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April 16, 1984

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DUKE POWER COMPANY, ET AL.	)	Docket Nos. 50-413 OL
	)	50-414 OL
(Catawba Nuclear Station, Units 1 and 2	)	
(Emergency Planning))	)	

NRC STAFF TESTIMONY OF THOMAS URBANIK, II
CONCERNING THE EVACUATION TIME ESTIMATE
STUDIES FOR CATAWBA NUCLEAR STATION

Q.1. State your name and occupation.

A.1. My name is Thomas Urbanik, II. I am an Associate Research Engineer associated with the Texas Transportation Institute of the Texas A&M University System, College Station, Texas.

Q.2. Have you prepared a statement of your professional qualifications?

A.2. Yes. A statement of my professional qualifications is attached to this testimony.

Q.3. In what capacity are you testifying in this proceeding?

A.3. I am testifying on behalf of the NRC staff, for which I serve as a subcontractor through the Battelle Pacific Northwest Laboratories which is responsible under contract to the Nuclear Regulatory Commission for reviewing evacuation time estimates of nuclear facilities.

NUCLEAR REGULATORY COMMISSION

Docket No. 50-413/414 Official Exh. No. Staff EP-1

In the matter of Duke, Catawba 1 and 2

Staff	IDENTIFIED ✓
Applicant	RECEIVED ✓
Intervenor	REJECTED
Cont'g Off'r	
Contractor	DATE 5/8/84
Other	Witness
Reporter M Meltz	

Q.4. Briefly summarize your experience with evacuation time estimate studies for nuclear facilities.

A.4. I was principal author of NUREG/CR-1745, "Analysis of Techniques for Estimating Evacuation Times for Emergency Planning Zones" (November 1980), which described the limitations of several methodologies and some alternatives for determining evacuation time estimates. Also, I provided input to the development of the current guidance for evacuation time estimate studies which appear in Appendix 4 to NUREG-0654, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants" (NUREG-0654/FEMA-REP-1, Rev. 1, November 1980). In addition, I reviewed the initial evacuation time estimate study submittals of approximately 52 operating and near term nuclear facilities for the NRC against the guidance of NUREG-0654/FEMA-REP-1, Revision 0, the results of which are published in NUREG/CR-1856, "An Analysis of Evacuation Time Estimates Around 52 Nuclear Power Plant Sites" (May 1981). I am currently reviewing revisions to evacuation time estimate studies and new submittals against NUREG-0654, Revision 1.

Q.5. What is the purpose of this testimony?

A.5. The purpose of this testimony is to address, within the scope of Contentions 14 and 15, how the evacuation time estimate study, prepared by PRC Voorhees for Catawba Nuclear Station compare to the guidance of Appendix 4, NUREG-0654/FEMA-REP-1, Revision 1. With respect to Contentions 14 and 15, I will address whether this study can be relied on by public authorities for making decisions relative to the

time required to evacuate residents including those with special transportation requirements. I did not review the state and local plans which is done by FEMA; my testimony relative to Contention 15 is, therefore, limited to the development of the evacuation time estimates.

Q.6. What is the purpose of evacuation time estimate studies?

A.6. The purpose of evacuation time estimate studies is to indicate the range of times required to evacuate the emergency planning zone under a limited number of commonly occurring events. In the event of an actual emergency, decisionmakers will have a good basis on which to make informed decisions based on actual conditions. It is not the intent of evacuation time estimate studies to include estimates of the exact conditions during an evacuation, but to indicate the sensitivity of the analysis to a limited number of commonly occurring events.

A secondary purpose of evacuation time estimate studies is to assist emergency planners in deploying resources during an evacuation. A prime example would be the use of traffic control at congested locations. Also, in some cases, special traffic control procedures might be used in a limited number of locations to reduce the evacuation time due to a bottleneck in the roadway network. An example would be the use of a shoulder on an entrance ramp to provide more access capacity to a freeway to make more effective use of freeway capacity.

Q.7. What was the scope of your review of the Applicants' evacuation time estimate studies prepared by PRC Voorhees?

A.7. I reviewed the Applicants' April 1983 study by PRC Voorhees against the guidance of NUREG-0654/FEMA-REP-1, Revision 1. I have also reviewed the testimony of Mr Kulash submitted April 16, 1984.

Q.8. What were the criteria that you used during your review of the Applicants' revised study?

A.8. In conducting my review, I considered various elements set forth in Appendix 4 to NUREG-0654/FEMA-REP-1, Revision 1, which the NRC and FEMA believe should be included in evacuation time studies. These considerations include: (a) an accounting for permanent, transient, and special facility populations in the plume exposure EPZ; (b) an indication of the traffic analysis method and the method of arriving at road capacities; (c) consideration of a range of evacuation scenarios generally representative of normal through adverse evacuation conditions; (d) consideration of confirmation of evacuation; (e) identification of critical links and need for traffic control; and (f) use of methodology and traffic flow modeling techniques for various time estimates, consistent with the guidance of NUREG-0654/FEMA-REP-1, Revision 1, Appendix 4.

Q.9. For the Applicants' study, briefly describe the methodology employed in the study for analyzing evacuation times.

A.9. The Applicants' study used the PRC Voorhees EVACPLAN models to estimate evacuation times. The consultant's model was developed specifically for evacuation time estimate studies. It has been used concurrently with other simulation models at a number of sites and has produced similar time estimates. The method for computing total evacuation time was the distribution method, consistent with one of the two acceptable approaches identified in NUREG-0654/FEMA-REP-1, Revision 1, Appendix 4.

Q.10. Does the Applicants' study use methodologies for analyzing evacuation times that are reasonable or customary?

A.10. The methodologies use accepted and proven transportation planning techniques. The methodologies represent years of experience in transportation planning, modeling and operating transportation systems, and are consistent with NUREG-0654/FEMA-REP-1, Revision 1, Appendix 4.

Q.11. Are the assumptions made by these studies reasonable?

A.11. The assumptions are consistent with the guidance of NUREG-0654/FEMA-REP-1, Revision 1, make best use of available data, and are therefore reasonable.

Q.12. Are the demand estimates (estimate of the number of people to be evacuated) for the Applicants' study reasonable?

A.12. Yes. The Applicants' study considers all population components (permanent residents, transients, and special facility populations). ~~However, as noted in A.16. and A.18., additional information needs to be provided regarding peak transient population.~~

Q.13. Does the Applicants' study use traffic capacities that are reasonable?

A.13. Yes. The study used the Highway Capacity Manual, the standard reference in the transportation profession for determining capacities. The capacities suggested in the contention (600 and 900 vehicles per hour) are unreasonably low and are not supported by experience or sound technical analysis.

Q.14. Does the Applicants' study address adverse weather conditions?

A.14. The study appropriately considers adverse weather conditions. The Applicants' study appropriately reduces capacities to reflect adverse weather conditions. It should be noted that the adverse weather scenario is not intended as a "worst case" scenario. It is intended to reflect wet or slick roadways under which capacities are impaired, but the roadway is still passable. The decision maker could use this adverse weather estimate under more severe weather conditions by adding the amount of time necessary to clear the roads (e.g., a heavy snow).

Q.15. Do the studies use an evacuation roadway network that is reasonable?

A.15. ~~The~~ Yes, the evacuation roadway network is reasonable, ~~with one notable exception. The one change that is necessary concerns Lyle Boulevard (Rock Hill, S.C.). Lyle Boulevard does not represent an independent evacuation route in that traffic must merge with other routes outside the EPZ. The routing of evacuees using Lyle Boulevard will have to be altered.~~

Q.16. Based on your review of these evacuation time estimate studies for Catawba, have you identified any weaknesses or areas in the studies which were not addressed?

A.16. ~~Yes.~~ No. ~~The study does not fully address a peak summer scenario. Additional estimates for a peak summer transient population evacuating simultaneously with residents will have to be made.~~

Q.17. What would be the impact, if any, on these studies' evacuation time estimates if persons evacuated from a much larger area than was intended by an official advisory to evacuate?

A.17. The evacuation time estimates assume the implementation of traffic control beyond the EPZ. This traffic control is necessary to prevent problems that could result if vehicles outside the EPZ are not controlled. This would include the need for traffic control on I-77 outside the EPZ. This is the reason why planning is an important part of emergency preparedness.

Q.18. Did you attempt to verify the accuracy of the estimates made by the Applicants?

A.18. Yes, I drove the roadways in the Catawba EPZ and surrounding area in order to become familiar with the roadway network. I also performed several independent calculations of volume-to-capacity ratios to determine if any parts of the network appeared to require times longer than those indicated in the Applicants' study. My calculations lead me to conclude that the Applicants' analyses are reasonable, ~~but incomplete. The Lyle Boulevard change should not significantly alter the time estimate due to the available alternative routes. Additional estimates will also be required to account for peak transient populations in the summer. The peak summer estimate is likely to be significantly longer than the other scenarios.~~

Q.19. Is the road system adequate to evacuate persons within the plume exposure pathway EPZ?

A.19. Yes, the road system is adequate to evacuate persons in the EPZ.

Q.20. Do the evacuation time estimates assume quick response or multiple trips?

A.20. ~~No. The estimates assume additional time is required to obtain some buses which are brought from outside the EPZ. The estimates also assume that adequate numbers of buses are available for a single evacuation trip per bus. Demonstration of the necessary resources is a necessary part of the actual plan.~~ There is some quick response assumed for evacuating schools where the buses and drivers are onsite. However, some multiple trips are necessary for school children and also transportation dependent population. The multiple trips do not impact the evacuation time estimates.

Q.21. Would parents picking up their children at school significantly affect the time estimates?

A.21. No. The distribution functions used for preparation time are such that they assume 20 percent of the population which requires more than 40 minutes for preparation. This should be adequate for contingencies such as some families picking up their children if that were in fact feasible (i.e. they hadn't already been evacuated by bus).

Q.22. Would you consider 33 hours a realistic time estimate for Catawba?

A.22. No. There isn't a single site in the U.S. where a 33-hour estimate would be reasonable. The range of general population evacuation time estimates for all sites in the United States under normal weather conditions is from a minimum of 1 hour to a maximum of 12 hours.

Q.23. Do the evacuation time estimates adequately consider transients, including those at the Carowinds Theme Park and Heritage U.S.A.?

A.23. ~~No. As previously indicated, an additional estimate will be necessary for the peak summer scenario that includes maximum observed utilization of Carowinds and Heritage.~~ yes, a peak summer weekend scenario has been analyzed which includes Carowinds and Heritage, USA (PTL).

Q.24. What is your opinion as to the overall compliance of the Applicants' study with the criteria set forth in NUREG-0654/FEMA-REP-1, Revision 1?

A.24. The Applicants' study is in overall compliance with the NUREG-0654/FEMA-REP-1, Revision 1, Appendix 4, ~~except as previously noted. The problems must be corrected before a recommendation of adequacy of the time estimates can be given by me to the NRC Staff. I do not anticipate any problems in correcting the deficiencies.~~

Q.25. In your opinion, how will emergency response personnel be able to utilize these evacuation time estimates?

A.25. The Applicants' evacuation time estimates should provide to emergency response decision-makers additional information and a basis on which a decision as to the feasibility of an evacuation could be made in the event of an emergency at Catawba.

February 1984

BIOGRAPHICAL DATA

URBANIK II, THOMAS
Program Manager, Texas Transportation Institute
Lecturer, Civil Engineering Department, Texas A&M University

Education

Ph.D., Civil Engineering, Texas A&M University, 1982.
M.S., Civil Engineering, Purdue University, 1971.
B.S., Civil Engineering, Syracuse University, 1969.
B.S., Forest Engineering, State University of New York, 1968.

Experience

Program Manager, Texas Transportation Institute, Texas A&M University System, 1983-Present.
Assistant Research Engineer, Texas Transportation Institute, Texas A&M University System, 1977-1983.
Lecturer, Civil Engineering, Texas A&M University, 1982-Present.
Traffic Engineer, City of Ann Arbor, Ann Arbor, Michigan, 1972-1976.
Transportation Planning Engineer, City of Ann Arbor, Ann Arbor, Michigan, 1971-1972.
Research Assistant, Joint Highway Research Project, Purdue University, 1970-1971.

Professional Licenses

Registered Professional Engineer, Texas and Michigan

Memberships

American Society of Civil Engineers
Institute of Transportation Engineers
Sigma Xi
Chi Epsilon

SIGNIFICANT REPORTS AND PUBLICATIONS

Traffic Engineering

Speed/Volume Relationships on Texas Highways, State Department of Highways and Public Transportation, Research Report 327-2F, Austin, Texas, October 1983.
Priority Treatment of Buses at Traffic Signals. Transportation Engineering, November 1977.
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Total Accessibility Versus Equivalent Mobility of the Handicapped. Institute of Transportation Engineers, Compendium of Technical Papers, 49th Annual Meeting, 1979.

Survey of Vehicles and Equipment for Elderly and Handicapped Transportation. State Department of Highways and Public Transportation, Technical Report 1056-1, 1978.

Corpus Christi Elderly and Handicapped Transportation Study. City of Corpus Christi, Texas, 1978.

Expert Witness

Presented expert testimony before the Atomic Safety and Licensing Board, U.S. Nuclear Regulatory Commission, concerning evacuation times at several nuclear power plant sites including Three-Mile Island, Diablo Canyon, Indian Point, Seabrook and Shoreham.