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City Statement 1
November 2, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

Helen F. Hoyt, Chairman
Richard F. Cole, Administrative Law Judge
Dr. Jerry Harbour, Administrative Law Judge

In the Matter of: :

Philadelphia Electric Company : Docket Nos. 50-352 OL
(Limerick Generating Station 50-353 OL
Units 1 and 2) :

TESTIMONY OF BRUCE S. APTOWICZ AND THOMAS J. KULESZA, DESCRIBING THE CITY OF PHILADELPHIA'S WATER TREATMENT SYSTEM AS IT RELATES TO EMERGENCY PLANNING

Q.1. Please state your names, positions, addresses, and the purpose of your testimony.

A.1. My name is Bruce S. Aptowicz, Manager, Water Operations, Water Department, City of Philadelphia. My name is Thomas J. Kulesza, Manager, Water Treatment Plants, City of Philadelphia. Our business address is One Reading Tower, Third Floor, Philadelphia, Pennsylvania 19102.

The purpose of this testimony is to describe the Philadelphia Water Department's treatment facilities in so far as is currently known to be pertinent to any emergency planning to protect the water supply to the City of Philadelphia as may be associated with an accident at Limerick Nuclear Generating Station.

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Q.2. Please describe the sources of raw water for the City of Philadelphia water treatment plants.

A.2. Philadelphia has three water treatment plants. These are:

1. Samuel S. Baxter Water Treatment Plant,
   9001 State Road

2. Queen Lane Water Treatment Plant
   Queen Lane and Fox Streets

3. Belmont Water Treatment Plant
   Belmont Avenue and Ford Road

The Baxter Treatment Plant takes water from the Delaware River. Its intake is located between Linden Avenue and Pennypack Street. The Queen Lane Plant takes water from the Schuylkill river. Its intake is located at Ridge Avenue and School House Lane. The Belmont Plant takes water from the Schuylkill River. Its intake is located on the West River Drive below the Columbia Avenue bridge.

In Fiscal Year 1983, 44.8% of the City's consumptive water needs were met with Schuylkill River (Queen Lane and Belmont Plants) water and 55.2% with Delaware River water (Baxter Plant), including the supply to Bucks County Water and Sewer Authority. For the Schuylkill River water, 55.4 mgd (40.0%) were treated at the Belmont Plant and 87.1 mgd at the Queen Lane Plant (60.0%). These figures can vary from year to year.

Q.3. Please describe the City's water treatment facilities.

A.3. These are described fully in the pamphlet, "How Water in Philadelphia is Treated and Distributed," on pages 3, 4, 11, 13, & 15. City Exhibit "A". However, additional pertinent information not indicated in the pamphlet is:

- The Torresdale Plant has been renamed the Samuel Baxter Treatment Plant.

- Chlorine and chlorine dioxide can be added to the water prior to the raw water sedimentation basins at Baxter and Belmont.

- Carbon can be added prior to the raw water basin at Belmont.

- Chlorine can be added to the raw water at the influent to the raw water basin at Queen Lane.

- The rated capacity of the Baxter Plant is now 310 mgd due to the replacement of 15 conventional sand filters with dual media filters. (See Q.4 & Q.5 below.)

- Alum is often used at the Queen Lane Plant instead of ferric chloride.

Q.4. What are the capacities of these water treatment plants?

A.4. The design capacities (for water treatment plants only, not the pumping stations), based on state environmental requirements, are as follows:

Baxter	310 MGD
Queen Lane	120 MGD
Belmont	78 MGD

The design peak capacities are:

Baxter	423 MGD
Queen Lane	150 MGD
Belmont	108 MGD

Due to raw water pumping constraints, actual peak capacity at Baxter is 350 MGD, not 423 MGD.

The potential treatment methods needed to remove radionuclides to acceptable levels could significantly reduce treatment plant capacities. For example, if recycle is required to, in effect, treat some or all the water twice, the capacities are automatically reduced proportionately. Or, if increased detention times are required to permit longer periods of settling, capacities would likewise decrease.

Q.5. Please describe what is meant by design capacity and peak capacity.

A.5. The design capacities are calculated based upon the number of filters, their surface area, and a flow of 2 gal./min./sq, ft, for conventional filters and 4 gal./min./sq. ft. for dual media filters. These rates are pursuant to the Pennsylvania Department of Environmental Resources filter design criteria.

The peak capacities are based upon hydraulic limitations. However, at the Baxter Plant hydraulic limitations on pumping from the raw water basin to the plant is the critical factor. Only about a 350 mgd average raw water feed rate can be sustained. Backwash and in-plant losses reduce the estimated maximum average output of the plant to about 330 mgd.

Q.6. Are the water treatment plant capacities ever limited by planned maintenance needs and unexpected failures?

A.6. Yes.

Q.7. Provide some examples of the frequency of these occurrences and their impact upon the water system.

A.7. Frequently sections of the plants are taken out of service for routine preventive maintenance or to effect repairs. For example, at the Queen Lane Plant each of the four floc/sed basins are taken out of service for routine cleaning and maintenance, one at a time, each for about one week's duration during the fall and spring. This limits plant capacity to about 120 mgd. At Belmont all four floc/sed basins, two at a time, are taken out of service each fall and spring for about a one week period. Thus, for two week's duration Belmont's capacity is limited to about 55 or 60 mgd depending upon which two basins are out of service. Under emergency conditions, these basins can be placed back into service, in most cases, within 24 hours. At Baxter, floc/sed basin cleaning does not generally limit capacity due to the raw water pumping rate limitations.

As far as unscheduled outages, several filters are often not available at each plant for reasons including but not limited to valve or underdrain failures or structural leaks. In fact, it is almost a certainty that at any given time several filters will be out. Usually an outage of a filter results in a directly proportionate reduction in output.

Q.8. Are there other planned or unplanned outages that affect storage or output?

A.8. Yes, unplanned outages at the reservoirs, raw water basins, and finished water conduits are a possibility. All of these must be taken out of service for inspection, repairs and cleaning, although on a less frequent basis than the plant facilities. However, the impact of these outages on system capacity is greater than the previously discussed outages because of the difficulty in restoring the capacity to full service, and the time it takes to accomplish this. The significance of such an outage would be a function of the available warning time.

Q.9. If the raw water basins at Queen Lane and/or Belmont became contaminated due to an airborne plume, could they be drained and refilled?

A.9. If the Schuylkill River and the Queen Lane intake were not contaminated but the raw water basin was, the Queen Lane Plant could, through valve operations, be fed directly from the raw water intake bypassing the raw water basin. However, due to piping limitations the capacity of the plant would be limited to approximately 80 MGD.

If the raw water basin was full at the time of the event, approximately one-third of its contents could be discharged to the sewer system (to the City's Southeast Waste Water Control Plant using existing plant piping.) Due to elevation limitations the lower two thirds of the contents of the raw water basin would have to be pumped to the sewer system. There are no on-site pumps to perform this function. There is also the concern of contamination of the sludge at the bottom of the basin in terms of both being disposed and/or recontamination of water used to refill the basin. Routinely the sludge is removed from the raw water basin at Queen lane through a dredging contract let approximately every fifteen years. The sludge is pumped by the contractor to an on-site lagoon with the overflow supernatant being discharged to the sewer system. If the sludge is contaminated, this would not be an acceptable disposal method. Draining of the raw water basin would most likely require several weeks due to pumping and sewer capacity limitations. We have no experience with the removal of contaminated sludge.

At Belmont the plant could be fed from the raw water intake directly and the contaminated raw water basins discharged to the sewer system (the effect upon the Southwest Waste Water Treatment Plant must be considered). The contaminated sludge might also have to be removed. The normal disposal practice is to remove each of the two raw water basins from service and flush the sludge to the sewer system every 3 or 4 years. This cleaning process normally requires at least a month and may very well not be an acceptable disposal means in the event of contamination.

Furthermore, at Belmont while the valve changes are being made to feed the plant directly from the raw water intake, the high service would be out of water. The time period to make the valve changes would depend upon when the crisis occurred as well as difficulties encountered in operation of the valves. However, it would undoubtedly be a minimum of several hours.

Q.10. Are you able to comment on the issues of water decontamination associated with radionuclides?

A.10. At the present time the Water Department has no specialized expertise in the area of treating water for the removal of radionuclides in the event of a release of radionuclides that results in contamination of the watersheds that supply the City's water. The Water Department also has no expertise in the first stage of contingency nuclear treatment planning; that is, the estimation of the specific radionuclide, the duration, and the concentration actual mass (mg/l) not merely disintegrations (pci/l) in the raw water and the required removal rates needed to assure the protection of the public.

The City also has no knowledge of the effects upon the water treatment plant sludges regarding acceptable disposal methods due to contamination at various raw water concentrations and removal efficiencies. These sludges include the raw water basin sludges at each plant as well as floc/sed basin sludges which are normally discharged to an on-site lagoon at Baxter, the City's sewer system at Belmont and to both an on-site lagoon and the sewer system at Queen Lane. (These sewer systems are connected to the City's Southwest and Southeast Water Pollution Control Plants, respectively.) The filter backwash sludge at Baxter is discharged to the raw water basin at Baxter and to the City's sewer system at Queen Lane and Belmont. It is of concern that discharge of these sludges in the normal method could cause further contamination of Baxter's raw water basin, contamination of Baxter's sludge lagoon and/or contamination of the Southeast and Southwest Pollution Control Plants (including their sludges).

City Water Department personnel have had numerous meetings and informal discussions with both PECO personnel, their consultants and Commonwealth officials with regard to decontamination. The City has also reviewed the limited information and documents made available by PECO, the Commonwealth and the NRC Staff with regard to this area.

The information available appears to address radionuclide removal in very general experimental terms and not specifically in terms of the radionuclides nor concentrations which may be involved in a Limerick incident, nor in terms of the removals which can be expected under Philadelphia's specific water quality and contamination concentration considerations; nor in terms of the specific application points, equipment to be used, sludge removal and disposal problems, etc., involved in implementing alternate treatment methods at Philadelphia's plants. Thus, although of general interest, the information contained in these articles is by no means sufficient to understand the contaminants involved and treatment techniques needed in the event of a Limerick incident.

Two methods mentioned by PECO's consultants, NUS, verbally at a meeting with the Water Department were activated carbon for I-131 removal and lime-sode ash softening for Sr-90 removal. They stated that other radionuclides were of no concern. This is contradictory to previous PECO testimony which indicated that Cs is of concern in the event of more severe incidents. An adequate emergency plan would also need a list of these and any other significant contaminants and methods of removal.

The NRC Staff has also stated that for some accidents some or all of the water would need to be softened twice, resulting in reduced through-put. This process raises questions as to supply capabilities and advance designing needs.

Even the implementation of the two (activated carbon and lime-soda ash) methods are not routine and many specific questions arise. Some of these questions which are initially apparent are:

- Type of activated carbon which should be used for most efficient removal of I-131. This choice would require lab testing as would the other aspects which follow.

- Determination of the most efficient application points. For example, carbon can be added at the raw water influent in the event of an emergency. However, will the deposited carbon in the raw water basin release I-131 as an equilibrium phenonmenon when the concentration in the raw water decreases?

- How much carbon should be added at each application point chosen? Is there adequate mixing (also applicable to aspects of lime-soda ash treatments)?

- Where and how to feed soda ash. How much lime and soda ash are needed for what levels of contamination? How to control feed rate?

- At what raw water concentration is a two stage lime-soda ash precipitation needed? How to control feed rate? Can it be done by utilizing two points in the plant or is repeat precipitation of entire water supply needed?

- How can repeat precipitation, if needed, be accomplished?

- Can the plant's sludge removal systems handle the type and quantities of sludge generated?

  Need they be disposed of as contaminated wastes? If so, how can they be removed, transported, and to where?

- How and where can acid be added to reduce the pH after treatment?

- Where should chlorination be performed due to its inefficiency as a disinfectant at high pH's?

- Will chlorine addition affect I-131 removal because of the formation of iodine containing trihalomethanes?

These and other questions which will need to be addressed as part of the contingency plan which should be developed. The development of a plan would require a complete analysis now of possible raw water contaminants, removal rates based upon actual lab tests, and emergency considerations of treatment plant capabilities, logistics and limitations.

Besides the lack of expertise in the area of removal of radionuclides, the Water Department does not have expertise in the use of the lime-soda ash softening since it does not use this process at all. It also does not have expertise to conclude that these two processes (activated carbon and lime soda ash) are the only and/or most efficient available or that I-131 and Sr-90 are the only two radionuclides of concern, as has been postulated. More analysis of the types of radionuclides and the applicable decontamination process must be done for other contaminants.

Finally, due to the complexity of the problem and the need for quick action in the event of contamination of the water, a complete written plan must be developed now. This plan must be available and capable of being able to be understood by laymen in the field of water treatment.

The plan must also address the problem of testing of raw and finished water to determine what level of treatment is needed and to evaluate finished water contamination level. Effective planning distates that this be done before an incident. In order to initiate a response immediately and avoid unnecessary reliance on PECO during the course of an accident such a plan must be in place now.

Q.11. Does the information and testimony from the earlier NRC proceeding provide adequate indication of contamination in either the Delaware or Schuylkill Rivers during the period of less than one month from the occurrence of a release?

A.11. No, the information provided in the testimony addressed the concentrations of Cesium 137 and Strontium 90 in terms of picocuries per liter at various probabilities or excedence for time periods ranging from one month to 5 years after the occurrence of an incident at Limerick. The expected concentrations during the first month for these and other possible contaminants, such as, but not limited to, I 131 were not addressed.

Q.12. Does this conclude your testimony?

A.12. Yes it does.