BOSTON EDISON

Pilgrim Nuclear Power Station
Rocky Hill Road
Plymouth, Massachusetts 02360

George W. Davis
Senior Vice Preside   Nuclear

December 16, 1991
BECo Ltr. 91-152

U.S. Nuclear Regulatory Commission
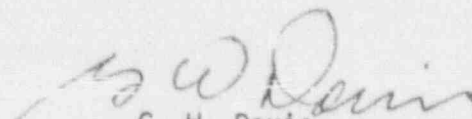Attn: Document Control Desk
Washington, D.C. 20555

Docket No. 50-293
License No. DPR-35

Subject: SENSITIVITY STUDY OF BEACH POPULATION ESTIMATES FOR PILGRIM

Dear Sir:

As requested in your November 14, 1991, correspondence we have received KLD
Associates response to Dr. Thomas Urbanik II review comments on the Saquish
Neck/Gurnet Point and Duxbury Beach Evacuation Time Estimate sensitivity
studies. A copy of the KLD response has been forwarded to the Federal
Emergency Management Agency. Copies of our correspondence and KLD's response
are attached.

If you have any questions regarding this matter, please contact
Mr. Ronald Varley at 508-747-9464.

G. W. Davis

RAV/jlm

Attachments

cc: Mr. Thomas T. Martin
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. R. B. Eaton
Div. of Reactor Projects I/II
Office of NRR - USNRC
One White Flint North - Mail Stop 14D1
11555 Rockville Pike
Rockville, MD 20852

Sr. NRC Resident Inspector - Pilgrim Station

Emergency Preparedness Department

December 4, 1991
EP91-711

Mr. Richard Strome, Director
FEMA Region I
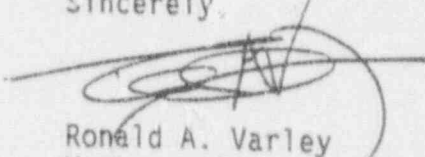J. W. McCormack Post Office
and Court House
Boston, MA 02109

Dear Director Strome:

By letter dated August 7, 1991 (EP 91-443), Boston Edison Company forwarded to
you the results of a sensitivity study performed by KLD Associates, Inc., to
determine if certain higher population estimates for Duxbury Beach and
Saquish-Gurnet would have a significant impact on the Evacuation Time
Estimates for the Pilgrim EPZ. Those higher estimates were discussed in
NUREG-1438 "Findings on Issues of Offsite Emergency Preparedness for Pilgrim
Nuclear Power Station.

By letter dated November 14, 1991, the NRC transmitted to Boston Edison
comments on the KLD study prepared by its technical consultant, Dr. Thomas
Urbanik. The NRC's November 14 letter requested that Boston Edison "address
the areas of concern in Dr. Urbanik's review in a supplement" to the original
sensitivity study provided to FEMA.

We directed KLD to prepare a supplement addressing Dr. Urbanik's comments.
That supplement is included as Attachment A. While KLD has performed the
requested supplemental analysis and provided the additional detail requested
by Dr. Urbanik, as we stated in our August 7, 1991 letter, we continue to
believe that the current ETE population estimates for Duxbury Beach and
Saquish-Gurnet are the most realistic. Therefore, we will continue to utilize
those in the ETE and in protective action recommendation procedures.

Sincerely,

Ronald A. Varley
Manager, Emergency Preparedness

/jlm
EOF4058
Enclosure
cc: A. D. Rodham, MEMA
    R. Markovich, BECo

December 10, 1991

Mr. Ronald A. Markovich
Boston Edison Company
Emergency Planning Group
118 Long Pond Road
Plymouth, MA 02360

Dear Ron:

We are in receipt of the comments offered by Dr. Thomas Urbanik, II from his review of our August 2, 1991 sensitivity study. This letter supplements our earlier submission and incorporates our response to his comments.

As documented in NUREG-1438, the NRC Task Force examining the Pilgrim Nuclear Power Station Offsite Emergency Response Program suggested that Boston Edison conduct several Evacuation Time Estimate (ETE) sensitivity studies. These studies were designed to determine whether significant increases in the postulated population estimates for Saquish/Gurnet and Duxbury Beach would have an effect upon the ETE. At your request, we conducted several sensitivity studies which were described in our August 2 letter.

Dr. Urbanik's letter indicated that the analyses which we previously performed did not consider the highest population estimates for Gurnet/Saquish referenced in NUREG-1438 (i.e., 5,000 persons), but also recognized that we utilized an estimate for the Duxbury Beach population higher than that referenced in NUREG-1438. Dr. Urbanik also suggested that the sensitivity analyses consider the populations of both beach areas together, rather than independently, in evaluating potential impacts on the ETE. As discussed in our August 2 letter, we continue to believe that the most realistic population estimates are those derived from the survey conducted on July 5, 1987. Nevertheless, we have factored Dr. Urbanik's suggestions into an additional sensitivity study.

Before providing the results, however, we are also providing additional supporting information as requested by Dr. Urbanik. In particular, Dr. Urbanik requests additional information on: the location of vehicles entering the road

network; vehicle routings; location of anticipated congestion; and the basis for the vehicle occupancy factors used in the analyses. This information is provided below.

Additional Supporting Information

1. Location of Vehicle Entry Into the Network

Vehicles to be used for an evacuation of Duxbury Beach are assumed to be parked in the Duxbury Beach parking fields. These fields are located in the area north of, and adjacent to, the Powder Point Bridge. Off-road vehicles are assumed to originate their evacuation trips from the beach areas south of the Powder Point Bridge. Similarly, off-road vehicles which begin their evacuation trips on Saquish Neck or near Gurnet Point are assumed to load the roadway system along the length of Saquish Neck.

2. Vehicle Routings

Two routes exist for vehicles evacuating from the Duxbury Beach and Saquish/Gurnet areas -- one over the Powder Point Bridge into Duxbury, and one north onto Route 139 in Marshfield. Routes using the Powder Point Bridge eventually access Route 3A north. Routes accessing Route 139 in Marshfield have access to Route 3A north and are capable of utilizing Route 3 north as well. Since we are currently using all available routes off Duxbury Beach and Saquish/Gurnet, vehicle routing remained the same for all sensitivity studies discussed herein.

3. Location of Anticipated Vehicle Congestion

Traffic congestion is expected on roads leading to the northbound exit from Duxbury Beach and at the Powder Point Bridge area. Since the capacity of roads leading to these exit points is generally lower than the capacity of the roads leading from those exit points to the EPZ boundary, traffic congestion due to beach traffic is localized on or near the beach. This congestion takes two forms: delays to vehicles departing from parking fields, and off-road vehicles queuing along the path leading to the Power Point Bridge.

4. Basis for Vehicle Occupancy Factor

As mentioned in our August 2, 1991 sensitivity study, the vehicle occupancy factor used in our analyses was derived from the vehicle occupancy survey which we previously conducted. On July 5, 1987, vehicles entering the Duxbury Beach parking area were observed and the number of occupants were recorded. This data collection was performed simultaneously with the aerial photography. The vehicles which were observed included both those destined for the Duxbury Beach

parking areas as well as those destined for the Saquish/Gurnet area and those portions of Duxbury Beach requiring off-road vehicles. A total of 191 vehicles were sampled as they entered the area. Analysis of the results of the vehicle occupancy survey indicated an average occupancy rate of 2.54 persons per vehicle.

Supplemental Sensitivity Analyses

In response to Dr. Urbanik's comments, we have conducted two additional sensitivity studies. In both cases, we have combined the population estimates for both Duxbury Beach and Saquish/Gurnet in calculating the evacuation time estimates and beach clearance times.

In the first case analyzed, we combined the highest population estimates for Duxbury Beach and Saquish/Gurnet contained in our August 2 letter. The results are as follows:

CASE ID	ESTIMATED VEHICLES	ESTIMATED PERSONS	EVACUATION TIME ESTIMATES	TIME TO CLEAR BEACH AREAS
XD	4,701	11,940	5:15[1]	5:15

The above combination results in an ETE and beach clearance times identical to Case D2 for Duxbury Beach described in our August 2 letter. In this case, the time to clear Duxbury Beach has increased to the point where the last vehicles leaving the EPZ are those vehicles exiting Duxbury Beach. Those vehicles should not encounter significant traffic congestion on roads leading from the beach access to the EPZ boundary, because the majority of non-beach evacuating traffic has already cleared these routes. Hence, the time to clear the beach approximates the ETE for the entire EPZ.

Second, we have also utilized the highest population estimates set forth in NUREG-1438 as suggested by Dr. Urbanik. The results are as follows:

CASE ID	ESTIMATED VEHICLES	ESTIMATED PERSONS	EVACUATION TIME ESTIMATES	TIME TO CLEAR BEACH AREAS
PK	5,118	13,000	5:55	5:35

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[1] All times are referenced from the issuance of the order to evacuate to the general public which would occur at the General Emergency. However, plans call for beach areas to be closed at the Alert stage.
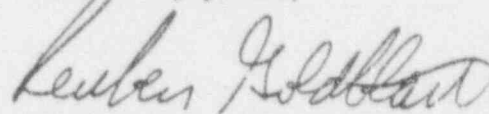
As shown above, increasing the population estimates for Duxbury Beach and Saquish/Gurnet to the levels cited in NUREG-1438 (Case PK) causes the ETE to further increase from 5:15 to 5:55. The time to clear the beach areas further increases from 5:15 to 5:35. The last roads to clear within the EPZ are Routes 3A northbound at the EPZ boundary and Route 139 leaving the beach access 4.

It should be noted that the above estimates were based upon a vehicle occupancy factor of 2.54 persons, as measured by field data collection. If the value of 3.33 persons, as implied from figures cited in NUREG-1438, were used, then the estimated number of vehicles required to evacuate the 13,000 people would be 3,904. This figure is somewhat greater than the number of vehicles evacuated from the beach area in Case D2 from our August 2 letter (3,667), and less than the number of vehicles evacuated in Case XD (4,701), both of which produce an ETE and beach clearance times of about 5:15. Consequently, we have concluded that the ETE for this case would be about 5:15, and that the time to clear the beach areas would also be about 5:15. This represents an increase in ETE of about 5% over that reported in the Evacuation Time Estimate study.

In summary, we have shown that even very substantial increases in the postulated population of Saquish/Gurnet and Duxbury Beach do not significantly increase the current ETE. Some increases in the ETE do occur if the NUREG-1438 maximum population estimates are used, and one also conservatively assumes that the field data collection vehicle occupancy value of 2.54 persons is accurate. If however, we use the occupancy value of 3.33 persons implied by NUREG-1438, the ETE increases only by about 5%.

As we stated in our August 2 letter, the most important criterion in judging the reliability of an ETE is whether the estimate depicts a realistic picture of conditions present in time of emergency. Therefore, while we have evaluated the effects of substantially increased population estimates, we do not recommend that those higher estimates be incorporated into the current revision of the ETE because they do not present a realistic picture of evacuation traffic demand.

Very truly yours,

Reuben Goldblatt, P.E.
Principal Analyst