

ILLINOIS POLLUTION CONTROL BOARD

January 16, 1975

ILLINOIS POWER COMPANY, )  
Wood River Station, )  
Petitioner, )  
 )  
v. ) PCB 74-423  
 )  
ENVIRONMENTAL PROTECTION AGENCY, )  
Respondent. )

Sheldon A. Zabel, attorney for Illinois Power Company.  
Henry J. Handzel, Jr., attorney for the Environmental Protection Agency.

OPINION AND ORDER OF THE BOARD (by Dr. Odell)

On November 15, 1974, the Illinois Pollution Control Board (Board) received from Illinois Power Company a Petition for Variance from the 1.0 mg/l boron standard in Rule 203(f) of Chapter 3 from December 31, 1974, to June 30, 1975, to complete their research on boron control.

Petitioner owns and operates a fossil-fuel fired electric power generating station, referred to as the Wood River Station, near East Alton, Madison County, Illinois. The Wood River Station consists of five steam electric generating units. Units 1 through 3, which are fired with No. 2 distillate oil, have a combined capacity of 155 MW. Units 4 and 5 are coal-fired with capacities of 103 MW and 320 MW, respectively at the present time.

After coal and oil are burned to generate electricity, the ash (mostly from coal) is sluiced with water to the ash lagoon. It is retained there to permit the settling of suspended solids. Longer retention in the lagoon increases settling of suspended solids, but this also increases the leaching of boron out of the fly ash. The ash lagoon effluent, which is the subject of this variance request, is discharged into and flows about 200 feet in an unnamed tributary of Wood River Creek, and then flows approximately 3,500 feet in Wood River Creek to the Mississippi River. The Wood River Station is located at the confluence of Wood River Creek and the Mississippi River. Since the ash lagoon effluent is discharged to Wood River Creek, which is an intermittent stream, the effluent plus limited stream flow must meet the Rule 203(f) water quality standard of 1.0 mg/l boron. If the effluent discharged directly to the Mississippi River, Rule 408 of Chapter 3 would apply, which includes no limitation for boron.

In response to Petitioner's previous variance request in PCB 74-9, 12 PCB 81 (April 18, 1974), the Board granted Petitioner a Variance from Rule 408 of Chapter 3, as it pertained to suspended solids, until May 30, 1974; from Rule 1002 (project completion schedule for control of suspended solids); and from Rule 203(f), as it pertained to boron, until December 31, 1974. The Variance that was granted from Rule 203(f) for boron in PCB 74-9 was subject to the following conditions:

- "(a) Petitioner's discharges shall not exceed 16 mg/l boron in any 24-hour composite sample;
- "(b) Petitioner shall submit quarterly reports to the Agency beginning July 1, 1974. Such reports shall contain information relating to all progress or lack of progress in research conducted by Southern Illinois University relating to the removal of boron from ash lagoon effluent;
- "(c) Petitioner shall submit with any request for an extension of variance an engineering feasibility report on the diversion of the ash lagoon waste to the Mississippi River;
- "(d) Petitioner shall submit comments on the feasibility of its boron removal as per its research program with any request for an extension of this variance."

On May 29, 1974, Petitioner completed the ash lagoon extension, which increases the retention time of the effluent and reduces suspended solids in the effluent. Since May 29, 1974, total suspended solids have averaged 8 mg/l, which is within the 15 mg/l limit in Rule 408.

Research on boron removal, which was the basis for the Variance from Rule 203(f) that was granted in PCB 74-9, is still in progress with Messrs C. David Schmulbach and James A. Cox of the Department of Chemistry and Biochemistry at Southern Illinois University, Carbondale. This research lasts until June 1, 1975. The first and second quarterly research reports from Messrs Schmulbach and Cox accompanied Petitioner's current Petition for Variance. These two reports include the following results:

1. The major source of boron in the lagoon effluent is the fly ash. The rate of boron removal from fly ash is very rapid and increases with increasing acidity from pH 10-8 to pH 6-4. "Approximately 50 percent of the boron in fly ash is removed in the first 15 minutes of contact with the water. . . . Boron in bottom ash appears to exist in an inert, non-leachable form. . . . The percentage removal of boron from fly ash varied from approximately 55 percent in acid buffered solution to about 35 percent in basic solution."

2. Boron content in the ash lagoon sediment increases from 450 ppm at the ash sluice inlet to 2,300 ppm at the lagoon outlet. Therefore, the boron needs to be removed or be made chemically insoluble before or soon after it enters the ash lagoon. Boron is not removed to any significant extent from water by adsorption on limestone or glauconite.
3. Exposure of fly ash to temperatures of 1,200°C for periods as short as 1 minute causes most of the boron in the fly ash to be converted to a non-leachable form, but exposure to fly ash to 800°C does not convert the boron to a non-leachable form. "Mixing limestone, CaCO<sub>3</sub>, with fly ash improves the extent of conversion of boron to a non-leachable form at a given temperature and firing time. . . . CaCO<sub>3</sub> added to fly ash to give a weight ratio of 75:1 (fly ash:CaCO<sub>3</sub>) and fired (at 1,200°C) for 1 minute, or a blend of 100:1 fired for 5 minutes, are optimum."
4. Limited tests indicate that "boron is fixed when a coal sample is fired with CaCO<sub>3</sub> at 1,200°C."
5. Research is in progress to evaluate ion exchange membranes as devices for the removal of boron from the effluent.

A Recommendation was received from the Environmental Protection Agency (Agency) on December 6, 1974. They reported that Petitioner has complied with conditions (a), (b), and (d) of the boron portion of the Variance granted from Rule 203(f) in PCB 74-9 (quoted above), but the data submitted in regards to condition (c) are inadequate as an engineering feasibility report on the diversion of the ash lagoon waste to the Mississippi River. A sample taken by the Agency on October 1, 1974, from the discharge of the ash lagoon contained 10 mg/l boron. This is within the limit of 16 mg/l boron listed in condition (a) of PCB 74-9.

"The Agency believes that Petitioner's discharge has no adverse effect on the present condition of the unnamed tributary of Wood River Creek which received Petitioner's effluent. Boron is not harmful to aquatic life in moderate concentrations. Studies have indicated that the minimum lethal dose of boron affecting minnows is a concentration in excess of 19,000 mg/l. The waterway in question here is not a public water supply nor is it used for irrigation." The 1.0 mg/l boron level was established in 1972 primarily on evidence that higher levels can harm irrigated crops (3 PCB 412 and 760); but this water is not used for irrigation.

Effective methods of boron removal from aqueous solutions are unknown at the present time. It is hoped that the current research at Southern Illinois University that is being done in cooperation with Petitioner will develop a suitable process for boron removal. If so, it would be valuable to Petitioner and other dischargers with similar problems. In view of Petitioner's

efforts to investigate technology for removal of boron from aqueous solutions, the Agency recommends that Petitioner be granted a Variance from Chapter 3, Rule 203(f) as it pertains to boron, from December 31, 1974, to June 1, 1975. The Agency mentioned a six-month variance, but then recommended one for only five months. Since the research is to be completed by June 1, 1975, the Board will grant a Variance to June 30, 1975, to complete the research and provide more time for Petitioner to finalize future plans based on the research results.

If a viable boron removal method is developed, a test facility will be established at the Wood River Station to test the most promising possibilities on Petitioner's effluent.

If this research does not result in a suitable method for boron removal from the effluent, Petitioner plans to use one of several other alternatives for controlling the boron discharge problem. These include dry collection of the fly ash, direct discharge of ash lagoon effluent to the Mississippi River, and rerouting the effluent to a "borrow pit" northwest of the plant and then through twin 60-inch culverts in the levee to the Mississippi River. Any planning for this latter alternative should insure that the existing impoundment problem behind the Mississippi River levee is not aggravated at any time. [EPA v. Alton Box Board Company PCB 73-61, 74-5 and 74-51 (August 29, 1974); and EPA v. Laclede Steel Company PCB 72-425 and 72-505 (November 22, 1974)].

#### ORDER

IT IS THE ORDER of the Pollution Control Board that Petitioner is granted a Variance from Chapter 3, Rule 203(f) as it pertains to boron, from December 31, 1974, to June 30, 1975, subject to the following conditions:

- (a) Petitioner's discharge shall not exceed 16 mg/l boron in any 24-hour composite sample;
- (b) Petitioner shall continue to submit quarterly reports to the Agency which were begun July 1, 1974. Such reports shall contain information relating to all progress or lack of progress in research conducted by Southern Illinois University relating to the removal of boron from ash lagoon effluent;
- (c) Petitioner shall, within 90 days of the grant of this Variance, submit an Engineering Feasibility Report on alternative means of disposal of fly ash, i.e. dry storage of all ash or diversion of the ash lagoon effluent to the Mississippi River;

- (d) Any proposals which Petitioner develops to solve its boron problem should receive review by the appropriate permitting engineers.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify that the above Opinion and Order was adopted on the 16<sup>th</sup> day of January, 1975, by a vote of 4 to 0.

Christan L. Moffett