6.8
c. The percent of permanent residents attending the event should be estimated.	yes	Sect 6.8
<b>2.5.2 Shadow Evacuation</b>		
a. A shadow evacuation of 20 percent should be included for areas outside the evacuation area extending to 15 miles from the NPP.	yes	Sect 1.2, 1.4, 6.4
b. Population estimates for the shadow evacuation in the 10 to 15 mile area beyond the EPZ are provided by sector.	yes	Appendix C

	<b>Criterion Addressed In ETE Analysis (Yes/No)</b>	<b>Comments</b>
c. The loading of the shadow evacuation onto the roadway network should be consistent with the trip generation time generated for the permanent resident population.	yes	Sect 5
<b>2.5.3 Background and Pass Through Traffic</b>		
a. The volume of background traffic and pass-through traffic should be based on the average daytime traffic. Values may be reduced for nighttime scenarios.	yes	Sect 2.1, 4.3
b. Pass-through traffic should be assumed to have stopped entering the EPZ about two hours after the initial notification.	yes	Sect 2.1, 4.3
<b>2.6 Summary of Demand Estimation</b>		
a. A summary table should be provided that identifies the total populations and total vehicles used in the analysis for permanent residents, transients, transit dependent residents, special facilities, schools, shadow population, and pass-through demand used in each scenario.	yes	Table 3-1 thru 3-4
<b>3.0 Roadway Capacity</b>		
a. The method(s) used to assess roadway capacity should be discussed.	yes	Sect 4
<b>3.1 Roadway Characteristics</b>		
a. A field survey of key routes within the EPZ has been conducted.	yes	Sect 4.1
b. Information should be provided describing the extent of the survey, and types of information gathered and used in the analysis.	yes	Sect 4.3
c. A table similar to that in Appendix A, "Roadway Characteristics," of NUREG/CR-7002 should be provided.	yes	Appendix D
d. Calculations for a representative roadway segment should be provided.	yes	Appendix D
e. A legible map of the roadway system that identifies node numbers and segments used to develop the ETE should be provided and should be similar to Figure 3-1, "Roadway Network Identifying Nodes and Segments," of NUREG/CR-7002.	yes	Figure 4-1 plus map in Appendix D
<b>3.2 Capacity Analysis</b>		
a. The approach used to calculate the roadway capacity for the transportation network should be described in detail and	yes	Sect 4.3 and Appendix D



	Criterion Addressed in ETE Analysis (Yes/No)	Comments
identifies factors that are expressly used in the modeling.		
b. The capacity analysis identifies where field information should be used in the ETE calculation.	yes	Sect 4.3 and Appendix D
<b>3.3 Intersection Control</b>		
a. A list of intersections should be provided that includes the total numbers of intersections modeled that are unsignalized, signalized, or manned by response personnel.	yes	Sect 7 and Appendix D
b. Characteristics for the 10 highest volume intersections within the EPZ are provided including the location, signal cycle length, and turn lane queue capacity.	yes	Table 7-1
c. Discussion should be provided on how time signal cycle is used in the calculations.	yes	Sect 4.3
<b>3.4 Adverse Weather</b>		
a. The adverse weather condition should be identified and the effect of adverse weather on mobilization should be considered.	yes	Sect 2.3
b. The speed and capacity reduction factors identified in Table 3-1, "Weather Capacity Factors," of NUREG/CR-7002 should be used or a basis should be provided for other values.	yes	Sect 2.3
c. The study identifies assumptions for snow removal on streets and driveways, when applicable.	N/A	No added delays for snow removal were assumed.
<b>4.0 Development of Evacuation Times</b>		
<b>4.1 Trip Generation Time</b>		
a. The process used to develop trip generation times should be identified.	yes	Sect 5
b. When telephone surveys are used, the scope of the survey, area of the survey, number of participants, and statistical relevance should be provided.	yes	Appendix E
c. Data obtained from telephone surveys should be summarized.	yes	Appendix E
d. The trip generation time for each population group should be developed from site specific information.	yes	Sect 5
<b>4.1.1 Permanent Residents and Transient Population</b>		
a. Permanent residents are assumed to evacuate from their homes but are not assumed to be at home at all times. Trip	yes	Sect 5


	Criterion Addressed in ETE Analysis (Yes/No)	Comments
generation time includes the assumption that a percentage of residents will need to return home prior to evacuating.		
b. Discussion should be provided on the time and method used to notify transients. The trip generation time discusses any difficulties notifying persons in hard to reach areas such as on lakes or in campgrounds.	yes	Sect 5
c. The trip generation time accounts for transients potentially returning to hotels prior to evacuating.	yes	Sect 5
d. Effect of public transportation resources used during special events where a large number of transients are expected should be considered.	N/A	
e. The trip generation time for the transient population should be integrated and loaded onto the transportation network with the general public.	yes	Sect 5
<b>4.1.2 Transit Dependent Residents</b>		
a. If available, existing plans and bus routes are used in the ETE analysis. If new plans are developed with the ETE, they should have been agreed upon by the responsible authorities.	N/A	
b. Discussion should be included on the means of evacuating ambulatory and non-ambulatory residents.	yes	Sect 5.3
c. The number, location and availability of buses, and other resources needed to support the demand estimation are provided.	N/A	Transportation resources are part of offsite agency planning process
d. Logistical details, such as the time to obtain buses, brief drivers and initiate the bus route are provided.	yes	Sect 5.4.3, 6.7
e. Discussion should identify the time estimated for transit dependent residents to prepare and then travel to a bus pickup point, and describes the expected means of travel to the pickup point.	yes	Sect 6.7; means of travel to pick up points not addressed. Transportation Assistance phone numbers provided for the public.
f. The number of bus stops and time needed to load passengers should be discussed.	yes	Sect 6.7
g. A map of bus routes should be included.	N/A	Bus route information was not available.
h. The trip generation time for non-ambulatory persons includes the time to mobilize ambulances or special vehicles, time to drive to the home of residents, loading time,	N/A	Individual needs are part of offsite planning process

	Criterion Addressed in ETE Analysis (Yes/No)	Comments
and time to drive out of the EPZ should be provided.		
i. Information should be provided to support analysis of return trips, if necessary.	yes	Sect 6.7
<b>4.1.3 Special Facilities</b>		
a. Information on evacuation logistics and mobilization times should be provided.	yes	Sect 6.7
b. Discussion should be provided on the inbound and outbound speeds.	yes	Sect 6.7
c. The number of wheelchair and bed-bound individuals should be provided, and the logistics of evacuating these residents should be discussed.	yes	Table B-6
d. Time for loading of residents should be provided.	yes	Sect 6.7
e. Information should be provided that indicates whether the evacuation can be completed in a single trip or if additional trips are needed.	yes	Table 6-6
f. If return trips are needed, the destination of vehicles should be provided.	N/A	Return trips are not anticipated.
g. Discussion should be provided on whether special facility residents are expected to pass through the reception center prior to being evacuated to their final destination.	yes	Sect 5.4.3
h. Supporting information should be provided to quantify the time elements for the return trips.	yes	Sect 6.7. Return trips are not anticipated.
<b>4.1.4 Schools</b>		
a. Information on evacuation logistics and mobilization times should be provided.	yes	Sect 6.7
b. Discussion should be provided on the inbound and outbound speeds.	yes	Sect 6.7
c. Time for loading of students should be provided.	yes	Sect 6.7
d. Information should be provided that indicates whether the evacuation can be completed in a single trip or if additional trips are needed.	yes	Table 6-7
e. If return trips are needed, the destination of school buses should be provided.	N/A	Return trips are not anticipated.
f. If used, reception centers should be identified. Discussion should be provided on whether students are expected to pass through the reception center prior to being evacuated	yes	Sect 5.4.3; Schools evacuate directly to host schools

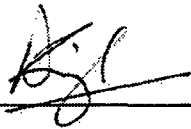
	Criterion Addressed in ETE Analysis (Yes/No)	Comments
to their final destination.		
g. Supporting information should be provided to quantify the time elements for the return trips.	N/A	Return trips are not anticipated.
<b>4.2 ETE Modeling</b>		
a. General information about the model should be provided and demonstrates its use in ETE studies.	yes	Sect 5.5
b. If a traffic simulation model is not used to conduct the ETE calculation, sufficient detail should be provided to validate the analytical approach used. All criteria elements should have been met, as appropriate.	N/A	
<b>4.2.1 Traffic Simulation Model Input</b>		
a. Traffic simulation model assumptions and a representative set of model inputs should be provided.	yes	Sect 5.5
b. A glossary of terms should be provided for the key performance measures and parameters used in the analysis.	yes	Sect 5.5, 6.7
<b>4.2.2 Traffic Simulation Model Output</b>		
a. A discussion regarding whether the traffic simulation model used must be in equilibration prior to calculating the ETE should be provided.	yes	Sect 5.5
b. The minimum following model outputs should be provided to support review: <ol style="list-style-type: none"> <li>1. Total volume and percent by hour at each EPZ exit mode.</li> <li>2. Network wide average travel time.</li> <li>3. Longest Queue length for the 10 intersections with the highest traffic volume.</li> <li>4. Total vehicles exiting the network.</li> <li>5. A plot that provides both the mobilization curve and evacuation curve identifying the cumulative percentage of evacuees who have mobilized and exited the EPZ.</li> <li>6. Average speed for each major evacuation route that exits the EPZ.</li> </ol>	yes	Sect 6 and Appendix F
c. Color coded roadway maps should be provided for various times (i.e., at 2, 4, 6 hrs., etc.) during a full EPZ evacuation scenario, identifying areas where long queues exist including level of service (LOS) "E" and LOS "F" conditions,	yes	Appendix F

	Criterion Addressed in ETE Analysis (Yes/No)	Comments
if they occur.		
<b>4.3 Evacuation Time Estimates for the General Public</b>		
a. The ETE should include the time to evacuate 90% and 100% of the total permanent resident and transient population.	yes	Table 6-1
b. The ETE for 100% of the general public should include all members of the general public. Any reductions or truncated data should be explained.	yes	Table 6-1
c. Tables should be provided for the 90 and 100 percent ETEs similar to Table 4-3, "ETEs for Staged Evacuation Keyhole," of NUREG/CR-7002.	yes	Table 6-4
d. ETEs should be provided for the 100 percent evacuation of special facilities, transit dependent, and school populations.	yes	Sect 6
<b>5.0 Other Considerations</b>		
<b>5.1 Development of Traffic Control Plans</b>		
a. Information that responsible authorities have approved the traffic control plan used in the analysis should be provided.	yes	Sect 7
b. A discussion of adjustments or additions to the traffic control plan that affect the ETE should be provided.	yes	Sect 7
<b>5.2 Enhancements in Evacuation Time</b>		
a. The results of assessments for improvement of evacuation time should be provided.	yes	Sect 7
b. A statement or discussion regarding presentation of enhancements to local authorities should be provided.	yes	Sect 7
<b>5.3 State and Local Review</b>		
a. A list of agencies contacted and the extent of interaction with these agencies should be discussed.	yes	Sect 2
b. Information should be provided on any unresolved issues that may affect the ETE.	N/A	
<b>5.4 Reviews and Updates</b>		
a. A discussion of when an updated ETE analysis is required to be performed and submitted to the NRC.	yes	Sect 6.5
<b>5.5 Reception Centers and Congregate Care Center</b>		
a. A map of congregate care centers and reception centers should be provided.	yes	Figure 4-1
b. If return trips are required, assumptions used to estimate	N/A	

	Criterion Addressed in ETE Analysis (Yes/No)	Comments
return times for buses should be provided.		
c. It should be clearly stated if it is assumed that passengers are left at the reception center and are taken by separate buses to the congregate care center.	yes	Sect 3.1.2

Technical Reviewer 

Date 1/31/13

Supervisory Review 

Date 1/31/13