ILLINOIS POLLUTION CONTROL BOARD
October 19, 1978

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY (HUTSONVILLE POWER STATION),	)	
Petitioner,	)	
v.	)	PCB 78-108
ENVIRONMENTAL PROTECTION AGENCY,	)	
Respondent.	)	

THOMAS L. COCHRAN, ATTORNEY AT LAW, APPEARED ON BEHALF OF THE PETITIONER.

WILLIAM J. BARZANO, JR., ASSISTANT ATTORNEY GENERAL, APPEARED ON BEHALF OF THE RESPONDENT.

OPINION AND ORDER OF THE BOARD (by Dr. Satchell):

This matter comes before the Board for a determination pursuant to Rule 203(i)(5) of Chapter 3: Water Pollution Regulations as to whether the thermal discharges from Central Illinois Public Service Company's (CIPS) Hutsonville Power Station have not caused and cannot be reasonably expected to cause significant ecological damage to the receiving waters. CIPS filed its original petition in this matter on April 18, 1978. A hearing was held on July 11, 1978. There was no public participation in this matter. The Environmental Protection Agency (Agency) has not filed a recommendation nor did it present any testimony at the hearing. All data referred to in this opinion are from the Thermal Study prepared for CIPS' Hutsonville Power Station by R. W. Beck and Associates pursuant to Procedural Rule 602.

The Hutsonville generating station is located on the Wabash River at mile 173.9 near the town of Hutsonville, Illinois (p. 1-1). Hutsonville has four units: Units 1 and 2 are peaking units and have a generating capacity of 32 MW each, Units 3 and 4 are the base load and have a generating capacity of 83MW each (p. 1-1). Total gross station capacity is 230 MW (p. 1-1). Wabash river water is used for once-through condenser cooling (p. 2-1). Maximum capacity is 401 cfs for all four units. Water is pumped from the river through condensers for each unit (p. 2-1). Heat is rejected to the cooling water from the steam condensers at a rate of 1668 million BTU/hour

at maximum plant generation (p. 2-1). The resultant temperature rise of the cooling water at maximum flow is 18.4 F. Normally all cooling water pumps (two per unit) are operated (p. 2-1). During the winter only one pump is used, resulting in higher cooling water temperature rise (p. 2-1). Across the condensers the range of induced temperature rise is 12 F to 19 F (p. 2-1).

Both actual and theoretical plume studies were included in the Thermal Study as required by Procedural Rule 602(c). The predominant discharge behavior configuration for typical flows is a shore-line attached plume (p. 3-9). For low flow cases, fully mixed river conditions with exponential temperature decay are utilized in conjunction with the initial plume conditions from the shore-attached analysis (p. 3-9).

DATA SUMMARIZED FROM THEORETICAL PLUME STUDIES FOR TYPICAL CONDITIONS IN THE WABASH RIVER AT THE HUTSONVILLE STATION (p. 4-15)

Season	Ambient River Temp(F)	River Flow in cfs	Surface Area In Acres Within Designated Isotherms 3F	5F	7F	Cross-Section as Percent of Total River Flow Within Designated Isotherms 3F	5F	7F	ΔT_{FM} (F)
Winter	36.5	11,000	0.1	<0.1	<0.1	11	4	-	0.7
Spring	53.6	18,700	<0.1	<0.1	<0.1	6	-	-	0.4
Summer	77.0	7,200	0.3	<0.1	<0.1	16	9	-	1.0
Fall	62.6	4,000	1.2	0.2	<0.1	29	19	8	1.8

ΔT_{FM} represents fully-mixed condition.

Figures based on 100 percent generation (230 MW) and condenser cooling water flow of 401 cfs, except for winter when flow is 50 percent.

With worst-case conditions the isotherm occupies the entire river cross-section.

DATA SUMMARIZED FROM THEORETICAL PLUME STUDIES FOR WORST-CASE CONDITIONS IN THE WABASH RIVER AT THE HUTSONVILLE STATION (p. 4-17)

Season	Ambient River Temp(F)	River Flow in cfs	X_{FM} in Feet	Downstream Distance in Miles for Heat Dissipation in Designated Percentage 25%	50%	ΔT_{FM} (F)
Winter	47.3	1700	1200	17	40	4.3
Spring	69.8	6100	1200	40	96	1.2
Summer	88	2900	1000	17	40	2.5
Fall	78.8	1250	1000	7	16	5.9

X_{FM} represents the distance below the discharge where the water is essentially fully-mixed (less than 2 F gradient).

ΔT_{FM} represents the increase in temperature at the fully-mixed condition.

Figures are based on 100 percent generation (230 MW) and condenser cooling water flow of 401 cfs, except for winter when flow is 50 percent.

An assessment of ecological damage was made during the time period of April 1973-May 1974 (p. 4-1). This study included the following parameters and components: temperature, dissolved oxygen, chlorine, phytoplankton, zooplankton, benthos and fishes (p. 4-1). The study made a number of conclusions. During the period of 1973-1974, a period of relatively normal river flow, significant ecological damage did not occur (p. 4-13). The study further states that under typical conditions, with the predicted thermal discharges, significant ecological damage is unlikely (p. 4-13). Both predicted worst-case conditions and extreme worst-case conditions will cause substantial ecological damage to the river, even without thermal discharge (p. 4-13). Under full power generation and with the latter two conditions

significant ecological damage would occur below the discharge (p. 4-13, 4-14).

PROBABLE BIOLOGICAL EFFECTS OF THERMAL DISCHARGE BY THE HUTSONVILLE STATION ON THE WABASH RIVER UNDER WORST-CASE AND EXTREME WORST-CASE CONDITIONS (p. 4-18, 4-19)

Case and Season	Physical Conditions	Probable Biological Effects
Worst-Case Winter	Ambient temp. is 47.3 F and ΔT_{FM} is 4.3 F. River Flow is 1700 cfs.	ΔT is sufficient to increase biological productivity even further. Increase in temperature below plant plus low river stage will tend to increase fish density for many miles below the plant. Significant ecological damage is unlikely.
Worst-Case Spring	Ambient temp. is 69.8 F, and ΔT_{FM} is 1.2 F. River Flow is 6100 cfs.	ΔT not sufficient to cause significant changes over no-discharge condition.
Worst-Case Summer	Ambient temp. is 88 F and ΔT_{FM} is 2.5 F. River Flow is 2900 cfs. Additional oxygen depletion below discharge is likely.	Localized areas between discharge and X_{FM} (1000 ft) will experience heat stress. Blue-green algae will increase. Benthic organisms experience lethal conditions. Fish avoid this area. Below X_{FM}, the ΔT will influence the river for miles. Thermophilic bacteria and algae increase even further. Benthic community experiences increased stress and lethality. Fishkill episodes increase. Interference with fish movements including entry to mainstream from tributaries, is likely. Significant ecological damage is likely.

PROBABLE BIOLOGICAL EFFECTS TABLE (Continued)

Case and Season	Physical Conditions	Probable Biological Effects
Worst-Case Fall	Ambient temp. is 78.8 F, and ΔT_{FM} is 5.9 F. River Flow is 1250 cfs.	Effects depend on timing. Thermal discharge in early fall will probably stress biota; higher temperature in late fall will increase biological productivity even further. Growth of juvenile fish will be influenced by ΔT. Strain on carrying capacity of river may be exacerbated. Fishkills possible in early fall. Blockage of fish movements not likely.
Extreme Worst-Case Condition	Ambient temp. is 90 F, and ΔT_{FM} is 5.9 F. River Flow is 1250 cfs. Further oxygen depletion below discharge is likely.	Severe thermal stress and lethal effects on all trophic levels for considerable distance below discharge. Extensive growths of thermophilic bacteria and algae. Blue-green algae become dominant. Fishkills become common occurrence. Interference with fish movements occurs for many miles. Significant ecological damage is highly probable.

These are highly infrequent occurrences (p. 4-14). The history of plant generation indicates that full power generation on a daily average basis occurs infrequently (p. 4-14). Consequently, the combined events of river flow, ambient temperature and thermal discharges which could cause significant ecological damage are highly improbable (p. 4-14)

SELECTED DATA ON THE PROBABLE JOINT OCCURRENCE OF VARIOUS COMBINATIONS OF FLOW AND TEMPERATURE AT THE RIVERTON STATION ON THE WABASH RIVER (p. 4-20)

Flow (cfs)	Temp. F (C)	Total Number of Days/10 Years	Comments
Equal to or less than 3000	88 (31) 90 (32)	5.3 1.8	ΔT_{FM} is 2.5 or more.
2900	88 (31)	About 5.3	This is the worst-case summer condition; ΔT_{FM} is 2.5 F.
Equal to or less than 2000	88 (31) 90 (32)	0.9 $<$ 0.1	ΔT_{FM} is 3.7 or more.
Equal to or less than 1500	88 (31) 90 (32)	0.3 $<$ 0.1	ΔT_{FM} is 4.9 or more.
1250	90 (32)	$<$ 0.1	This is the extreme worst-case; ΔT_{FM} is 5.9 F.

The Board notes that the above table indicates that CIPS has the potential to cause a violation of Rule 203(i)(4) of Chapter 3. Thus it would be required to derate its Hutsonville Power Station whenever the thermal discharge would raise the Wabash River temperature above the permitted maximum temperatures.

The Agency made no effort to contest these conclusions and no recommendation was made. The Board is satisfied that the possibility of ecological damage due to the thermal discharge is sufficiently remote so as not to be "reasonably expected". The Board finds that the thermal discharges from CIPS Hutsonville Power Station have not caused and cannot reasonably be expected to cause significant ecological damage to receiving waters. Petitioner has, therefore, satisfied the requirements of Rule 203(i)(5) of Chapter 3.

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

ORDER

It is the Order of the Pollution Control Board that the Petitioner has complied with Rule 203(i)(5) of Chapter 3: Water Pollution Regulations by demonstrating that its thermal discharges from its Hutsonville Power Station have not caused and cannot be reasonably expected to cause significant ecological damage to receiving waters.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify the above Opinion and Order were adopted on the 19th day of October, 1978 by a vote of 4-0.

Christan L. Moffett, Clerk
Illinois Pollution Control Board