

October 26, 1973

THREE MILE ISLAND NUCLEAR STATION DOCKET No. 50-289

Supplemental Testimony on Emergencies and Evacuation

By

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Contention 4. It is contended that the evacuation and emergency plans must be fully developed, including procedures, before the Applicant can be given an operating license. The routes for evacuation must be clearly defined as well as all warning systems; medical care centers, emergency drills, etc. It is further contended in order to fully analyze the environmental impact of the facility as well as the full cost of the facility, the Applicant must establish the evacuation route, the medical care centers, and the costs of the evacuation and emergency plans. (Emphasis added)

My testimony will be limited to the underlined portions of the contention above, the remainder to be provided by C. Richard Van Niel.

The original cost-benefit analysis contained in the Final Environmental Statement (FES) for the Three Mile Island (TMI) plant included among the costs, the costs of the capital expenses of facility construction and operating and maintenance costs. These costs included license fees and taxes. The costs to the applicant in terms of facilities planning for emergencies and evacuation and annual maintenance of preparedness are included in the initial or capital cost of the nuclear plant

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facility. The incremental costs to governmental agencies of planning and maintenance of preparedness is comparatively small; it is noted, however, that the applicant pays several million dollars in taxes per year to Federal, State, and local governments and that these taxes compensate those governments for services which are, or might be, provided. In the unlikely need to evacuate a part of the population from the area immediately adjacent to the plant, there would be additional costs to some individuals for unusual expenses for food, lodging, disruption of income and production, etc. However, the original cost estimates in the FES did include an annual expense item for public liability insurance up to \$95 million obtained through private insurance sources. A breakdown of information has been developed in this testimony in order to establish the correctness of the FES analysis as described above.

Several classes of postulated accidents ranging in severity from trivial to very serious have been identified by the Atomic Energy Commission as explained in further detail in Section VI of the FES. In general, accidents in the high potential consequence end of the spectrum have a low probability of occurrence and those on the low potential consequence end have a higher probability. The most serious accident considered as the basis for formulating the evacuation plan is in Class 8. The probability of occurrence of large Class 8 accidents is very small. Therefore, when the consequences indicated in Table 19 of the FES are weighted by probabilities, the environmental risk is very low.

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Even in the unlikely event of a Class 8 accident, the probability of release of sufficient radioactive material to constitute a significant health hazard to the public in the vicinity of the Three Mile Island plant is small. However, in order to further protect public health and safety from these contingencies, the applicant and the Pennsylvania State Department of Environmental Resources (PDER) are developing emergency plans for evacuation of the site and sectors of the low population zone (LPZ) adjacent to the Three Mile Island plant which might be affected by any such accident. The LPZ is defined in 10 CFR Part 100.3(b) as the area immediately surrounding the plant site which contains residents, the total number of which is such that there is a reasonable probability that protective measures could be implemented in the event of a serious accident. The LPZ extends 2 miles from the plant and 2348 people resided in this area in 1970. The population of the LPZ is projected to reach 3,463 people by the year 2,014.

In the event of an accident only persons in that portion of the LPZ which might be affected by radioactivity releases would be evacuated. Their fraction would depend to a great extent upon meteorological conditions at the time of the accident, the population distribution within the LPZ, and the precise nature of the accident. The population distribution is such that the sector of this zone possessing the highest density is directly west of TMI. The 1970 population in this sector was 399 and by the year 2014 the population is expected to be about 740.

Costs for emergency medical and evacuation contingencies may be divided into several separate categories. First, in order to prepare for an emergency, equipment expenses and some initial degree of planning are necessary. A second cost item will be essential annual expenses to maintain the capacity to provide emergency services; in a general case, this may include maintenance of radiological monitoring equipment, emergency decontamination rooms and training programs. A third cost item will be the cost of implementation of the plan if an accident occurs; this cost item can be further subdivided into costs of evacuation and costs of maintaining the evacuees away from their usual homes for a period of time.

Planning Costs

The cost of developing an emergency medical plan for TMI by the Bureau of Radiological Health (BRH) of the PDER and other government agencies concerned with public safety has been estimated to be \$30,000. The primary responsibility for on-site safety is with the applicant. The cost of writing a comprehensive on-site plan has been estimated by the applicant to be an additional \$50,000.

Equipment and Training Costs

Off-site radiological monitoring in the event of an accident is to be provided by the applicant and BRH and is further supported by local Civil Defense efforts.

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The original capital cost of radiological monitoring equipment required by the state and civil defense organizations is estimated to be \$15,000 and annual maintenance expenses for this equipment is expected to be \$1,000.

A number of facilities and personnel employed by the applicant serve a dual purpose: routine monitoring of effluent discharges and service during an emergency situation. Precise allocation of cost between uses is not possible; however, the important cost items can be reviewed. The applicant is equipping a health physics laboratory for \$72,000 which can be used during an emergency. A radiation supervisor and four radiation technicians are employed by the applicant; annual wage and benefits costs for these personnel are estimated to be \$125,000 per year.

Radiological monitoring equipment being installed by the applicant which also serves the function of routine monitoring is a much larger cost item. Approximately \$334,000 of such equipment and \$21,000 of spare parts are required for Unit 1 of the facility.

Annual personnel training expenses of local public agencies necessary for implementation of the emergency plan are expected to be \$10,000. In addition the applicant plans to hold a one-day annual drill for a 17 person radiological monitoring team. The applicant is conducting on a continuing basis a number of other classes, training, and public

briefings for both employees of the applicant and off-site personnel from local agencies such as Civil Defense, fire departments, as well as state police. The estimated annual cost to the applicant of this training is \$15,000 per year. The applicant will maintain a continuous environmental monitoring program including milk sampling and will fund a radiation protection department for a total annual sum of \$96,000 per year. An emergency medical room is being set aside at the Hershey Medical Center. The original cost to the applicant to equip this room is \$3,600. The annual maintenance cost of this emergency medical facility is expected to be about \$1,000.

Evacuation Costs

The costs of evacuation for emergency services necessary in the unlikely event of an accident cannot be estimated with a high degree of precision; the actual cost would depend upon the number and type of skilled personnel available and the length of time required for their services. However, a range of potential costs have been given after consultation with relevant local agencies.

The costs of radiological monitoring necessary to determine that evacuation must take place is \$1,000 to \$5,000 depending upon the severity of the accident. The Pennsylvania State Police, Troop H located in Harrisburg has the basic responsibility for traffic control and notification of the affected residents of the LPZ. A State Police official estimates that in the unlikely event of an accident requiring evacuation, 20 to 30 officers would be required for this operation;

the costs of this service could be \$2,000 to \$3,000. The costs of local doctors, medical assistants and ambulance drivers required to move aged and bed-ridden persons is estimated to be \$1,000 to \$2,000. Should evacuation from the LPZ be necessary, the local Civil Defense organization acts as the coordinating agency. The costs of local paid Civil Defense personnel is estimated to be \$500 to \$1,000. The emergency medical plan for TMI largely envisions reliance on private transportation with augmentation as necessary with school buses. The cost of round trip transportation to emergency housing sites 5 miles from the LPZ would be \$1.20 per car for private auto transportation computed at a mileage rate of 12¢ per mile.

Costs of Maintaining Evacuees

The costs of maintaining evacuees away from their usual homes in the unlikely event of a need to evacuate depends upon the number of evacuees and the duration of their stay. A local Civil Defense official has estimated that the daily food and maintenance expense is in the range of \$5 to \$7.50 per day per person. I have determined that this estimate is reasonable. Emergency rations of this type come from Red Cross supply stocks. However, Civil Defense also makes arrangements with local supermarket chains for delivery of fresh food. Emergency housing is to be provided primarily through the use of local public schools outside the LPZ.

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If the other uses of the buildings are not interrupted, the opportunity cost of use of the public buildings per se would be zero. However, use of these types of building for emergency purposes would undoubtedly result in some increase in costs through provision of utilities, janitorial services, etc. These costs are estimated to be \$1 - \$3 per day per person.

However, in the unlikely event that the time period for an evacuation were to last beyond several days, one might reasonably expect better accommodation than the emergency public housing described above and better cuisine than emergency food rations. Daily living expenses for a family of four could be \$18 - \$27 per day for a motel and \$20 - \$32 per day for food. Thus, a total daily living expense range is \$38 - \$59 per family of four.

Evacuation of individuals from the LPZ could cause disruption of earnings from farm crop production and other income producing activities near the plant. The only municipality within the LPZ is Goldsboro (1970 population of 576) located one mile west of the plant in York county. The local employment opportunities in Goldsboro are restricted to a very few service facilities and a small recreational marina. Since the town is substantially smaller than the 2,500 population required for Bureau of Census income statistics, no income statistics are available for estimation of interruption of local earnings through evacuation. While Goldsboro residents would be

Initial Cost

Planning, negotiation, and coordination	\$ 80,000
Emergency medical facilities at Hershey Medical Center	\$ 3,600
Radiological monitoring equipment	\$346,000
Initial training for Civil Defense, State Police, and others	\$ 15,000

Annual Expense

Maintenance of radiological monitoring programs and equipment	\$ 96,000
Maintenance of emergency medical facilities	\$ 1,000
Annual personnel training expense	\$ 25,000

Cost of Evacuation

Radiological monitoring	\$ 1,000 to \$5,000
State Police	\$ 2,000 to \$3,000
Local medical doctors and assistants	\$ 1,000 to \$2,000
Civil Defense personnel	\$ 500 to \$1,000
Private transportation; 10 miles at 12¢ per mile - round trip	\$1.20 per car

Costs of Maintaining Evacuees Away from Home

Food and necessities (short term)	\$5.00-\$7.50 per person-day
Emergency public housing (short term)	\$1.00-\$3.00 per person-day
Motel housing and restaurant (long term alternative)	\$38 - \$59 per family-day
Lost gross farm income	\$45.00-\$55.00 per farm-day

Time

The primary rationale for evacuation of individuals from the LPZ is to protect public health and safety in the event of an accident by keeping the radiation dose to the nearby population within the guidelines set forth in 10 CFR Part 100. The requirements for the reaching of a decision to evacuate and the duration of an evacuation depends critically upon the accident which occurs. However, based on extremely conservative assumptions utilized for purposes of the safety analysis, in no case does a design basis accident require an evacuation from the LPZ of longer than 30 days. Based upon the more realistic assumptions used for assessing the consequences of a design basis accident for purposes of the environmental review, evacuation would probably not be required in any case, but it is possible that it might be instituted as a matter of prudence, in which case it would be reasonable to assume a duration of from a few hours to two days. The nature of the accident could trigger the decision to evacuate selected portions of the LPZ within several hours from the time of the accident or a substantially longer period of time may elapse before evacuation is undertaken.

Summary:

The following is a summary tabulation of the components of costs of emergency planning and potential costs associated with an evacuation based on the unlikely event of an accident at TMI which requires evacuation.

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inconvenienced by an evacuation, it does not appear that there would be a substantial amount of local income disruption through evacuation of this sector.

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There are a number of residential homes not on farms on the east bank of the Susquehanna River. There does not appear to be any non-farm income producing activities in this portion of the LPZ. Therefore, the conclusion reached with regard to impacts on income for Goldshoro would appear to be equally applicable to this portion of the LPZ.

Other land uses near the plant are primarily farming, including dairy and poultry farming, and crop production such as tobacco, vegetables, fruit, alfalfa, corn and wheat. The gross average annual agricultural income per farm in Dauphin County (the county containing the TMI facility) for 1971 was about \$18,000. Although the cash flow of the farmer's receipts and expenses is highly uneven through the year, a range of values of \$45 - \$55 per farm-day is a useful guide in assessing the potential farm income consequences of evacuation of the LPZ. A gross income loss estimate overstates the loss to the extent that short run variable costs may be avoided, but could very substantially understate the income loss of evacuation if it is necessary at a time of peak agricultural activity such as harvest or planting.

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discounted to current dollar costs and it may be a great many years before such an accident might occur, if ever.

In conclusion, in the original cost-benefit calculations performed for the TMI application, essentially all costs for emergency planning and potential evacuation were evaluated although they were not shown separately from other costs. The purpose of this statement has been to "break out" those cost items. It should be emphasized that the procedure of identifying specific items of cost, both actual and potential, is unusual in that essentially all of these costs have been categorically covered in the cost items originally included in the FES. These costs include insurance premiums and taxes. The costs of insurance substantially protects the public from losses due to an accident, and a portion of the taxes paid by the applicant can be viewed as compensation to governments for emergency services. I conclude that the original analysis was substantially correct and, furthermore, that no important contribution can be achieved through detailed analysis of the particularized costs of the emergency planning and the potential evacuation.

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The initial capital costs and planning expenses are less than \$500,000. Annual costs of maintaining preparedness for evacuation are less than \$150,000. The actual costs of an evacuation of a portion of the LPZ depends upon the number of people affected which in turn depends importantly on meteorological conditions at the time of the incident and the exact nature of the incident. In no design basis accident (DBA) could the affected population be larger than 3,500 people in the year 2014. Furthermore, the maximum duration of evacuation which would be required based on a conservative estimate of the releases of a design basis accident is 30 days; however, an evacuation for this time period is exceptionally unlikely based on more realistic assumptions.

Within the context of a DBA a wide range of evacuation scenarios for the portions of the LPZ could be postulated and no single one is hypothesized here. However, the relatively small population potentially affected and the limited time duration leads to the conclusion that costs of emergency evacuation would not be an important cost item requiring separate evaluation. Also, in order to include contingency cost account would have to be taken of the low likelihood of the evacuation and this would substantially reduce the expected value of the cost of an evacuation. (The expected cost is the product of the contingency cost times its probability of occurrence.) Furthermore, the cost which would be included in cost-benefit analysis would be, on the average, a future cost. In order to perform the analysis in present value terms, emergency evacuation costs must be