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January 30, 1980

Mr. Brian K. Grimes, Director
Emergency Preparedness Task Group
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Grimes:

This letter is in response to your letter of November 29, 1979 on Evacuation Time Estimates (after notification) for Areas Near Nuclear Power Plants. This response provides evacuation times on the basis of the present state of emergency preparedness. These estimates could change as state and county plans are revised and notification systems are developed.

The time estimates for this response were developed by the Pennsylvania Emergency Management Agency (PEMA) and Philadelphia Electric Company. Some information to develop these estimates was provided by the Maryland Civil Defense and Disaster Preparedness Agency. All of the groups involved agreed that providing separate time estimates for different phases of an evacuation can be misleading. In a rapidly developing emergency situation it could be expected that mobilization of emergency personnel, notification of the public, and evacuation of the public would be occuring simultaneously. As a result, adding time estimates together for different phases of an evacuation may not be indicative of the total time required to evacuate an area.

The time of day at which an incident occurs can also have a significant effect on the time to notify and evacuate the public. Notification times will be longer in the middle of the night than during the day because most forms of communication (e.g., radios and television) are not being used. However, evacuation times will generally be shorter at night because most families are together, schools do not have to be evacuated, and factories do not have to be shut down.

The time estimates in this response are conservative. Calculated times which were part of an hour were rounded up to the next whole hour.

Your letter gave the following information concerning the format to be used in this response.

Format for Reporting Information

The areas for which evacuation estimates are required must encompass the entire area within a circle of about 10 miles radius, and have outer boundaries corresponding to the plume exposure emergency planning zone (EPZ). These areas are as follows:

Distance	Area
2 miles	two 180 degree sectors
5 miles	four 90 degree sectors
about 10 miles	four 90 degree sectors

Estimates for the outer sectors should assume that the inner adjacent sectors are being evacuated simultaneously. To the extent practical, the sector boundaries should not divide densely populated areas. Where a direction corresponding to the edges of areas for which estimates have been made is thought not to be adequately represented by the time estimates for adjacent areas, an additional area should be defined and a separate estimate made for this case. The format for submittal should include both a table and a figure (overlaid on a map) which each give the information requested in items 1 and 2 below. Additional material may be provided in associated text.

Required Information

1. Two estimates are requested in each of the areas defined in item 1 for a generic evacuation of the population (not including special facilities). A best estimate is required and an adverse weather estimate is required for movement of the population.

Response

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Two estimates for each of the areas defined above are shown in Table 1. Sectors and evacuation routes are shown on the attached maps. The estimates for the areas in Pennsylvania were developed by PEMA for a 10 mile radius around Peach Bottom Atomic Power Station. The method used by PEMA to develop these estimates, which is described in response to item 6, was also used to

estimate evacuation times for the area in Maryland within the 10 mile radius. The adverse weather data are based on PEMA's estimate that evacuation times would double in a two and five mile radius and would triple in a 10 mile radius.

Required Information

2. The total time required to evacuate special facilities (e.g., hospitals) within each area must be specified (best estimate and adverse weather).

Response

There are no hospitals, nursing homes, or prisons within a 10 mile radius of Peach Bottom Atomic Power Station.

Required Information

3. The time required for confirmation of evacuation should be indicated. Confirmation times may consider special instructions to the public (e.g., tying a handkerchief to a door or gate to indicate the occupant has left the premises).

Response

Confirmation of evacuation could include steps such as checking traffic flow, patrolling evacuated areas, and door-to-door verification. In an actual event confirmation would probably be a combination of all of these methods. It is PEMA's opinion that preliminary confirmation would be completed when there are essentially no more vehicles leaving the evacuated area. Based on their estimates for vehicle travel time it would take approximately three hours for preliminary confirmation, although this confirmation would be part of the evacuation time.

Patrolling the evacuated area with emergency vehicles and aircraft and a door-to-door check of some residences would provide more complete confirmation. If it is assumed that patrolling the area will require approximately the same amount of time as notification, which is discussed in item 4, it would take three hours for this more complete confirmation. The effectiveness of this method would depend on how many people were notified to leave some indication that they had evacuated, such as tying a cloth to their front door or mailbox, and how many people would actually follow these instructions when they did leave.

Required Information

4. Where plans and prompt notification systems have not been put in place for areas out to about 10 miles, estimates of the times required to evacuate until such measures are in place for the plume exposure emergency planning zone (EPZ) should also be given. Notification times greater than 15 minutes should be included in the evacuation times and footnoted to indicate the notification time.

Response

Each county presently has a number of different methods of notification including sirens, radio and television broadcasts, use of weather channels, mobile public address systems and door-to-door, however, the present plans cannot provide complete notification within the 10 mile radius in a 15 minute time period. PEMA estimates that it would take approximately three hours to notify essentially everyone in a 10 mile radius that they should listen for further instructions or that they should evacuate immediately.

It has been assumed that the three hour notification estimate can be applied to the area in Maryland since no unique notification problems have been identified.

In some cases the total evacuation time will not be the sum of notification and travel time since they could be occuring simultaneously, however. for purposes of these estimates it was assumed that notification was complete before the evacuation began.

10 Mile Radius	Notification Time (Hours)	Travel Time (Hours)	Total Evacuation Time (Hours)
North Sector	3	3	6
East Sector	3	3	6
South Sector	3	2	5
West Sector	3	2	5

Required Information

5. Where special evacuation problems are identified (e.g. in high population density areas), specify alternative protective actions, such as sheltering, which would reduce exposure and the effectiveness of these measures.

Response

There are no high population density areas within 10 miles of the Peach Bottom Atomic Power Station.

Required Information

6. A short background document should be submitted giving the methods used to make the estimates and the assumptions made including the routes and methods of transportation used. This document should also note the agreement or areas of disagreement with principal local officials regarding these estimates.

Response

For Pennsylvania the time estimates developed by PEMA were calculated using 1970 population information for the townships within a 10 mile radius of Peach Bottom Station. Evacuation routes were selected which provided the best roads with maximum traffic capabilities. Secondary roads were not considered.

The following assumptions were made:

1) Two way traffic maintained on all roads
2) Average vehicle speed of 35 miles per hour
3) Three persons per vehicle.
4) 750 cars per lane per hour.
5) Buses were not considered.

The primary routes used for evacuation are all medium or heavy duty roads aithough none of them are more than two lanes wide. The routes used were PA 851 west, PA 74 west, PA 324 north, PA 272 north, US 222 north, and US 1 east.

Based on these assumptions it was calculated that 2250 people could pass by a check point each hour. Using population figures for each township it was then possible to estimate how long it would take for enough vehicles to pass a check point to evacuate everyone in that area.

For Maryland the same logic and assumptions used by PEMA were applied to Cecil and Harford Counties. Road conditions are similar. The primary evacuation routes used were US 165 south, MD 646 south, MD 623 south, MD 222 south, and US 1 east. The population data used was based on the same 1970 data.

There is one major difference in the development of the data for Pennsylvania and Maryland. The PEMA evacuation data is based on sending people to mass care facilities outside of the 10 mile radius. For this reason, some people in the east sector travel north within the 10 mile radius even though more direct evacuation would be to travel east. This was not taken into consideration for developing the Maryland evacuation estimates although it is expected that mass care facilities will be considered when state and county plans are revised.

The estimates in this response were developed with the cooperation of state and local officials. Although there were no major areas of disagreement, PEMA has emphasized that all of their estimates are preliminary and may be revised as emergency planning and notification systems are updated.

Very truly yours,

Attachments

TABLE 1

EVACUATION TIME ESTIMATES

	Evacuation Time (Hrs) Good Weather	Evacuation Time (Hrs) Adverse Weather
2 Mile Radius		
NE Sector	1	2
SW Sector	1	2
5 Mile Radius		
N Sector	2	4
E Sector	2	4
S Sector	2	4
W Sector	2	4
10 Mile Radius		
N Sector	3	9
E Sector	3	9
S Sector	2	6
W Sector	2	6