

Callaway2COLPEm Resource

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Sent: Thursday, May 21, 2009 1:11 PM
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Cc: Callaway2COL Resource; Joseph Colaccino; Ann Hodgdon; Kevin Williams; Don Johnson; NPUnit2-EPR@ameren.com; Surinder Arora
Subject: Final RAI N0. 18 (eRAI 2643) - Public
Attachments: FINAL RAI 2643.doc

Dave,

Attached please find the subject request for additional information (RAI). A draft of this RAI was provided to you on April 28, 2009. Based on the email dated May 20, 2009 from Roger Wink, no clarification phone call was necessary for this RAI.

The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a schedule date for submitting your technically correct and complete response will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the review schedule.

Thanks.

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Callaway Unit 2

AmerenUE

Docket No. 52-037

SRP Section: 13.03 - Emergency Planning

Application Section: SRP Chapter 13.3, Requirements A and H, Acceptance Criterion 11

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

13.03-2

ETE-1: Estimated Population Growth

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Regulatory Guide 1.206, Appendix 4 to NUREG-0654 Section II.A.

A. None identified.

ETE-2: Site Location and Emergency Planning Zone

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Section I.A.

A. Planning Element J.10.a from Section J, "Protective Response," in NUREG-0654/FEMA-REP-1 calls for a topographical map, which should include elevations. No information on land formations other than water body locations is provided.

Provide a topographical map of the region proposed for CNPP Unit 2 that includes elevations.

ETE-3: ETE General Assumptions

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Sections I.B, Section II.C, Section III.A, IV.A.1

A. The traffic time estimates and roadway capacity assumptions were based on regional traffic flow patterns from the Missouri Department of Transportation, U. S. Department of Transportation roadway capacity data, the Transportation Research Board division of the National Research Council, and the ETE analysis that was performed when the Callaway Plant Unit 1 facility was licensed in 1984.

1. **Discuss the specific assumptions that were applied in the ETE modeling from 1984 and are carried through to the current analysis, and update the ETE analysis to reflect this discussion.**

2. **Provide a discussion on why the ETE modeling assumptions from 1984 remain valid for this ETE analysis.**

- B. Section 1.2, "Emergency Planning Zone," and Section 2.3, "Special Facility Residents," state that institutionalized populations within the plume exposure pathway EPZ will be sheltered in place, or they are dependent on the institution-specific facility response plans for the decision on providing shelter or means of evacuation. **Clarify details on why some special facilities are sheltered instead of evacuated.**
- C. NUREG-0654, Section D, "Planning Basis," and Appendix 4, Section II.D, "Emergency Planning Zone and Sub-Areas," states evacuations are in the general downwind direction and that dominant wind directions warrant special consideration.
1. **Discuss whether evacuation of special facilities will be considered if a situation occurs where prevailing winds are in the general direction of one or more of the institutionalized special facilities where the residents are stated to be sheltered in place.**
 2. **Discuss the impact on the evacuation time estimates if institutionalized special facilities were to be evacuated instead of sheltered in place and revise the ETE analysis to reflect changes in the evacuation time estimates.**
- D. A listing of Reception and Care Centers for subareas C-1 through C-11, G1-, M-1, M-2, and O-1 are proposed in the Missouri State Nuclear Plan, Annex C, "Public Information," however, the Reception and Care Centers for evacuees are not listed in the ETE analysis. **Provide a listing of all Reception and Care Centers to be used for evacuees in the ETE analysis report.**
- E. No information is provided on logistics involved in evacuating individuals, such as fishermen, tugboats, barges, etc., on the Missouri River which cuts across the southern portion of the plume exposure pathway EPZ. **Provide clarification on logistics for evacuating the portion of the Missouri River that crosses the CNPP plume exposure pathway EPZ.**
- F. Section 2.4, "Population and Vehicle Estimates by Subarea and Sector," discusses additional assumptions related to estimating populations, and assumptions related to vehicle demand estimates. Figure 1.0-8, "2008 General Population Distribution by 22° Radial Sector Out to 10 Miles," Figure 1.0-9, "2016 General Population Distribution by 22° Radial Sector Out to 10 Miles," and Figure 1.0-10, "2018 General Population Distribution by 22° Radial Sector Out to 10 Miles," show assumed population values broken down for each of the 22° sectors at the 2-, 5-, and 10-mile radius distances for 2008, 2016, and 2018. **Clarify whether the term "general population" in this ETE analysis refers to residents only or residents and transients.**
- G. Section 3.1, "Identification of Primary Evacuation Routes," states that designated evacuation routes do not require special traffic control measures, such as one-way operation on normally two-way roads, contra-flow on freeways, etc. In Section 5.0, "Confirmation of Evacuation," it is stated that emergency workers within the evacuation area will include traffic control personnel. Footnote #1 to three tables, Table 1.0-17, "Summary of Evacuation Time Estimates for Callaway Nuclear Power Plant – Operation Year 2008", Table 1.0-18, "Summary of Evacuation Time

Estimates for Callaway Nuclear Power Plant – Operation Year 2016," and Table 1.0-19, "Summary of Evacuation Time Estimates for Callaway Nuclear Power Plant – Operation Year 2018" states that traffic control resources would be alerted during periods of heavy precipitation to mitigate storm impacts and/or reroute traffic around flood prone areas and that evacuation time estimates may increase by 1 to 2 hours.

1. **Clarify whether traffic control personnel and traffic control points will be used for any or all conditions for evacuation.**
 2. **Clarify whether the 1 to 2 hour extension of the evacuation time due to weather impacts as stated in Footnote #1 of Tables 1.0-17 through 1.0-19 was included in the evacuation time estimates.**
 3. **Provide a basis for the 1 to 2 hour extension in evacuation time due to weather impacts.**
 4. **Clarify whether evacuation traffic will be redirected if one or more of the roads on the evacuation route are flooded.**
 5. **Discuss the impact of evacuation route flooding and redirection of evacuation traffic on the evacuation time estimates.**
- H. Section 4.1, "Assumptions and Methodology," provides assumptions used to calculate evacuation response times. Section 4.1.1.5, "Summary: Worst Case Adverse Conditions," concludes that the assumed worst weather condition for an evacuation for CNPP would be late winter/early spring with heavy and/or freezing rain causing local flooding, which in turn result in the highest combined residential, transient, and special facility population traffic demand. **Provide the details of other scenarios, including various times of day and times of year, and their impact on evacuation time estimates.**
- I. Section 4.1.4, "Automobile Ownership," (Page 1-17) indicates that the non-auto owning general population group would either secure a ride out of the plume exposure pathway EPZ with friends or family who own autos or would have to depend on municipality-provided transportation. This assumes that county and special facility evacuation plans are in place to use special facility buses to evacuate this population group after the special facility populations (i.e., a second wave of buses entering plume exposure pathway EPZ for evacuation).
1. **Discuss the effect of being on a second evacuation wave on evacuation time estimates for the non-auto owning population group in the plume exposure pathway EPZ.**
 2. **Provide a discussion on how non-auto owning individuals are expected to get from their residences to the bus routes, and whether this time was factored into the ETE analysis.**
 3. **Clarify the assumptions on bus capacity for wheelchair-bound passengers.**
 4. **Clarify how many stops are assumed along the pick-up routes for transit**

services provided for the non-auto owning population group.

5. **Clarify whether stopping and dwell time of transit services provided for the non-auto owning population group were considered in the estimation of the average route time proposed for transit services.**
 6. **Discuss the possibility of using transit services from other nearby towns, such as Columbia, Jefferson City, Rhineland, Hermann, or St. Louis, to aid in evacuation of the non-auto owning population group.**
- J. Section 4.2, "General Population Evacuation," provides the general times assumed for receipt of notification to evacuate, drive to residences, prepare for evacuation, and leave the plume exposure pathway EPZ. It is assumed that the capacity of the local roadways is adequate for the local population and no time delays are anticipated due to traffic delays.
1. **Clarify whether a field survey of the entire highway system within the plume exposure pathway EPZ was conducted.**
 2. **Clarify what factors are considered and what methods are used in determining road capacity.**
 3. **Discuss whether the 2000 Highway Capacity Manual (HCM) from the Transportation Research Board of the National Research Council was used in development of the roadway capacity estimates.**
 4. **Discuss if there are possible bottleneck locations along the evacuation routes and what measures would be used to control the traffic conditions at those locations.**
- K. Section 4.1.3, "Response Time of Transient Population Groups," (Page 1-16) states that as long as roadway capacity is not exceeded resulting in backups, the demand load from transient population evacuation would not have an impact on the evacuation time for permanent residents.
1. **Clarify what is meant by "as long as roadway capacity is not exceeded," in Section 4.1.3 when elsewhere in the document it is stated that the local roadway capacity is adequate.**
 2. **Discuss whether addition of anticipated delay times to the ETE analysis is necessary for cases when vehicle volumes exceed road capacity.**
- L. **Discuss the effect on the evacuation time estimates of voluntary evacuees who are within the plume exposure pathway EPZ , have not been issued an Advisory to Evacuate, yet elect to evacuate.**
- M. **Discuss the effect on the evacuation time estimates of individuals in the shadow area, which extends outside of the plume exposure pathway EPZ to approximately 15 miles radially out from the proposed CNPP Unit 2 location, for whom no protective action recommendations have been issued but who**

elect to evacuate.

ETE-4: ETE Methodology

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Section I.C.

- A. Section 1.0, "Introduction," states that traffic time estimates and roadway capacity assumptions were based on, among other things, the evacuation time estimate modeling that was performed at the time of licensing CNPP Unit 1 in 1984. **Provide a general description of the algorithms used in the evacuation time estimate modeling and revise the ETE analysis report to include this description.**
- B. Section 4.2, "Calculations," describes the calculational methods used for the ETE analysis for Unit 2 at CNPP. The major assumptions are given in Section 2.4.1, "General Population Evacuation," and are that the general population will require 15 minutes to receive notification, 30 minutes to drive into the plume exposure pathway EPZ to their residence, and 60 minutes to prepare for an evacuation to the plume exposure pathway EPZ boundary of 1 hour and 45 minutes under normal conditions, and 2 hours under adverse conditions.
- 1. Clarify how the 15-minute, 30-minute, 45-minute, and 1 hour and 45 minute components to the evacuation time were determined for each subarea in the plume exposure pathway EPZ.**
 - 2. Explain the basis for the 15-minute notification time.**
- C. No information is provided on evacuation routing from the plume exposure pathway EPZ boundary to the Reception and Care Centers.
- 1. Provide the evacuation time estimate values for evacuation routing from the plume exposure pathway EPZ boundary to the Reception and Care Centers.**
 - 2. Clarify whether including evacuation time estimate values from the boundary of the plume exposure pathway EPZ to the Reception and Care Centers will affect the overall evacuation time estimates.**
- D. In Section 4.2.1, it is stated that local roadway capacities are more than adequate.
- 1. An RAI was requested to clarify what factors were considered and what methods are used in determining road capacity. See RAI ETE-3(K)(1).**
 - 2. An RAI was requested to discuss whether the 2000 Highway Capacity Manual (HCM) from the Transportation Research Board of the National Research Council was used in development of the roadway capacity estimates. See RAI ETE-3(K)(2).**
- E. **Clarify how traffic control/management will be used to facilitate movement to expedite travel out of the plume exposure pathway EPZ and discourage traffic**

movements that permit evacuating vehicles from traveling in a direction that takes them significantly closer to CNPP.

- F. **Discuss how surveillance of traffic operations will be monitored during evacuation, including potential methods of fixed-point traffic surveillance, ground patrols, aerial surveillance, cell phone calls, etc.**
 - G. **Discuss how emergency workers en route to perform an important activity will be able to get where they are needed without traffic control in place.**
 - H. **Discuss the effect on evacuation time estimates of tow vehicles for disabled vehicles being present along evacuation routes.**
 - I. **Section 4.2.1, "General Population Evacuation," indicates a 40-mph evacuation speed in rural areas during normal conditions and a 30-mph evacuation speed during adverse conditions. Provide a discussion on how the evacuation speeds stated in Section 4.2.1 were developed considering traffic loading, existing roadway speed limits, and intersections along the evacuation routes.**
 - J. **Section 4.2.2, "Transient Population Evacuation," and Table 1.0-14, "Response Times for Evacuating Transient Population 2008 – 2018," (Page 1-41) discusses the estimation of evacuation times for transients. It is stated that the transient population is primarily limited to concentration in the city of Fulton at hotels, motels, inns, and permanent plant and temporary construction workers at CNPP. Provide methods, data, and results for calculating evacuation time estimates for hunters, campers, fishermen, hikers, trappers, agricultural workers, or vacationers located within the plume exposure pathway EPZ during an evacuation since these population groups are discussed in the FSAR, Section 2.1.3.3, "Transient Population."**
 - K. **In Section 4.2.2, it is stated that during peak construction time, a delay of up to 101 minutes results from a bottleneck of vehicles in the plant parking lot.**
 - 1. **Discuss how the 101-minute value stated in Section 4.2.2 for the construction worker traffic bottleneck in the plant parking lots was determined.**
 - 2. **Provide a map of all potential areas of traffic congestion along evacuation routes.**
 - 3. **Discuss the assumptions used and the effect on evacuation time estimates for evacuation of employees of major employers within the plume exposure pathway EPZ.**
 - 4. **Discuss the assumptions used for pass-through demand for vehicles on major highways like Highway 94 that happen to be traveling through the plume exposure pathway EPZ at the time that evacuation is ordered.**
 - 5. **Clarify impacts of pass-through demand traffic on the evacuation time estimates.**
 - L. **Provide transit operations and evacuation time estimates for non-ambulatory people.**
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ETE-5: Demand Estimation, Permanent Residents

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Section II.A.

- A. Section 2.4, "Population and Vehicle Estimates by Subarea and Sector," last paragraph of section, states that the evacuation of the non-auto owning general population is already accounted for in the factoring of the general population statistics to calculate the traffic demand estimate.
1. **Provide the assumptions on the number of non-auto owning members of the general public.**
 2. **Identify the type and number of resources needed to facilitate the evacuation of the non-auto owning population group.**
 3. **Provide additional detail to support the mobilization time of buses used to evacuate this population group.**
- B. Section 4.1.4, "Automobile Ownership," states that most people can be ready to leave within 60 minutes from the time they return home. **Discuss the basis for the time estimate of 60 minutes for most people to leave after they return home.**
- C. Section 4.1.4, "Automobile Ownership," indicates that the non-auto owning general population group would either secure a ride out of the plume exposure pathway EPZ with friends or family who own autos or would have to depend on municipality-provided transportation. This assumes that county and special facility evacuation plans are in place to use special facility buses to evacuate this population group after the special facility populations (i.e., a second wave of buses entering plume exposure pathway EPZ for evacuation).
1. **An RAI was requested to discuss the effect of being on a second evacuation wave on evacuation time estimates for the non-auto owning population group in the plume exposure pathway EPZ. See ETE-3(I)(1).**
 2. **An RAI was requested to provide a discussion on how non-auto owning individuals are expected to get from their residences to the bus routes, and whether this time was factored into the ETE analysis. See ETE-3(I)(2).**
 3. **An RAI was requested to clarify the assumptions on bus capacity for wheelchair-bound passengers. See ETE-3(I)(3).**
 4. **An RAI was requested to clarify how many stops are assumed along the pick-up routes for the non-auto owning population group. See ETE-3(I)(4).**
 5. **An RAI was requested to clarify whether stopping and dwell time were considered in the estimation of the average route time proposed for transit services. See ETE-3(I)(5).**
 6. **An RAI was requested to discuss the possibility of using transit buses from other nearby towns, such as Columbia, Jefferson City, Rhineland, Hermann, or St. Louis, to aid in evacuation of the non-auto owning population group. See ETE-3(I)(6).**

- D. Table 1.0-6, "Calculation of Housing Unit Occupancy Factors and Automobiles Evacuation Availability Factors on 4-County Wide Regional Demographics," lists values for 0 to 5+ vehicle OHUs (occupied housing units). **Provide clarification on the basis for the vehicle occupied housing unit (OHU) values used in Table 1.0-6.**
- E. Table 1.0-7, "Sector Residential Population Evacuation Traffic Loading Summary for Operating Year 2008," Footnote #4 states that 1,470 vehicles per OHU is assumed for estimating the total residential traffic demand load. Footnote #6 of the same table states a value of 1.470 vehicles per OHU. **Provide clarification if the value to be used for number of vehicles per OHU factor for Table 1.0-7 is 1,470 or 1.470. Discuss the basis for the value used for vehicles per OHU factor used in Table 1.0-7.**
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ETE-6: Demand Estimation, Transient Populations

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Sections II.B, II.E, IV.B.5

- A. Section 1.2, "Emergency Planning Zone," identifies major employers within the plume exposure pathway EPZ including a large distribution warehouse, a technology and business park, a firebrick plant, a potato chip company, farm implement manufacturers, and other diversified businesses.
1. **Provide a discussion on why major employers in the plume exposure pathway EPZ, such as a large distribution warehouse, a technology and business park, a firebrick plant, a potato chip company, farm implement manufacturers, and other diversified businesses, are not included in Table 1.0-2, "Transient Populations within the 4-County EPZ Region."**
 2. **Discuss whether the demand estimation of these transient employees working at major employers within the plume exposure pathway EPZ is considered in the ETE analysis.**
- B. Section 2.2, "Transients," states that the transient population is not expected to vary significantly through year 2018. **Discuss the basis for assuming that the transient population will not significantly vary through the year 2018 as stated on Page 1-9 of the ETE analysis.**
- C. Section 2.2, "Transients," states that the maximum onsite worker population is estimated to increase to 5,093 persons, which includes 76 essential workers who will not evacuate the plant. Table 1.0-2, "Transient Populations within the 4-County EPZ Region," indicates that 5,017 CNPP workers will be evacuating for the year 2016, and Footnote #6 states that up to 86 essential plant workers will shelter on site. Table 1.0-3, "Summary of Transient Plant Worker Populations for Years 2008 through 2018," indicates that the total worker population including 76 essential personnel amounts to 5,017, and Footnote #3 states that essential response personnel will remain onsite.
1. **Clarify whether the correct value of essential personnel who will not evacuate but will shelter on site is 76 or 86 persons.**

- 2. Clarify whether the correct value for the maximum estimated onsite worker population for year 2016 is 5,017 or 5,093 persons.**
- D. Section 2.2, "Transients," states the CNPP workers who live within the plume exposure pathway EPZ should plan alternative advance arrangements for the most timely evacuation.
 - 1. Discuss how this ETE analysis demonstrates that alternative advance arrangements are necessary for the CNPP workers who live within the plume exposure pathway EPZ.**
 - 2. Discuss whether the alternative advance arrangements for the most timely evacuation of CNPP workers were included in the ETE analysis.**
- E. Section 2.2, "Transients," states that the total evacuating worker population in the year 2018 is estimated to be 2,369 persons. Table 1.0-2, "Transient Populations within the 4-County EPZ Region," (Page 1-24) and Table 1.0-3, "Summary of Transient Plant Worker Populations for Years 2008 through 2018," identifies that population to be 2,371 persons. **Clarify whether the correct value for the total evacuating worker population for year 2018 is 2,369 or 2,371 persons.**
- F. Section 2.2, "Transients," states the average vehicle demand factor for those other than workers who are residing in hotels as 3 persons per vehicle, for those staying in hotels the factor is 2 persons per vehicle, and for worker populations the factor is 1.3 persons per vehicle. **Provide a basis for the vehicle demand factors for workers and other transients presented in Section 2.2.**
- G. Section 2.4, "Population and Vehicle Estimates by Subarea and Sector," states that the transient worker population was all assigned to one subarea, C1. **Discuss the effect on the evacuation time estimate by distributing all the transient worker population by the actual location of the transient workers instead of only in subarea C1.**
- H. Section 4.1.3, "Response Time of Transient Population Groups," states that transient populations will only need to board their vehicles and exit the plume exposure pathway EPZ upon receiving the notice to evacuate. **Discuss the affect on the evacuation time estimate if the transient population groups were to return to their hotel/area of lodging to collect their belongings prior to evacuating the plume exposure pathway EPZ.**
- I. Section 4.1.3, "Response Time of Transient Population Groups," states that at peak construction in year 2016 Table 1.0-3 indicates that approximately 144 workers would be living within the plume exposure pathway EPZ and not on site at time of evacuation. However, Table 1.0-3, "Summary of Transient Plant Worker Populations for Years 2008 through 2018," indicates that the number of second shift workers not onsite but living within the plume exposure pathway EPZ is 507. **Clarify whether the correct value for transient workers in year 2016 that are living within the plume exposure pathway EPZ but not on site at the time of evacuation is 144 or 507.**

- J. Table 1.0-2, "Transient Populations within the 4-County EPZ Region," Footnote #1 indicates that the population figures are based on either recent data from January and February 2008 or on estimates based on previously reported data. **Provide the source of the previously reported data that supports the transient population estimates mentioned in Footnote #1 of Table 1.0-2.**
- K. Footnote #2 of Table 1.0-2 states an occupancy rate of 50% assuming two people per room at hotels, motels, and inns. **Discuss the basis for the transient population occupancy rate estimate stated in Footnote #2 of Table 1.0-2.**
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ETE-7: Demand Estimation, Special Facility Population

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Sections II.C, II.E, III.A, IV.B.4, IV.B.5

- A. Section 1.2, "Emergency Planning Zone," and Section 2.3, "Special Facility Residents," include statements that not all special facilities within the plume exposure pathway EPZ and the 10-mile radius of the CNPP will be evacuated. Although sheltering may be implemented, evacuation must be considered.
- 1. Provide an evacuation time estimate for evacuation of the special facility population.**
 - 2. Identify the type and number of resources needed to facilitate the evacuation of this population group.**
 - 3. Discuss how inclusion of evacuation of the special facility population will affect the overall evacuation time estimates and revise the ETE analysis to reflect changes in the evacuation time estimates.**
- B. Section 1.2, "Emergency Planning Zone," identifies Westminster College being within the plume exposure pathway EPZ. However, Westminster College is not mentioned in Table 1.0-4, "Special Facility Populations within the 4-County EPZ Region – School Populations."
- 1. Clarify whether data on Westminster College should be included in Table 1.0-4.**
 - 2. Discuss the impact on the evacuation time estimate if Westminster College is included.**
- C. Section 5.0, "Confirmation of Evacuation," states that individuals having special notification or transportation needs are identified in a 'data file'. **Clarify whether data in the data file mentioned in Section 5.0 for special notification or transportation needs was used in the development of the demand estimate for this population group.**
- D. Table 1.0-4, "Special Facility Populations within the 4-County EPZ Region – School Populations," Footnote #1 states that upon notification to evacuate, the students will not return home locations within the plume exposure pathway EPZ, but will be

evacuated to designated assembly areas according to school facility evacuation plans. It is not clear whether all students will be evacuated or just students whose home residence is within the plume exposure pathway EPZ.

1. **Clarify whether all students in schools listed in Table 1.0-4 will be evacuated to designated assembly areas or just students whose home residences is within the plume exposure pathway EPZ.**
 2. **Clarify whether the term, “designated assembly areas,” as used in Footnote #1 of Table 1.0-4, is the same as Reception and Care Centers.**
 3. **If designated assembly areas are different than Reception and Care Centers, then provide the evacuation time estimate values for evacuation routing of students from schools listed in Table 1.0-4 from the plume exposure pathway EPZ boundary to the various designated assembly areas and revise the ETE analysis report to include this description.**
- E. Footnote #5 of Table 1.0-4 states that the Callaway County Elementary School is shown on the map but lies outside the plume exposure pathway EPZ. However, the Callaway County Elementary School is not present on any of the figures in the CNPP Unit 2 ETE analysis. **Provide the location of the Callaway County Elementary School on a map, such as the one shown in Figure 1.0-4, “Regional Map Showing EPZ Boundary and Locations of Major Features.”**
- F. Table 1.0-5, “Special Facility Populations within the 4-County EPZ Region – Non-School Populations,” Footnote #1 states that the population estimates are based on either recent data from January and February 2008, numbers from most current special facility plans, or on estimates based on previously reported data. **Provide the source of the previously reported data that supports the special facility population estimates mentioned in Footnote #1 of Table 1.0-5.**
- G. Table 1.0-5 does not consider peak populations or behavioral aspects of special facility populations as provided in NUREG-0654, Appendix 4, Section IV.B, “Methodology.” The means of transportation for the special population group is not included. **Provide the data for peak population sizes for each special facility presented in Table 1.0-5 and the behavioral aspects, such as bed-ridden, wheelchair bound, prisoner, etc., to support the transportation resources needed to evacuate these facilities.**
- H. For the second section of Table 1.0-5 for non-school non-sheltering populations, the footnote for “Latitude x Longitude” should be “4” instead of “2”.
1. **Provide appropriate footnote number for the column title “Latitude x Longitude” in the second section of Table 1.0-5 for non-school non-sheltering populations.**
 2. **Clarify what is meant by “included above” for the seven “house” institutions listed in the second section of Table 1.0-5.**

- I. Section 4.1.4, "Automobile Ownership," states that non-auto owning residents within the plume exposure pathway EPZ will need to wait for buses that will first evacuate the special facility populations.
- 1. Provide a basis for the assumption that there are not enough buses to evacuate the non-auto owning population along with the initial evacuation.**
 - 2. Discuss the number of buses that will need to return to the plume exposure pathway EPZ to evacuate the non-auto owning residents within the plume exposure pathway EPZ population group.**
 - 3. An RAI was request to provide a discussion on how non-auto owning individuals are expected to get from their residences to the bus routes, and whether this time was factored into the ETE analysis. See ETE-3(I)(2).**
 - 4. An RAI was request to clarify the assumptions on bus capacity for wheelchair-bound passengers See ETE-3(I)(3).**
 - 5. An RAI was request to clarify how many stops are assumed along the pick-up routes for the non-auto owning population group. See ETE-3(I)(4).**
 - 6. An RAI was request to clarify whether stopping and dwell time were considered in the estimation of the average route time proposed for transit services. See ETE-3(I)(5).**
 - 7. An RAI was request to discuss possibility of using transit buses from other nearby towns, such as Columbia, Jefferson City, Rhineland, Hermann, or St. Louis, to aid in evacuation of the non-auto owning population group. See ETE-3(I)(6).**
- J. A summary of evacuation time estimates for special facility populations are discussed in Section 4.2.3, "Special Facility Population Evacuation," and summarized in Table 1.0-15, "Response Times for Evacuating Special Facilities Population 2008 – 2018." It is stated that the evacuation time estimates listed are based on those estimated times from current special facility plans.
- 1. Provide an explanation of the column "Time to Leave (minutes)" in Table 1.0-15 is intended to include.**
 - 2. Explain why six trips, 5 of which would be return trips, are needed for the Missouri Girls Town facility.**
 - 3. Provide an explanation of how the five return trips for the Missouri Girls Town facility are included in the column "Total Evacuation Time Estimate Normal Condition (Best Case) (minutes)," of Table 1.0-15.**
 - 4. Clarify the basis for the estimate of 10 minutes to load 2,727 students for Fulton Public Schools as shown in the "Time to Load Buses (minutes)," column of Table 1.0-15.**

- K. Footnote #3 of Table 1.0-15 states that the Missouri Girls Town is outside the plume exposure pathway EPZ but included in the evacuation plan. However, Figure 1.0-4, "Regional," shows the Missouri Girls Town Main Campus to be within the plume exposure pathway EPZ. **Clarify whether the special facility, Missouri Girls Town, is located within the plume exposure pathway EPZ.**
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ETE-8: Demand Estimation, Emergency Planning Zone (EPZ)

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Section II.D, Section III.B, IV.B.1

- A. Section 4.3, "Evacuation Time Estimate Summary," (Page 1-21) identifies the maximum times for evacuation of the population groups. Table 1.0-13, "Response Times for Evacuating General Population 2008-2018," and Table 1.0-14, "Response Time for Evacuating Transient Population 2008-2018," show the maximum evacuation time estimates. Each time that is provided in these tables is specifically for the subarea identified. **An RAI was requested to provide the evacuation time estimate values for evacuation routing from the plume exposure pathway EPZ boundary to the various Reception and Care Centers. See ETE-4(C)(1).**
- B. Section 2.4, "Population and Vehicle Estimates by Subarea and Sector," state that NUREG-0654 states that evacuation time estimates are needed the four 90-degree sectors and the entire plume exposure pathway EPZ. **Discuss why the evacuation time estimates provided in Tables 1.0-13 and 1.0-14 do not include the time estimates for the evacuation of the 2-, 5-, and 10-mile radius areas for the four 90-degree sector/quadrants, and the entire plume exposure pathway EPZ as provided in NUREG-0654, Appendix 4, Section II.D, "Emergency Planning Zone and Sub-areas."**
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ETE-9: Demand Estimation, Emergency Planning Zone and Sub-Areas

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Section II.E.

- A. Section 1.3, "EPZ Subareas," states that the evacuation time estimate and roadway traffic demand within the CNPP plume exposure pathway EPZ includes the total population within the plume exposure pathway EPZ and includes the populations for the cities of Fulton and Rhineland. Figure 1.0-7, "Regional Map Showing EPZ Boundary and EPZ Subareas with 2-5-10 Radius," shows an area outside the 10-mile radius but included in the plume exposure pathway EPZ around the entire 360° area.
1. **Clarify whether the traffic and population demand for the areas within the plume exposure pathway EPZ but outside the 10-mile radius, Fulton and Rhineland city limits, was considered in the evacuation time estimate calculations.**
 2. **An RAI was requested to discuss whether general wind directions will be added to sector maps. See ETE-3(C)(1). An RAI was requested to discuss**

whether evacuation be considered if a situation occurs where prevailing winds are in the general direction of one or more of the institutionalized special facilities where the residents are stated to be sheltered in place. See ETE-3(C)(1).

ETE-10: Traffic Capacity, Evacuation Roadway Network

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Sections III.A, Section III.B

- A. Section 2.4, "Population and Vehicle Estimates by Subarea and Sector," states that if the roadway capacity is not exceeded, then backups should not occur. However, congestion and backups can still occur at intersections even if roadway capacity is not exceeded.
- 1. Discuss how the vehicles were loaded onto the roadway network to calculate whether the roadway capacity was exceeded.**
 - 2. Provide a discussion of the analysis performed to determine the queuing and delay times at intersections along evacuation routes.**
- B. Section 3.1, "Identification of Primary Evacuation Routes," discusses the evacuation routes for plume exposure pathway EPZ evacuation. Figure 1.0-28, "Major Evacuation Routes," shows the major evacuation routes. The evacuation routes to the north largely depend on Interstate Highway 70, to the west largely depend on Highway 54, and to the south largely depend on Highway 94 (north of the Missouri River) and Highway 100 (south of the Missouri River).
- 1. Discuss the impact of on-ramp capacities for the major highways (94, 100, 70, and 54) on the evacuation time estimates.**
 - 2. Discuss the affect on evacuation time estimates if vehicles are assumed not to travel at posted speeds.**
- C. Section 3.3, "Roadway Capacity," identifies an adjustment downward of 15 percent for the capacity of critical intersections.
- 1. Provide a discussion of which intersections along the evacuation route are considered critical.**
 - 2. Provide a basis for applying the 15 percent reduction in vehicle capacity at critical intersections stated in Section 3.3.**
- D. A summary of the evacuation time estimates for operating years 2008, 2016, and 2018 partitioned by subareas and the 2-, 5-, and 10-mile radius areas are presented in Table 1.0-17, "Summary of Evacuation Time Estimates for Callaway Nuclear Power Plant – Operation Year 2008," Table 1.0-18, "Summary of Evacuation Time Estimates for Callaway Nuclear Power Plant – Operation Year 2016," and Table 1.0-19, "Summary of Evacuation Time Estimates for Callaway Nuclear Power Plant – Operation Year 2018." **Provide an explanation of the basis for the values in the**

“Evacuation Capacity Vehicles per Hour” column in Table 1.0-17, Table 1.0-18, and Table 1.0-19.

- E. Section 4.1.3, “Response Time of Transient Population Groups,” states that the vehicle traffic capacity of 1,200 cars per hour is used for two independent exits from the parking lot of CNPP. This value, which was derived from the Highway Capacity Manual, is only valid if the roadway capacity is not exceeded. If the roadway capacity is exceeded, the roadway capacity value of 1,200 cars per hour may no longer be valid.

- 1. Discuss whether the roadway capacity is exceeded in the CNPP ETE analysis.**
- 2. Discuss the affect on the evacuation time estimates if the roadway capacity is exceeded.**

- F. There are railroad routes from St. Louis to Kansas City with a stop in Jefferson City. However, there is no mention of rail traffic in the ETE analysis.

- 1. Discuss whether there is any railroad traffic through the CNPP plume exposure pathway EPZ.**
- 2. If there is railroad traffic through the CNPP plume exposure pathway EPZ, discuss whether the impact of rail traffic through the plume exposure pathway EPZ during an evacuation was included in evacuation time estimate calculations.**

ETE-11: Traffic Capacity, Roadway Segment Characteristics

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Section III.B

- A. The CNPP ETE analysis does not include a table or a map of the evacuation route segments and their characteristics.
- 1. Provide a table and a map that indicates the evacuation route segments and their characteristics.**
 - 2. Explain how the roadway characteristics were factored into the roadway capacity and speed calculations.**
- B. Section 1.2, “Emergency Planning Zone,” states that intersections for roads within the plume exposure pathway EPZ are marked with stop signs or yield signs rather than stop lights. **Provide an explanation of the calculations developed to support the traffic flow through intersections marked with stop or yield signs in the plume exposure pathway EPZ.**
- C. This section also states that the roadways within the plume exposure pathway EPZ are two-lane, paved roads with no turning lanes and limited or no shoulders. There is no information on lane width provided in the ETE analysis. **Discuss the impact**

on the evacuation time estimates if disabled vehicles occur with no shoulder to pull off the roadway.

ETE-12: Analysis of Evacuation Times, Report Format

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Section IV.A.1

- A. The potential for flooding on Highway 94 and Highway 100, which are major evacuation routes, is discussed in Section 3.1, Section 4.1.1.3, Section 4.2.2, and Footnote #1 in Table 1.0-17, "Summary of Evacuation Time Estimates for Callaway Nuclear Power Plant – Operation Year 2008", Table 1.0-18, "Summary of Evacuation Time Estimates for Callaway Nuclear Power Plant – Operation Year 2016", and Table 1.0-19, "Summary of Evacuation Time Estimates for Callaway Nuclear Power Plant – Operation Year 2018."
1. **Clarify whether the evacuation time estimates provided in Table 1.0-13, "Response Times for Evacuating General Population 2008-2018," and Table 1.0-14, "Response Time for Evacuating Transient Population 2008-2018," were calculated with consideration of the potential for flooding in Highway 94 and Highway 100 and the resultant use of alternate routes.**
 2. **An RAI was requested to clarify whether evacuation traffic will be redirected if flooding on one or more of the roads on the evacuation routes are flooded. See ETE-3(G)(4).**
 3. **An RAI was requested to discuss the impact of evacuation route flooding and redirection of evacuation traffic on the evacuation time estimates. See ETE-3(G)(5).**
- B. Section 4.1.1.3, "Weather Conditions," indicates that an earlier revision of the evacuation time estimate stated that local flooding on evacuation routes, such as Highway 94, could extend the evacuation time estimate by one to two hours. However, Table 1.0-13, "Response Times for Evacuating General Population 2008-2018," shows the maximum difference in evacuation time estimates between normal and adverse conditions to be 43 minutes.
1. **Discuss the changes made in this ETE analysis that have reduced the one to two hour delay (Section 4.1.1.3) to only 43 minutes (Table 1.0-13).**
 2. **Clarify whether 43 minutes or one to two hours is the correct value for effect of adverse weather on evacuation time estimates.**
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ETE-13: Analysis of Evacuation Times, Report Format,

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Sections IV.A.2, Section IV.B.1

- A. Section 4.1.1, "Adverse Time Limiting Factors to Consider," discusses factors such time of day, time of year, weather conditions, and Callaway Unit 2 construction. However, it is not clear which of factors were then applied in the evacuation time estimate analysis. **Clarify which factors were used in the evacuation time estimate analysis for CNPP Unit 2 under normal and adverse conditions.**
 - B. The Notes found in Figures 1.0-8 through 1.0-28 cite tables and figures that have a different numbering system that given in this ETE analysis for CNPP Unit 2. **Clarify whether the tables and figures cited in the Notes section of Figures 1.0-8 through 1.0-28 are those from this CNPP Unit 2 ETE analysis or another document. If the table and figure citations given in notes in figures 1.0-8 through 1.0-28 are from another document, provide the reference for that document.**
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ETE-14: Analysis of Evacuation Times, Methodology, Total Evacuation Times

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Section IV.B.1

- A. None identified.
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ETE-15: Analysis of Evacuation Times, Methodology, Traffic Congestion

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Section IV.B.3

- A. Section 2.4, "Population and Vehicle Estimates by Subarea and Sector," states that if the roadway capacity is not exceeded, then backups should not occur. Maps of traffic queue (backup) locations and estimated delay times are not included in the CNPP Unit 2 ETE analysis. **Provide a map that includes traffic queue locations and estimated delay times should backups in traffic occur.**
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ETE-16: Other Requirements, Confirmation of Evacuation

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11

Regulatory Basis: Appendix 4 to NUREG-0654 Section V.A

- A. Section 5.0, "Confirmation of Evacuation," states that emergency workers at access control points will be able to observe the beginning and end of traffic flow out of an evacuation area and emergency workers, such as transportation providers, field monitoring teams, traffic control personnel, etc., within the evacuation area will be able to provide information on the progress of evacuation. However, there is no discussion how these workers, who already have assigned tasks during an evacuation, will accomplish the confirmation phase of evacuation. **Clarify the process to be used for confirmation of evacuation.**
- B. Section 4.2.1, "General Population Evacuation," and Section 5.0, "Confirmation of Evacuation," state that the verification time to confirm evacuation is included in the

evacuation time estimates. Table 1.0-13, "Response Times for Evacuating General Population 2008-2018," and Table 1.0-14, "Response Time for Evacuating Transient Population 2008-2018," indicate that confirmation time is included as an element in calculating the total evacuation time estimates. However, the confirmation time does not affect the demand estimation, mobilization, or travel time. **Clarify why the confirmation time is included as an additive element in the calculation of evacuation time estimates.**

- C. Table 1.0-13 states that it will take 23 minutes for the general population in subarea C-1 to evacuate. **Provide clarification on how the general population will be able to evacuate the plume exposure pathway EPZ within 23 minutes (Table 1.0-13) when there is increased congestion in the area caused by workers from CNPP evacuating from the same subarea.**

ETE-17: Other Requirements, Specific Recommendations

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Section V.B

- A. None identified.

ETE-18: Other Requirements, Draft Review

Acceptance Criteria: Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Section V.C

- A. The CNPP Unit #2 ETE analysis does not state whether state and local organizations involved in emergency response have reviewed this ETE analysis and provided any comments.
1. Provide a discussion on whether state and local organizations involved in emergency response have reviewed this ETE analysis and provided any comments.
 2. Discuss how comments from the state and local organizations involved in emergency response that may have affected evacuation time estimates were integrated into the study.