



NRC STAFF TESTIMONY OF THOMAS URBANIK, II  
CONCERNING THE EVACUATION TIME ESTIMATE  
STUDIES FOR INDIAN POINT, UNITS 2 AND 3

Q.1. State your name and occupation.

A.1. My name is Thomas Urbanik, II. I am an Assistant 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.

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 Contention 3.3, how the evacuation time estimate studies prepared by CONSAD Research Corporation and by Parsons, Brinckerhoff, Quade & Douglas, Inc. for Indian Point, Unit No. 2 and Unit No. 3 compare to the guidance of Appendix 4, NUREG-0654/FEMA-REP-1, Revision 1. With respect to Contention 3.9, I will address whether these studies are based on a road system in the vicinity of Indian Point, Units 2 and 3, that is adequate for evacuating persons within the plume exposure pathway EPZ.

Contention 3.3 - The present estimates of evacuation times, based on NUREG-0654 and studies by CONSAD Research Corporation and by Parsons, Brinckerhoff, Quade & Douglas, Inc., are unreliable. They are based on unproven assumptions, utilize unverified methodologies, and do not reflect to the actual emergency plans.

Contention 3.9 - The road system in the vicinity of the Indian Point plant is inadequate for timely evacuation.

Q.6. What was the scope of your review of the Licensees' (Consolidated Edison Company of New York and Power Authority of the State of New York) evacuation time estimate studies prepared by Parsons, Brinckerhoff, Quade & Douglas, Inc. and the CONSAD Research Corporation's evacuation time estimate study for Indian Point, Units 2 and 3?

A.6. Initially, I reviewed the Licensees' January 31, 1980 study by Parsons, Brinckerhoff, Quade and Douglas, Inc. entitled "Evacuation Time Estimates for Areas Near the Site of Indian Point Power Plants" (hereafter "Licensees' Study") against the guidance of NUREG-0654/FEMA-REP-1, Revision 0.

I also reviewed an independent assessment dated, June 23, 1980, (revised) which was prepared for FEMA by CONSAD Research Corporation and entitled "An Assessment of Evacuation Time Around the Indian Point Nuclear Power Station" (hereafter "FEMA Study") against the guidance of NUREG-0654/FEMA-REP-1, Revision 0.

The results of both evaluations are summarized in NUREG/CR-1856, Volume 1. Both studies received excellent evaluations based on the current guidance of NUREG-0654/FEMA-REP-1, Revision 0.

In November 1980, Revision 1 of NUREG-0654/FEMA-REP-1 was published. This revision provided specific guidance in both methodology to be used and formats for reporting various data.

The Licensees have subsequently revised their evacuation time estimate study to reflect the new guidance of NUREG-0654/FEMA-REP-1, Revision 1. The study dated November 1981 and entitled "Methodology to Calculate Evacuation Time Estimates for Indian Point Emergency Planning"

Zone" (hereafter "Licensees' Revised Study") was also performed by Parsons, Brinckerhoff, Quade and Douglas, Inc.

Q.7. What were the criteria that you used during your review of the Licensees' revised study?

A.7. 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.8. Does the FEMA study meet the criteria of NUREG-0654/FEMA-REP-1, Revision 1?

A.8. The FEMA study was done before NUREG-0654/FEMA-REP-1, Revision 1, and was intended to allow the contractors flexibility in developing an "independent" analysis. Although, the FEMA study would be found deficient in some minor areas (e.g., format for presenting data) the overall methodology and assumptions are consistent with NUREG-0654/FEMA-REP-1, Revision 1.

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

A.9. The Licensees' revised study used a static traffic assignment model to estimate roadway travel times. The roadway travel time is added to the terminal time and free flow travel time to determine the total roadway evacuation travel time. The methodology used in the Licensees' revised study for analyzing evacuation times at Indian Point is a Volume 1 capacity analysis on a roadway link basis. In order to determine critical roadway segments under various evacuation scenarios a computer program was used in the analysis to do the counting of vehicles on evacuation routes and to determine the volume to capacity ratios. The method for computing total evacuation time was a sequential method, consistent with one of the two acceptable approaches identified in NUREG-0654/FEMA-REP-1, Revision 1, Appendix 4.

Q.10. For the FEMA study, briefly describe the methodology used in studying evacuation times.

A.10. The FEMA study used a dynamic evacuation model. The model uses a time-dependent loading and tracks vehicles on a link by link basis. The FEMA study also used a volume to capacity analysis on a roadway link basis to determine evacuation times. However, the method for computing total evacuation time is the distribution approach. This is the other acceptable method identified in NUREG-0654/FEMA-REP-1, Revision 1, Appendix 4 for estimating total evacuation time.

Q.11. Does the Licensees' revised study and the FEMA study use methodologies for analyzing evacuation times that are reasonable or customary?

A.11. The methodologies used 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.12. Are the assumptions made by these studies reasonable?

A.12. 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.13. Are the demand estimates (estimate of the number of people to be evacuated) for the Licensees' revised study and the FEMA study reasonable?

A.13 Yes. The Licensees' revised study and the FEMA study consider all population components (permanent residents, transients, and special facility populations). The Licensees' revised study includes updated estimates of the transient population. The maximum number of evacuating vehicles in the Licensees' revised study was approximately 134,000 as compared to approximately 97,000 in the FEMA study.

Q.14. Does the Licensees' revised study and the FEMA study use traffic capacities that are reasonable?

A.14. Yes. Both studies use the Highway Capacity Manual, the standard reference in the transportation profession for determining

capacities. The FEMA study used level-of-service D for its capacity calculations whereas the Licensees' revised study used a range from level-of-service D to level-of-service E. The Licensees' range was intended to represent varying levels of preparedness at the time of an evacuation order and is a good approach to reflect that variable.

Q.15. Does the Licensees' revised study and the FEMA study address adverse weather conditions?

A.15 Both studies consider adverse weather conditions. However, the FEMA study is deficient in only considering speed reductions and not a capacity reduction due to adverse weather. The Licensees' revised 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.16. Do the studies use an evacuation roadway network that is reasonable?

A.16. The evacuation roadway network is reasonable because it considers the principal roadways that would be used in an evacuation. In actuality, some evacuees are likely to use other roadways not included in the evacuation roadway network in order to avoid some bottlenecks.

Q.17. Did you attempt to verify the accuracy of the estimates made by the Licensees?

A.17. Yes, I drove the roadway in the Indian Point 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 Licensees' revised study. My calculations lead me to conclude that the Licensees' analyses are reasonable.

Q.18. 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.18. 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 is the reason why planning is an important part of emergency preparedness.

Q.19. Based on your review of these evacuation time estimate studies for Indian Point, have you identified any weaknesses or areas in the studies which were not addressed?

A.19. No.

Q.20. Describe the extent to which the evacuation time estimates of these studies are reflected in the emergency plans for Rockland, Orange, Putnam and Westchester County.

A.20. The county plans include the evacuation time estimates developed in the Licensees' revised study. This is the only study of the three which has been done in accordance with NUREG-0654/FEMA-REP-1, Revision 1.

Q.21. Are you familiar with the road system in the vicinity of Indian Point, Units 2 and 3?

A.21. Yes, I drove the principal roads within and around the plume exposure pathway EPZ.

Q.22. Is the road system for the counties of Putnam, Orange, Rockland and Westchester adequate to evacuate persons within the plume exposure pathway EPZ?

A.22. Yes, the evacuation time estimates account for the nature of the evacuation roadways in the EPZ.

Q.23. What is your opinion as to the overall compliance of the Licensees' revised study and the FEMA study with the criteria set forth in NUREG-0654/FEMA-REP-1, Revision 1?

A.23. The FEMA study was done prior to NUREG-0654/FEMA-REP-1, Revision 1; consequently, the study does not reflect some aspects of that guidance. In addition, this study does not contain current population data. However, the methodology and assumptions are consistent with NUREG-0654/FEMA-REP-1, Revision 1. The FEMA study, therefore, provides an independent basis for confirming the validity of the Licensees' revised study. The Licensees' revised study is in overall compliance with the NUREG-0654/FEMA-REP-1, Revision 1, Appendix 4.

Q.24. In your opinion, how will emergency response personnel be able to utilize these evacuation time estimates?

A.24. The Licensees' revised 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 Indian Point.

## PROFESSIONAL QUALIFICATIONS

- Education:** Ph.D., Civil Engineering (Transportation), Texas A&M University, 1982
- M.S., Civil Engineering (Transportation), Purdue University, 1971
- B.S., Civil Engineering, Syracuse University, 1969
- B.S., (Forest Engineering), State University of New York, 1968
- Professional Positions:** Texas Transportation Institute, Texas A&M University, January 1977 to Present. Assistant Research Engineer.
- City of Ann Arbor, Ann Arbor, Michigan, 1972-1976. Traffic Engineer.
- City of Ann Arbor, Ann Arbor, Michigan, 1971-1972. Transportation Planning Engineer.
- Joint Highway Research Project, Purdue University, 1970-1971. Research Assistant.
- Experience:** Principal person responsible for the evaluation of evacuation time estimates for the NRC. Work includes review of all evacuation time estimate submittals and the preparation of recommendations for revisions when submittals are not consistent with the guidance of NUREG 0654, Revision 1. Expert testimony has also been prepared for several sites concerning evacuation time estimates.
- Principal Investigator on several studies concerning public transportation planning at the state and local levels. Areas include general transit, intercity bus service, rural public transportation, elderly and handicapped transportation, and priority treatment of freeways and arterial streets. Other transportation planning studies include hurricane evacuation, nuclear evacuation and truck routing for hazardous materials.
- Responsible to Director of Streets, Traffic and Parking, Ann Arbor, Michigan. Responsible supervisory and professional traffic engineering work in directing the traffic engineering function of the department. Work involved responsibility for the application of professional engineering skill and knowledge to difficult traffic engineering problems in traffic regulation and control, street use, street lighting, geometrics, parking,

school safety, curb cuts, and related traffic engineering activities. Was directly responsible for the supervision of the traffic signal and traffic sign maintenance personnel.

Responsible to Director of Traffic Engineering and Transportation, Ann Arbor, Michigan. Reviewed transportation aspects of all plans for development in the city. Staff member to the Ann Arbor Transportation Authority responsible for budget and union negotiations. Staff Coordinator for the planning, design, implementation, and operation of the Dial-A-Ride demand-responsive demonstration project.

Under general direction of Dr. Kenneth W. Heathington, Purdue University, designed attitudinal questionnaire concerning public transportation for a home interview survey in Lafayette, Indiana. Also analyzed survey results for inclusion in a report which was the basis for improving public transportation in Lafayette.

Affiliations: Institute of Transportation Engineers  
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Registration: Registered Professional Engineer, Texas and Michigan.

Publications: Urbanik, T., et al., The Intercity Bus Industry in the U.S. and Texas, Texas Transportation Institute Technical Report 0965-1F, August 1981.

Urbanik, T. and A. E. Desrosiers, An Analysis of Evacuation Time Estimates Around 52 Nuclear Power Plant Sites, U.S. Nuclear Power Plant Sites, U.S. Nuclear Regulatory Commission, NUREG/CR-1856, May 1981.

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Urbanik, T. and Jose' A. Soegaard, Transportation of the Elderly and Handicapped in Texas: A Case Study, Texas Transportation Institute, Technical Report 1056-2F, September 1979.

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Urbanik, T., et al., Survey of Vehicles and Equipment for Elderly and Handicapped Transportation, Texas Transportation Institute, Technical Report 1056-1, September 1978.

Urbanik, T. and R.W. Holder, Corpus Christi Elderly and Handicapped Transportation Study, Texas Transportation Institute, September 1978.

Urbanik, T., Texas Hurricane Evacuation Study, Texas Transportation Institute, September 1978.

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Urbanik, T. and R.W. Holder, Evaluation of Alternative Concepts for Priority Use of Urban Freeways in Texas, Texas Transportation Institute, March 1977.

Urbanik, T., et al., Ann Arbor Dial-A-Ride Project Final Report, Ann Arbor Transportation Authority, April 1973.

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Urbanik, T. and K.W. Heathington, Driver Information Systems for Highway-Railway Grade Crossings, Highway Research Record Number 414, 1972.

Urbanik T., et al., The Greater Lafayette Area Bus Transit Study, Joint Highway Research Project, Purdue University, April 1971.

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 and Diablo Canyon.