October 26, 1973

THREE MILE ISLAND NUCLEAR STATION - DOCKET No. 50-289

Supplemental Testimony on Chlorine Effect

By

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Contention 6

It is contended that the plant should not be operable if and at such times when the cooling towers create any fog or icing that would create a hazard to vehicular and aircraft traffic. It is further contended that the applicant should be required to establish a cooling system by the use of the cooling towers that would minimize chlorination but would be the most efficient system as the state of the art will allow.

My testimony addresses only the biological impacts expected from chlorine releases at the levels specified in the Technical Specifications for Unit One. The remainder of the contention is addressed by supplemental testimony of Dr. Joseph E. Draley and Dr. James E. Carson.

I believe a review of the history of the development of the Staff's position on chlorine discharge concentrations would be helpful. The Applicant on page 3.7-2 of the Environmental Report states:

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"Approximately 1000 lb/day/unit average and 2000 lb/day/ unit maximum of chlorine will be injected into the circulating water system for algae and plant growth control. These quantitites of chlorine will be consumed so that 0.5 to 1.0 ppm chlorine residual will remain in the water. This low amount of chlorine will be in the blowdown and will be mixed and reduced to insignificant quantities in the cooling water discharge. Chlorine will be injected from one to four times a day periods of 15 to 30 minutes each."

Based upon these data, the Staff concluded in the Draft Environmental Statement that fish mortality due to chlorine release could occur in the immediate vicinity of the discharge.

In the Final Environmental Statement the Staff coupled its predicition of possible fish mortality and changes in the aquatic ecosystem composition and productivity with specific recommendations, namely:

"Accordingly, the Staff recommends that chlorine levels be limited to 0.1 ppm at the point of discharge in order to meet the EPA water quality recommendations of 0.05 ppm (for discharges up to 2 hours per day) for receiving waters. If this concentration exceeds 0.1 ppm the Applicants should take all practical measures to reduce it below this value. Should these efforts fail, the Applicants should determine the extent of the zone in the river within which the total residual chlorine concentration exceeds the EPA

recommended criteria. The Environmental Technical Specifications will define a monitoring program for chlorine to insure compliance with the staff's recommendations." (Page V-20).

The Staff's independent assessment of the environmental impact of chlorine release included examination of two documents referenced in Chapter V of the Final Environmental Statement. These are:

25. Water Quality Criteria Recommendation for Total Residual Chlorine in Receiving Waters for the Protection of Freshwater Aquatic Life, Staff, National Water Quality Laboratory (EPA) Duluth, 1972; and

27. Brungs, W. A., Literature Review of the Effects of Residual Chlorine on Aquatic Life. Prepublication Manuscript, 1972.

The author of Number 27, Dr. Brungs, is a member of the Staff which authored number 25.

Subsequent to the issuance of the Final Environmental Statement, I visited the Duluth EPA Laboratory accompanied by Dr. Joseph Draley and spent a day with Dr. Brungs. During this visit I acquired first hand knowledge of his experimental and analytical procedures. I discussed with him his ongoing review of his recommended criteria as presented in the documents I mentioned earlier. At this time

he gave us a revised version of reference 27 (dated 12/20/72) which contained changes in the recommendations from those contained in reference 25 and the original reference 27; for intermittent discharges at a level to protect most organisms except salmonids, which are uncommon in the Susquehanna in the vicinity of the Station in any case, the recommendations for total residual chlorine are: "for a period of 2 hr. a day, the concentration may be up to but not exceed 0.2 mg/l." A copy of reference 25 and the original and revised versions of reference 27 were supplied the Applicant and the Intervenor as part of discovery process.

In light of what I had learned, I revised the Staff's recommendation from 0.1 ppm at point of discharge to 0.2 ppm. This change in recommendation was concurred in by Dr. Draley and was communicated to the Regulatory Staff's Project Manager.

My independent assessment of the bases for the water quality criteria as stated by Brungs, namely no more than 0.2 ppm total residual chlorine not to exceed two hours per day, has led me to apply this limitation to the effluent. That is to say, rather than permit levels higher than 0.2 ppm to occur within a mixing zone, levels which in my opinion may be damaging to the biota within this mixing zone, the recommended Technical Specifications prohibit the discharge itself from exceeding concentrations judged to be safe. This conservatism was

applied to protect all the biota of York Haven Pool, not just those outside the mixing zone. Indeed if one were to treat these restrictions as a water quality limitation, the chlorine levels expected outside the mixing zone should even protect such sensitive species as trout which are hardly ever present in the Pool.

These recommendations have been incorporated into the proposed Technical Specifications for Unit 1 and read as follows:

"2.2.1 Chlorine

Specification a. The total chlorine concentration, as measured at the plant river discharge, shall not exceed 0.2 ppm and the free chlorine component shall be less than 0.1 ppm except as discussed in b below. b. For one consecutive 90 day period during the first year of plant operation the total residual chlorine concentration measured at the plant river discharge shall not exceed 0.5 ppm and the free chlorine component shall be less than 0.1 ppm. The starting date for this 90 day period will be selected by the Metropolitan Edison Company, and the Director of the Regional Regulatory Operations Office notified before its commencement. c. The total duration of chlorine discharge to the river at levels greater than 0.01 ppm shall not exceed 2 hours per day."

Coupled with this is a monitoring requirement for continuous monitoring of the discharge with a backup requirement for periodic analysis

if the automatic monitoring equipment shall fail.

It is my belief that operation in accordance with paragraphs a and c of this section of the technical specifications will not result in any long term or wide spread influence on the aquatic ecosystem of the York Haven Pool of the Susquehanna River. Aquatic food chains may be supported either by material washed into the body of water (allochthonous material), or by primary production (production of organic food materials by plant photosynthesis) taking place within the body of water. The food chain of the Susquehanna River is primarily supported by allochthonous material. Consequently, primary production based on phytoplankton photosynthesis, a process which may be affected by chlorine, should be of little importance to food chain dynamics. Therefore, we do not expect any impact on the foundations of the food chain. Likewise zooplankton reproduction in York Haven Pool is not expected to provide a significant input to the food chain. If any adverse impacts occur to the biota, I expect them to be limited to the fish. Any residual biocidal properties of the chlorinated effluent will be extremely localized and will probably have undetectable effects on fish or any other biota and be of no consequence to either the structure or the functioning of the aquatic ecosystem.

The Applicant is being required to monitor fish and macroinvertebrates both inside and outside of the plume so that if unexpected large biotic disturbances due to chlorine occur, they should be detected. It should be noted, however, that any monitoring program has limitations and the applicant's monitoring program may not be able to detect minor biotic disturbances.

The 90 day period specified in paragraph b of the section of technical specifications quoted above will probably result in some localized, short term damage to the resident biota. Since no long term or wide spread damage is expected, and since the purpose of this period is to permit the Applicant to devise procedures which will result in compliance with paragraphs a and c thereby insuring operation over the life of the station without notable adverse effect on the biota, it is my belief that the potential for temporary damage is outweighed by the long term benefits in improved operating procedures.