

ILLINOIS POLLUTION CONTROL BOARD
June 25, 1981

ILLINOIS POWER COMPANY, ET AL.,)
)
) Petitioners,)
)
) v.) PCB 81-82
)
 ILLINOIS ENVIRONMENTAL PROTECTION AGENCY,)
)
) Respondent.)

MR. SHELDON A. ZABEL and MS. CAROLYN A. LOWN, Schiff, Hardin & Waite, appeared on behalf of Petitioners;

MS. MARY V. REHMANN and MR. ROBERT C. THOMAS, Technical Advisors, appeared on behalf of Respondent.

OPINION OF THE BOARD (by I. Goodman):

This Opinion supports the Order entered on May 28, 1981.

On August 7, 1980 Illinois Power Company, Soyland Power Cooperative, Inc., and Western Illinois Power Cooperative, Inc. (IPC) filed a petition to allow a daily average condenser effluent temperature limitation of 99°F (37.2°C), and an absolute limitation of 108.3°F (42.4°C), to Lake Clinton when only one generating unit of the Clinton Power Station (Clinton Station) is operating. The prior regulatory proceeding relating to Lake Clinton (R75-2) had established a 96°F absolute limitation as alternative to that temperature which would have been required pursuant to Rule 203(i) (4) of Chapter 3, the Board's Water Pollution Rules and Regulations. That alternative temperature limitation was imposed pursuant to the procedure set forth in Rule 203(i)(10) and was listed as a regulation at Rule 203(i)(11).

The instant petition, first docketed PCB 80-143, proceeded as a regulatory matter (R80-17) pursuant to the procedure in Rule 203(i)(10), as ordered by the Board on September 4, 1980. On October 17, 1980, the Board ordered that hearings for docket R80-17 include proposed deletion of Rule 203(i)(11), which merely lists any alternative thermal effluent limitations granted by the Board pursuant to the procedure in Rule 203(i)(10). No objection to this Order was made by anyone either in writing or during the hearing on December 12, 1980. On May 14, 1981 the Board ordered that the record of the IPC proceeding be incorporated into adjudicatory proceeding PCB 81-82. On May 28, 1981 the Board issued a proposed Order deleting Rule 203(i)(11) (R80-17) and an Order granting alternative thermal limitations from Clinton Station to Lake Clinton (PCB 81-82).

Lake Clinton is an artificial cooling lake for nuclear-fueled Clinton Station currently under construction in DeWitt County by IPC. The station is designated to operate two generating units, each with a maximum capacity of 950 megawatts (net). The 5,000-acre lake was formed by damming two streams, Salt Creek and its north fork, downstream of their confluence. Water will be withdrawn from one arm (the north fork) to cool the condensers and will discharge into the other arm (Salt Creek) of the lake.

On July 31, 1975, prior to the final Order in R75-2, the Board granted IPC variance from Rules 203(i)(5) and 402. The terms of this variance were then incorporated into Rule 203(i)(11) on August 14, 1975 in R75-2. The scope of this proceeding extended to all the terms of the variance Order, as well as to daily average and absolute maximum temperature limitations given one-unit operation. On September 30, 1975 the USEPA issued NPDES Permit No. 0036919 imposing similar terms to the variance--specifically, an absolute thermal limitation of 96°F and the use of spray cooling modules to achieve it (Pet., p.2). All of the above legal proceedings concluded before construction of Clinton Station was completed and at a time when two generating units were planned for service. It is the delayed startup date of the second unit, for some ten years, which prompted this petition.

At hearing, IPC updated and supplemented its demonstration under Rule 203(i)(10) (which had been presented in 1975 for the variance petition, the proceeding R75-2, and the USEPA pursuant to §316(a) of the Clean Water Act, 33 U.S.C. §1251, et seq.). That modeling study was inherently nonrepresentative of cooling lake temperatures and currents, and its results as to Lake Clinton were at the time unverifiable because Lake Clinton had not then been created (R.14-15). In 1977 the Laterally Averaged Reservoir Model (LARM) was developed by a person whom IPC's consultant had hired regarding the demonstration in this proceeding. This model represents a vast improvement in 1975 modeling techniques; not only can it account for longitudinal and vertical physical characteristics of a cooling lake, meteorological data and hydrological data, but it can include the effects of various hydraulic structures of a power station.

LARM's results were validated using data derived from the year 1978; its results are not valid for early or late summer, although the results which are valid are conservative for several reasons. The year 1978 was the fourth warmest summer in the past 26 years, and 1955 the first warmest. Results were projected for 92% and 100% loadings, where an average loading of only 87% will occur (R.16-8). Finally, the temperature criteria which establish minimum and maximum temperatures for fish and other lake life behaviors (e.g., survival, reproduction, cold shock) are intentionally conservative ones (R.30-2). Consultants of IPC who testified at hearing concluded that LARM for Lake Clinton was verified from 1978 year data (and that therefore its results are reliable) (R.19); the Illinois Environmental Protection Agency (Agency) was without reservation at hearing as to these matters

(R.81). The Board notes that no person contradicted any witness' testimony. The Board finds that the modeling results afford reliable predictions and finds that any question of reliability as to early or late summer periods is more than answered by the conservative nature of many data points and assumptions used as input.

The modeling was performed to support the proposition that one-unit operation without any temperature limitation upon Clinton Station discharges will produce lower overall cooling lake temperatures than will two-unit operation at an absolute maximum limitation of 96°F, the prior applicable limitation. IPC's petition seeks 99°F as a daily average maximum limitation, and 108.3°F as an absolute maximum limitation, during one-unit operation only.

LARM's results were that the maximum possible temperature which would be discharged by one-unit operation at 100% loading would be, under the warmest summer conditions, 108.3°F. Other results were that temperatures over 96°F would occur only at lake bottom in the immediate vicinity of the condenser discharge point and only at relatively shallow surface levels in the remainder of the lake. One-unit operation would result in lower lake temperature than two-unit operation at a maximum limitation of 96°F except at the intake structures (R.18-9). Finally, 81% of the volume of the lake's upper arms will warm to no higher than 90°F and would therefore be available for temperature refuge (R.72). Only rarely would one-unit operation cause temperatures to exceed 96°F outside the months of July through September, and then they would not exceed 96.5°F (R.22).

IPC also produced evidence on the impact of its thermal effluent upon the ecological aquatic balance of the diverse biological community within the lake. IPC performed a survival and growth analysis of the same eight species of fish analyzed in its 1975 study and of the trophic level plants and animals (which are less sensitive to high temperatures than are fish). Four families of fish, with different feeding loads and temperature sensitivities, were chosen. The species of black bullheads and white and black crappie may not be representative of species found in Illinois cooling lakes (R.25-6, 61).

The ecological analysis considered both 1955 and 1978 years data, particularly meteorological and stream flow conditions, except that regarding reproduction the assumption was made that conditions in 1955 alone, regardless of the existence of heat input from Clinton Station, would severely inhibit reproduction. A further assumption was made that only the bluegill and channel catfish species spawn during the July-to-September months (R.23).

The entire LARM demonstration was dependent upon the reliability of certain critical temperatures used as input. IPC followed USEPA protocol on the matter (R.23-4), although USEPA's temperature criteria do not account for adaptation, genetic variability, or for water body type (R.31-2), and therefore are

not cooling lake-specific. These critical temperatures, derived from literature in the field, were compared with LARM's modeling of lake temperature distribution to determine the extent and location of areas having too-warm temperatures for survival and growth during the warmest periods of the summer months. Historical monitoring records of IPC were used to define the preferred (or most typical) habitats within the lake for each species. The use of this procedure was conservative in nature to the extent that other areas of habitat are available for spawning. The areas of preferred habitat were then compared with areas modeled to have acceptable survival temperature limitations to determine the percentage of each preferred habitat area which would be available for each species' spawning (R.24).

The results, given one-unit operation without any maximum temperature limitation, were that the five fish species which are most representative of those found in Illinois cooling lakes will maintain their populations; that there will be more available preferred habitat areas for spawning purposes; that there will be no cold shock impact (e.g., in the event that Clinton Station ceases its thermal discharge); and that beyond the immediate vicinity of the condenser, a minimum degree of trophic impact will occur (R.24-6). Again, even these favorable results are based on several conservative factors: the USEPA's thermal criteria, the warmer-than-average meteorological conditions, and the limitation of spawning areas to preferred rather than available habitats. Finally, IPC's lease to the Illinois Department of Conservation of 10,000 acres in and around Lake Clinton, and its joint efforts with that Department to enhance use of the lake as a sport fishery (R.27), will assure that one-unit operation over the next ten years will not result in the spoiling of the lake for recreational use or as a sport fishery. The Board is satisfied that one-unit operation will not produce unacceptable lake conditions.

Furthermore, IPC produced evidence, derived from data from existing Illinois cooling lakes, that the total net impact of its thermal input will have less adverse ecological impact than the demonstration indicates. This is primarily because of the fact that spawning dates are caused by acceptable temperatures generally, rather than by acceptable temperatures at the right time of year (R.35-6). Even though one-unit operation given 1978 weather conditions would eradicate 20% of the bluegill and 55% of the channel catfish preferred spawning habitats (R.34), and given 1955 weather conditions would not enable black and white crappie to survive (R.41), the relatively warm year-round temperature conditions in the lake can offset any reduction in fish populations. Fish stocking can also offset any reduction. Not only can cooling lakes provide protection against unseasonably cold weather, unlike natural lakes (R.36, 38), but cooling lakes provide an extended growth season (which can extend the fishing season) and, finally, seem to increase fish size. Clinton Lake will average over 50°F for ten of twelve months (R.38-0). These findings have support in several studies done during the mid-1970's.

The results of one study were that although the short-term maximum survival temperature for largemouth bass fry is 80.6°F, growth of this species was almost doubled at exposure to temperatures of 86°F as opposed to 68°F (R.37). This is further evidence of the conservative nature of the LARM results which are based upon critical temperature limitations. Studies of Baldwin Lake found that, although during the entire month of July of 1980 temperatures at the intake structure of the power station exceeded the short-term maximum survival temperature for crappie by 5°F, these fish survived even without established preferred habitats and with only a single limited area of refuge, which are not the conditions at the Lake Clinton (R.41). The Board notes with interest the testimony that artificial lakes which are not cooling lakes typically thrive as fisheries for five years but then decline, whereas Lakes Baldwin and Sangchris have thrived as fisheries for eleven and fourteen years respectively (R.43).

There is much evidence in the record of continued efforts to monitor survival and growth of the fish populations of Lake Clinton and the continued development of the area as a fishing and recreational site. Vertical profiles of water chemistry, derived from samples of 23 parameters taken at 1-meter-depth intervals at eight lake and two downstream lake locations, are being gathered for temperature, dissolved oxygen, pH, and conductivity (R.43). Testimony established that fish are more sensitive to low oxygen levels than to high temperature levels, but that oxygen depletion occurs at levels below the twenty-foot stratum where preferred habitats are found (R.58-0). When the lake was first filled, oxygen levels were approximately 4 parts per million in the top eight meters of the lake; however, this situation is improving (R.68-9). Fish and trophic level plants and animals are monitored quarterly at seven lake and two downstream lake locations. The Department of Conservation performs a fishery survey and IPC a fisherman's creel survey (R.44). These activities serve not only to detect changes in the lake's ecology, but to establish various types of baseline data which will be useful in assessing impact of two-unit operation, expected in the year 1991. IPC's studies can distinguish between the effects of its stocking the lake and the effects of its thermal input (R.64).

Neither the Illinois Environmental Protection Agency nor the Illinois Department of Conservation have objected to IPC's petition. Similarly, by letter of September 19, 1980 to the Agency the USEPA expresses approval. The Board has received no public comment from persons or entities other than the Agency and Illinois Power Company.

Although the temperature limitations in Rule 203(i)(4) may be achieved by the installation of spray cooling modules, IPC asserts that not only is this technology over five years old, but when two-unit operation begins ten or more years from now, IPC would like to have flexibility to consider other appropriate control methodologies. Furthermore, as Illinois Power Company's

comment points out, the Agency's permit issuance authority could be compromised were the Board to require the use of only a specific technology prior to the time that Clinton Station is operated with both generating units when other technology exists which can provide adequate environmental protection. The Board finds that the use of spray cooling modules is unnecessary to meet the limitations in its Order of May 28, 1981.

IPC testified as to the necessity of imposing conditions similar to those imposed in the prior variance, e.g.: (1) submittal of a lake management plan to the Department of Conservation; (2) allowing the public access to the lake for recreational purposes; (3) the invocation of specific startup and shutdown procedures to minimize the affects of cold shock; (4) developing the lake's ecological environment; and (5) regular reporting of environmental data to the Agency. At hearing the Agency offered no evidence or objection to deletion of these conditions. The Agency's comment (issued under R80-17) recommends that most of these conditions should remain in effect; the responsive comment of Illinois Power Company refutes the Agency on every point. The Board finds that, for the reasons expressed in this Opinion, none of the conditions remains necessary.

The Board finds that compliance with Rule 203(i)(4) by IPC at this time would impose an arbitrary hardship upon it. Not only are cooling modules, the sole existing technology for compliance, extremely expensive (\$29 million in 1983 dollars, August of 1983 being the scheduled date of startup of the initial generating unit, R.51, 71), but there is no evidence in the record of the impact of cooling modules upon the ecological community. Their installation will disrupt lake currents and, therefore, change preferred habitat locations and sizes. Moreover, they can create area fogging and are capable of emitting particulate matter. The Board is not convinced that better technology at a lower cost will not exist in the future such as to make a large expenditure at this time, and during interim operations before both units become on line, unreasonable. The evidence in this record compels the conclusion that one-unit operation will produce insignificant effects on the ecological community of Lake Clinton.

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

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify that the above Opinion was adopted on the 25th day of June, 1981 by a vote of 40.


 Christan L. Moffett, Clerk
 Illinois Pollution Control Board