ILLINOIS POLLUTION CONTROL BOARD
April 13, 1978

ILLINOIS POWER COMPANY (Wood River Station)	)	
Petitioner,	)	PCB 77-321
v.	)	
ENVIRONMENTAL PROTECTION AGENCY,	)	
Respondent.	)	

OPINION AND ORDER OF THE BOARD (by Mr. Dumelle):

This matter comes before the Board on a petition for hearing pursuant to Rule 203(i)(5) in Chapter 3: Water Pollution Regulations. A hearing was held in Chicago on February 10, 1978.

The Wood River generating station is located on the Mississippi River at mile 197, downstream of Lock and Dam 26 at Alton and upstream of the confluence of the Mississippi and Missouri Rivers. The station has five units and a total generating capacity of 696 MW gross. Units 1, 2, and 3 (51 MW each) burn oil, while Units 4 and 5 (104 and 405 MW) burn coal. The overall plant capacity factors during the last five years are: 1972-53.0%; 1973-44.4%; 1974-40.7%; 1975-45.3%; and 1975-41.2%. The projected 1977-81 plant capacity factors are between 40 and 50 percent. No retirement date has been established for any unit and no expansion has been planned during the last five years. Complete plant shutdowns were reported in 1973 (543 hours total) and 1974 (78 hours). Petitioner submitted a timetable for boiler and turbine overhauls through 1987 (Petitioners Exhibit #1,at 1-4).

Mississippi River water is used for once through condenser cooling at the Wood River station. Water is withdrawn from the river and pumped through a one-pass condenser for Units 1, 2, and 3, and through a two-pass condenser for units 4 and 5. Typical usage is 773 cfs; maximum capacity is 954.7 cfs. The amount of heat rejected in the cooling water discharge is directly proportional to electric generation. At maximum capacity (696 MW) and maximum cooling water flow conditions (954.7 cfs), heat rejected from the steam condenser to the cooling water at a rate of 3388 million Btu/hr. could increase the cooling water temperature by 15.8°F in spring, fall and summer. Data prepared by Petitioner Exhibit #1, at 2-1) shows actually observed monthly mean cooling water discharge substantially

below maximum capacity (range from 384 to 914 cfs) and induced temperature rise across the condenser in the range of 15 to 20°F. Recirculation of warm water to the intake structure for ice melt during winter operation explains the occurrence of observed effluent temperature rises in excess of those predicted at maximum generating capacity.

Actual field measurements were made on 34 occasions from June 1973 through October, 1975. The percentage of river flow used for cooling ranged from 0.11 to 1.58. The highest daily maximum discharge temperature at the river was 96.8°F; the lowest daily maximum discharge was 47.8°F. Four of the 34 temperature reports included calculation of the area of the thermal plume 5°F above ambient river temperature. These surface areas ranged from 0.27 to 0.63 acres (Exhibit #1, Table 3-1).

Theoretical studies were performed for a shoreline-attached plume such as exists at the Wood River station. The overall appearance of this kind of plume is an elongated shape which follows the shoreline and gradually spreads across the river. Conditions were modeled for all seasons under typical and worst case conditions. An unobserved worst case condition was calculated for a combination of 7 day, 10-year low flow and maximum temperature of record. Typical and worst case conditions for operation were modeled on maximum generating capacity although that capacity may be approached at only brief intervals during the year.

Under typical conditions for all seasons the surface area of the thermal plume which is 5°F or more above ambient river temperature is less than one (1) acre. The area of the 5°F isotherm at its maximum point occupies less than 1% of the total cross-sectional area of the river. Under worst case seasonal conditions the surface area of the thermal plume which is 5°F or more above ambient river temperature is less than one acre in all cases. During winter, summer, and spring worst case conditions, the areas of the 5°F isotherm at their maximum occupy less than 1% of the total cross-sectional area of the river. During fall, the season of lowest river flows, the cross-sectional area is 3% of the total river area. Under unobserved worst case conditions, the surface area was less than one acre and the cross-sectional area was 3%. The size of this mixing zone is well within the standards set forth in Rule 201 in Chapter 3 of 26 acres maximum surface area and 25% maximum of the cross-sectional area for the 5°F isotherm.

Petitioner has provided data showing 1°F isotherms for all conditions modeled (Exhibit 1, Figures 3-10 through 3-18). At no time is the maximum temperature for main river locations in violation of the Board standards.

Studies of the aquatic ecology of the Mississippi River were conducted by Petitioner during the period 1973-75. The parameters and components of the study were temperature, dissolved oxygen, phytoplankton, zooplankton, benthos, and fish. The study showed that none of the biota were excluded downstream from the site as a result of the thermal plume. Fish did tend to avoid the discharge plume when water exceeded 88° F during typical summer conditions; however, this is a highly localized area of less than one acre. Possible adverse effects on the aquatic community due to temperature changes under worst case seasonal conditions are mitigated by other factors such as river flow and the small area of the thermal plume. Some acclimation could result in localized areas; however, in no case is a lethal temperature approached. Small shifts in community structure will shift back to typical community as the river returns to ambient conditions. Permanent ecosystem damage due to temperature rise is unlikely even under worst case conditions.

No changes to the riparian habitat were foreseen as a result of the thermal plume. The area surrounding the Wood River Station is not conducive to amphibians, waterfowl, and mammals that are often found at the water-land interface. Additionally, changes would be more likely attributable to changes in river stage and substrate than to the Petitioner's thermal discharge. Adverse effects from the thermal discharge are also unlikely in regard to human activities such as recreation and commercial fishing on the Mississippi River.

Because the effect of the thermal discharge is highly localized and well within the standards of Chapter 3, the Board concludes that there has been no significant ecological damage to the ecosystem and that there is no reasonable expectation that such damage would occur even under worst case conditions. Because there are no significant adverse effects, corrective measures and management practices need not be addressed.

This constitutes the findings of fact and conclusions of law of the Board in this matter.

ORDER

It is the Order of the Pollution Control Board that:

1. The Petitioner has satisfied the requirements of Rule 203(i)(5) of Chapter 3: Water Pollution Regulations and Part VI of the Board's Procedural Rules.

2. The thermal discharge from Petitioner's Wood River generating station has not caused nor can reasonably be expected to cause significant ecological damage to the Mississippi River.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify the above Opinion and Order were adopted on the 13th day of April, 1978 by a vote of 5-0.

Christan L. Moffett, Clerk
Illinois Pollution Control Board