



MAY 1, 1984

ANALYSIS REPORT  
ON  
ISSUES RELATED TO THE PILGRIM EVACUATION TIME ESTIMATE  
PILGRIM NUCLEAR POWER STATION  
PLYMOUTH, MASSACHUSETTS

FEDERAL EMERGENCY MANAGEMENT AGENCY  
REGION I

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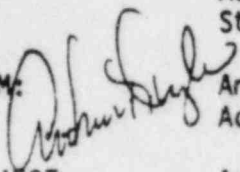


# Federal Emergency Management Agency

Region I J.W. McCormack Post Office and Court House  
Boston, Massachusetts 02109

May 4, 1984

MEMORANDUM FOR: Samuel W. Speck  
Associate Director  
State and Local Programs and Support

FROM:  Arthur T. Doyle  
Acting Regional Director

SUBJECT: Analysis Report on Bottleneck Issues Related  
to the Pilgrim Nuclear Power Station  
Evacuation Time Estimates

We have attached two copies of the final report dated May 1, 1984 on the above subject.

This report has received the concurrence of NRC's consultant, Dr. Thomas Urbanik II and your staff in the Office of Natural and Technological Hazards (NTH). Except for the cover, this report is identical to the previous report mailed on April 17, 1984 to NTH Assistant Associate Director, Richard Krimm.

Attachments

## P U R P O S E

This report was prepared in response to the Nuclear Regulatory Commission's request for assistance in the review of a traffic management issue affecting the Evacuation Time Estimates (ETE) for the 10-mile plume Emergency Planning Zone (EPZ) of the Pilgrim Nuclear Power Station.

The purpose of our analysis and this report was to determine whether issues raised by NRC in May 1981 concerning two evacuation road network bottlenecks and their effects on the Evacuation Time Estimates were considered in the Traffic Management Plan for the area around the site.

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## OVERVIEW

In a memorandum dated January 20, 1984 (Appendix #1) The Nuclear Regulatory Commission (NRC) requested that The Federal Emergency Management Agency (FEMA) further review issues related to the Evacuation Time Estimates (ETE) for the Pilgrim Nuclear Power Station. Specifically, NRC requested that FEMA evaluate whether the bottlenecks in the road network which could slow evacuation of the Plume Emergency Planning Zone (EPZ) had been addressed sufficiently by the Commonwealth of Massachusetts in its plans. The bottlenecks had previously been identified in NRC's Safety Evaluation Report (NUREG-0022, Supplement No. 5 to NUREG-75/054, hereafter referred to as NUREG-0022) done for the Pilgrim Unit 2 Construction Permit Application of May 1981 (extract in Appendix #2). Appendix A of that report indicated that the ETE did not adequately reflect two potential impediments to evacuation located outside the 10-mile EPZ.

FEMA has reviewed this matter by consulting with the principal author of NUREG-0022, reviewing the pertinent plans and documents developed in response to NUREG-0022, and consulting with the State agencies responsible for implementing evacuation plans. Our analysis revealed that, following the issuance of NUREG-0022, impediments to evacuation were carefully studied by the Boston Edison Company (BECO, operator of Pilgrim Nuclear Power Station) and a traffic management plan was developed to eliminate the problems identified by NRC.

## ANALYSIS OF ISSUES

Principal findings of NUREG-0022 were:

- 1) That there was a bottleneck at the Sagamore Bridge Rotary that could cause unusual delay during an evacuation of the Pilgrim 10-mile EPZ, but that proper traffic management would resolve this problem (p. 13.3-9).

- 2) That there might be evacuation problems if the southbound lane of Route 3 at the intersection of Route 128 were not closed.  
(p. B-1)
- 3) That BECo should extend the ETE study to cover areas south of the EPZ to the Cape Cod Canal in order to identify locations with similar problems needing advanced traffic planning.  
(p. 13.3-9)

We consulted Dr. Thomas Urbanik II of The Texas Transportation Institute who was the principal author of "Item G" and Appendices A and B in NUREG-0022 that identified possible traffic bottlenecks. Dr. Urbanik told us in a telephone conversation March 5, 1984 that the ETE for the Pilgrim Nuclear Power Station that he had examined did not pay sufficient attention to the details of traffic management.

The Commonwealth of Massachusetts advised us that, following the issuance of NUREG-0022, BECo funded a study entitled Evacuation Traffic Management Plan for Sagamore/Buzzards Bay (Appendix #3). In the study report, BECo's consultant, H.M.M. Associates, evaluated the area south of the Pilgrim Station EPZ and identified areas where physical and/or operational roadway characteristics might result in traffic flow problems during the course of an evacuation of the EPZ. The report also outlined several traffic management plans which could be implemented south of the Pilgrim Station EPZ to expedite the flow of evacuating vehicles from the EPZ. This included several traffic management options for the Sagamore Bridge traffic rotary. This information was used by the Massachusetts Civil Defense Agency and the State Police to develop the "Massachusetts State Police Troop 'D' Headquarters, Middleborough, Massachusetts Highway

Traffic Control and Notification Plan for an Emergency Condition at Pilgrim I NPS" (See Appendix 4). The plan calls for control of traffic at the Sagamore Bridge and in the affected vicinity including points several miles to the west. Our review of the State Police plan revealed that the information was not complete in comparison to the traffic management scheme suggested in the H.M.M. Associates traffic management study. In particular, the State Police plan did not indicate how traffic on the Cape Cod side of the Sagamore Bridge would be managed. However, in a meeting March 21, 1983 the State Police indicated that the need to handle traffic on Cape Cod was obvious and did not need to be included in the plan (see Appendix #5). The State Police also explained that they would have ample forces to control traffic at any time of the year. Fifteen additional troopers are assigned to the Southeastern Massachusetts area to alleviate Cape Cod traffic on summer weekends, which is the worst case condition for evacuation.

In addition, the Commonwealth of Massachusetts notes that NUREG-0022 erroneously states that there are no exits on the southbound lane of Route 3 between Route 128 and Plymouth. Nevertheless, in order to be particularly careful with respect to public safety, they have followed the recommendations in NUREG-0022 to close the southbound lane of Route 3 at Route 128 in event of an evacuation. This decision is reflected in the State Police plan.

#### CONCLUSIONS

After extensive analysis, we conclude that the traffic management issues raised by NRC in NUREG-0022 have been adequately addressed by the Common-

wealth of Massachusetts in accordance with proper emergency management standards and the evacuation time estimation methods now available. In the event that advances in evacuation time estimation such as FEMA's Exercise Evaluation Simulation Facility Model indicate that improvements in traffic management for this area are needed, FEMA will make appropriate recommendations.



## LIST OF APPENDICES

- #1. Memorandum from NRC dated January 20, 1984 requesting FEMA's assistance.
- #2. Extract of NUREG-0022, Supplement No.5 to NUREG-75/054, May 1981 (pages 13.3-8, 13.3-9, and 8-1).
- #3. Traffic Management Plan for Sagamore/Buzzards Bay - H.M.M. Associates, August 1981.
- #4. State Police - Traffic Control & Notification Plan for an Emergency Condition at Pilgrim I NPS.
- #5. Report on the Meeting of March 21, 1984 with technical experts (Memo to the file, March 27, 1984).

A P P E N D I X NO. 1

MEMORANDUM FROM NRC DATED JANUARY 20, 1984 REQUESTING FEMA ASSISTANCE