ILLINOIS POLLUTION CONTROL BOARD
January 17, 1974

COMMONWEALTH EDISON COMPANY PETITIONER	)	
v.	)	PCB 73-359
ENVIRONMENTAL PROTECTION AGENCY RESPONDENT	)	

MARK H. VIRSHBO, ATTORNEY, in behalf of COMMONWEALTH EDISON
DOUGLAS MORING, ASSISTANT ATTORNEY GENERAL, in behalf of the ENVIRONMENTAL PROTECTION AGENCY

OPINION AND ORDER OF THE BOARD (by Mr. Marder)

This action involves a request for a variance extension filed August 22, 1973. Relief is sought from Rules 201 and 203 (i) of Chapter 3, Water Pollution Regulations of Illinois, until August 15, 1974. By August 15, 1974, Petitioner alleges it will have a maximum recycle, liquid radioactive waste treatment facility operating. It is also alleged that the originally planned diffuser pipe will not be required. Shoreline alterations and discharge modifications are alleged to allow compliance with the applicable rules.

Commonwealth Edison owns and operates, in Grundy County, Illinois, a three-unit nuclear powered generating station. Unit One was made operable in 1960 and has a capacity of 200 mw. Units Two and Three came on stream in 1970 and 1971 with rated capacity of 809 mw each. Petitioner's need for variance centers around thermal pollution resulting from the discharge of cooling water into the Illinois River. Presently cooling water for Unit #1 is pulled from the Kankakee River and after once through cooling of the reactor core is discharged to the Illinois River. Cooling water for the #2 and #3 reactors are presently discharging to an open-cycle cooling lake of 1300 acres. Overflow from this lake is discharged to the Illinois River.

A brief chronology of events is in order so as to bring the variance extension request up to date. Dresden #1 has always operated on once through cooling and is not the subject of variance. Dresden Units #2 and #3 are the facilities in question. The following is a summary of events.

1. On March 3, 1971, the Board in PCB 70-21 issued a permit to Commonwealth Edison to operate Unit #3. In granting said permit a number of conditions were imposed, e.g.,

"3 (b) The permittee shall within thirty days after the issuance of this permit submit to the Board a written program with a time schedule for controlling the liquid radioactive discharges up to the amounts set forth in paragraph 3 (A) of this permit from Dresden Unit III without the use of dilution water."

"5 (b) Permittee in the operation of Dresden Unit 3 shall comply with the thermal discharge requirements of SWB-8* as interpreted in the opinion of the Board. In order to assume such compliance, Permittee shall submit the following information to the Board within thirty (30) days from this date."

2. On April 13, 1971, Petitioner filed the abovementioned reports, and also a request for time (PCB 70-21) to allow completion of their proposed plans. In the Board's order of November 23, 1971, it was noted that Petitioner had put into operation a cooling lake for Unit #2 and #3. It had also installed 98 spray modules in the canals. The Board ordered Petitioner to begin installation of a "Maximum recycle system" for radioactive wastes to be completed by September 1, 1973. The radioactive liquid waste limit of 80,000 microcurries per second would then apply to the blowdown from this cooling lake.

The Board further granted a variance from SWB-8 until November 23, 1973. The abovementioned lake and spray modules were found not to comply with SWB-8 and thus the need for this variance. A compliance plan called for the installation of a diffuser pipe to meet the required 5^{o} F. maximum temperature rise.

3. On August 23, 1972, Commonwealth Edison filed a petition for variance extension (PCB 72-350). By an interim Board order of October 10, 1972, a sixty-day extension was granted in order to gain time to conduct public hearings and also protect Petitioner from prosecution during the interim period (Nov. 23, 1972-Jan. 22, 1973). PCB 72-350 went to hearings to determine the facts. Petitioner claimed that the original wastewater system scheduled for completion by September 1, 1973, could not be completed before February 1, 1974. The diffuser pipe was not installed and no data on the barrier effect of such a pipe on fish was elicited. By Board order of March 29, 1973, variance was granted from 201 and 203 (i) until November 23, 1973.

4. On August 22, 1973, PCB 73-359 (the instant case) was filed asking for extension to November 23, 1974, or such shorter time needed to complete the aforementioned compliance plan. On November 13, 1973, Petitioner filed for and was granted an interim variance until January 22, 1973.

This chronology brings up to date the events since the startup of

* SWB-8 was superseded in part by Rules 201 and 203 (i) of Chapter 3 on March 7, 1972, (PCB R71-14).

Dresden #3. The instant case raises two new points in addition to the ones raised previously. In addition to deciding the variance case on its merits, the Board is requested to rule on an interpretation of Rule 201 and the acceptability of not using a diffuser pipe as required previously. These issues will be discussed separately.

Interpretation of Rule 201:

Rule 201 deals with mixing zones and states in part:

> "Moreover, except as otherwise provided in this Chapter, no single mixing zone shall exceed the area of a circle with a radius of 600 feet."

There are a number of ways in which this sentence can be interpreted, and the interpretation chosen will have a great impact on controls required.

A) The Agency contends (Pg. 5 Agency recommendation) that the 600 feet refers to a linear measure in any direction from the point of discharge. If the point of discharge is the shore line, this would restrict a mixing zone to about one-half the area of a circle with a radius of 600 feet.

B) The mixing zone may be considered to be not only the area of a circle 600 feet in radius but also the shape of a circle. This would put a double constraint on mixing zones.

C) The mixing zone may be considered to be restricted by area and not shape. This would state that the 26 acres of area could take any shape at all, e.g., cigar shape.

This issue first came up in the original request for a permit for Dresden #3 (PCB 70-21) March 3, 1971. In this opinion the fact that a 600 foot mixing zone was applicable was established. The Opinion went on to state that,

> "In so interpreting SWB-8 to include within it a mixing zone of 600 feet, we, as a Board, are not expressing favor in such a concept."

The Board upheld the principle in concept, but did not approve or disapprove at that time. Nor did the Board at that time establish how the 600 feet is to be measured.

During its deliberation in R-70-2 Thermal Standards, Lake Michigan, the Board expanded on the above reasoning. The mixing zone for Lake Michigan was interpreted to be 1000 feet with a maximum temperature differential of 3^{o} F. at the boundary. In going from 600 feet to 1000 feet at 5^{o} F. and 3^{o} F. no significant change was made. The major decision was that concept of area was brought in. On pages 24 and 25 of R-70-2 the word "area" is brought into play.

During adoption of Rule 201 in Board proceedings R-71-14, the problem of maintaining a circular area was explored. In the Board's opinion dated March 7, 1972, it was stated:

> "In response to other testimony received today's regulation alters the 600 foot linear zone....here preserved as a maximum....to a zone no larger than the area of a circle with 600-foot radius, by analogy to the Lake Michigan Standard (#R70-2, June 9, 1971), recognizing that in flowing streams the shape of a plume is likely to be long and thin in a downstream direction."

This quote would seem to answer the relevant question. In this action the Board will reaffirm the opinion of R70-2 defining mixing zones as a dually flexible condition comprising both area and shape (Case [C] above).

Petitioner alleges that the above rationale is the one it followed in all previous proceedings. Dr. Sayre testified (R. 29) that all of the work he has ever done in designing discharge structures to conform with Illinois temperature standards has been done on the shape/area basis. He further testified that a proposed standard (R-73-1) which would limit mixing zones to no more than 25 percent of the cross-sectional area of the river and no more than 25 percent of the total flow was considered. The Board feels that Petitioner has done well to consider the eventuality of adoption of R-73-1 and should pursue this course of action.

Use of Diffuser Pipe:

Petitioner contends that the previously proposed diffuser pipe will not be required to meet Rule 201 and 203 (i), and would rather modify the shoreline and install a slot at the end of its discharge canal. The Board has no interest in dictating technology, but rather in assuring that adequate technology is employed to abate pollution. The only question facing the Board is whether the proposed system would comply with Rule 201 and 203 (i).

Dr. W. Sayre testified (R. 14-40) as to the results of physical modeling. His conclusion was that a slot-jet discharge structure can be built at Dresden which will meet the regulations almost as effectively as a diffuser pipe system. The difference between a diffuser pipe's and a slot jet's ability to meet the standards would be less than one percent. There were two models constructed, the first being a simulation of 60% river width, the second being the entire river width with distorted horizontal and vertical dimensions. Model #1 study is completed and Model #2 studies are underway. Phase one study has led to the tentative design criteria for the slot jet. Many alternate jet designs were offered and if Phase two studies show modifications are in order, the planned-on design can be changed.

Tentative design calls for use of configuration #4, Run 23. Data on these two runs were submitted in Pet. Ex. 3 and 8. Data on these

runs is as follows:

Flow Dresden #1	426 c.f.s.
Flow Dresden 2 & 3	111 c.f.s.
Flow River	7400 c.f.s.
Delta T 1 (Temp. Dresden 1)	19° F.
Delta 2, 3 (Temp. Dresden 2, 3)	28° F.
Area required for 5° F.	10 acres

The average minimum 7 day low flow (10 years) for the Illinois River is 2,680 cfs. Also if this were coupled with a temperature of 85° F. (summer) or 55° F. (winter) the worst possible case would exist. These conditions would in effect lower the allowable Delta T at the edge of the mixing zone to less than 5° F. By use of both physical and mathematical models, Dr. Sayre claims that with a designed deletion ratio of 0.15 the 5°F. maximum should be met except at the lowest river flow and highest ambient river temperatures. The probability of this occurring is very low.

The data generated by Dr. Sayre has convinced the Board that equal protection would be afforded by using a slot-jet as would be by use of a diffuser. It is also interesting to note that the use of a slot-jet in combination with the abovementioned mixing zone should diminish the problems of a passage zone for fish. The question of environmental impact will be discussed later.

In determining whether to grant the requested variance extension the Board will consider the facts presented in the instant case. The pertinent questions are as follows:

A) What are the reasons for delay in compliance?
B) What is the environmental impact of a grant?
C) Is there an arbitrary and unreasonable hardship involved?

Delay in Compliance:

Mr. Galle testified for Petitioner as to the reasons for delay in the proposed radioactive wastewater treatment plant. The complete operation is scheduled to be finished on August 15, 1974 (R. 42). The main reason for delay was given as rework time for major components. Petitioner alleges that several pieces of equipment did not meet the required quality levels. The following are the various problems encountered:

1. Unexpected piling required on building foundation.
2. Metallurgical lamination flaws in sheet steel.
3. Contamination of stainless steel in concentrators.

Work on this unit is alleged to be 24 hours a day to meet the August 15 date.

Petitioner alleges that piping is underway and will require seven

and one-half months to complete, as will electrical work (R. 49).

Although this process is now one full year behind the original schedule, the end seems to be in sight. While some of the delay may have been self-imposed, on the whole it seemed unavoidable. The evidence is sufficient to warrant a grant in this respect.

Environmental Impact of Dresden:

Dr. Johnson of BIO-TEST Labs, Inc., testified (R. 52-74) as to the environmental impact of the thermal plume on the Illinois River. A number of exhibits were entered, among which was Pet. Exh. 26 which is a large study of the three river network up until December 1972. Dr. Johnson broke his testimony into four parts as follows:

(R. 54) (A) General Condition of the River:

The character of the rivers in the vicinity of Dresden has remained essentially unchanged.

(R. 55) (B) Effect of Dresden on Rivers:

Data from 1969 to December 1972 including chemical and bacteriological data show no detectable ecological damage to the river.

(R. 55) (C) Status of Monitoring Programs:

Dr. Johnson described the types of tests conducted and the phases of the testing. He outlined that further testing is planned. The monitoring program was set up to, among other things, ascertain the changes in the quality of the river in the vicinity of Dresden.

(R. 61) (D) Results of the Monitoring Program:

Many trends were uncovered in the five-year study. Various exhibits were entered, giving five-year records. The Dresden plant does not contribute to "water quality" parameters to any great extent. Data shows that the difference across Dresden is minimal (Pet. Ex. 28). Phytoplankton studies show a similarity across the Dresden plant, which varies from season to season; no noticeable effect was picked up. The same can be said for zoo plankton (R. 68). Benthos (bottom plants and animals) were also explored. The benthic community in the area was found to be of a highly restrictive type. Although there seems to be an increase in this community immediately downstream of the plant, the community is constant both upstream and well downstream (see Exhibits 27 and 32). The conclusion reached regarding benthos is that there was no deleterious effect on the community due to Dresden. Pet. Exhibits 27, 33, 34, 35, and 36 outline results gathered from fish studies. Again no adverse effect on fish life was noted. The following table from Exhibit 36 is typical of results garnered.

Sampling Period	No. of Species/No. of Fish at each Location		
	D-2	D-5	D-7
Spring 71	9/95	2/57	7/247
Summer 71	12/144	1/1	13/56
Fall 71	6/24	2/3	4/144
Spring 72	10/132	3/69	8/643
Summer 72	13/62	7/11	13/83
Fall 72	4/15	4/45	12/107
Spring 73	6/29	6/10	14/111
Summer 73	9/34	5/56	5/87

In the above table, D-2 is a location at the intake to Dresden's cooling system, D-5 is a location between the intake and outflow, and D-7 is a location just downstream of the outflow.

It must be remembered that location D-2 is the Kankakee River and locations D-5 and D-7 are after the confluence of the Kankakee and the Des Plaines.

From all the above the Board finds the weight of evidence is that no significant environmental harm has occurred due to Dresden Units 2 & 3. It is also important to note that the proposed slot-jet discharge should yield even better mixing in the near future.

Hardship and Need for Plant:

The entire hardship case centered around the testimony of Mr. R. Beckwith and Mr. R. Engle (of Commonwealth Edison). Both witnesses testified as to the hardship on the community rather than hardship on Edison itself.

Mr. Beckwith (R. 75-80) testified that the 1800 mw Dresden capacity is needed to provide power to meet Edison's peak load during the summer of '74. It is also needed during non-peak loads to allow maintenance on other equipment. Peak load at Edison is projected at 14,170 mw. Edison's rated capacity of all units is 17,176 mw., including both Zion units at 935 mw each. Counting purchases of electricity and deducting limitations Petitioner alleges it will have a net reserve of 1,184 mw. This figure does not take into account the possibility of Zion not being on stream or of reductions at Powerton, Waukegan, or Sabrooke.

Mr. Engle testified (R. 81-88) as to the need for reserve capacity to allow maintenance. The above 1,184 mw is after allowances for usual maintenance but before considerations of forced outages and forecasting errors. Mr. Engle testified that generators are planned for inspection

every five years with a six- to eight-week down time. Much other maintenance is done during this down time (ESP, etc.). Mr. Engle testified that during the period of September 1972 to January 1973 Edison experienced an average monthly loss of 15% of its generating capacity. It is clear that Dresden will be required to maintain steady state operation across the entire system.

From the above the Board finds that a significant hardship would be on the customers of Petitioner if Dresden was not allowed to operate.

One further point requires discussion. The Agency in its recommendation asks that Petitioner conduct its temperature monitoring in a certain way. In light of the Board's decision in this opinion regarding mixing zones, the Agency's request is not completely applicable. Petitioner will be required to continue its temperature monitoring, however, no specific methodology will be ordered. The Order will require the Agency and Petitioner to work out a reasonable method in light of the decision on mixing zones.

This Opinion constitutes the findings of fact and conclusions of law of the Board.

ORDER

IT IS THE ORDER of the Pollution Control Board that:

1. Petitioner be granted a variance from Rule 201 and 203 (i) of Chapter 3 until August 15, 1974. The reason for said variance is to allow Petitioner to install and make operable its maximum recycle system for radioactive wastes, and conform with the required mixing zone.

2. Petitioner shall by August 15, 1974, have operable a cooling water discharge system which will meet the mixing zone criteria as outlined in this Opinion.

3. Petitioner shall continue to conduct its sampling and temperature monitoring in a way to be mutually agreed upon by the Petitioner and the Agency. This method shall take into account this Board's interpretation of a mixing zone.

4. Petitioner shall report monthly to the Agency as to its progress in regards to Orders 1, 2, and 3 above.

IT IS SO ORDERED.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, certify that the above Opinion and Order was adopted by the Board on the 17th day of January, 1974, by a vote of 5 to 0.

Christan L. Moffett