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ILLINOIS POWER COMPANY



CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

July 6, 1988

Docket No. 50-461

U.S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, D.C. 20555

Subject: Clinton Power Station  
Environmental Protection Plan

Dear Sir:

In accordance with Section 3.2 of the Environmental Protection Plan (EPP) for the Clinton Power Station, attached is a copy of a requested variance to the National Pollutant Discharge Elimination System (NPDES) permit. Please contact me if you have any questions on this submittal.

Sincerely yours,

A handwritten signature in cursive script that reads 'F. A. Spangenberg, III'.

F. A. Spangenberg, III  
Manager - Licensing and Safety

DWW/krm

Attachment

cc: NRC Clinton Licensing Project Manager  
NRC Resident Office  
Regional Administrator, Region III, USNRC  
Illinois Department of Nuclear Safety

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PDR ADOCK 05000461  
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July 6, 1988

HAND-DELIVERED

Illinois Environmental Protection Agency  
Division of Water Pollution Control  
2200 Churchill Road  
Springfield, Illinois 62706

Attention: Mr. Mark T. Books  
Environmental Protection Specialist  
Compliance Assurance Section

Dear Mr. Books:

Clinton Power Station  
Application for Provisional Variance

In accordance with the provisions of Sections 35 through 38 of Title IX of the Illinois Environmental Protection Act (the "Act"), and the requirements of Part 180 of Title 35, Subtitle A, Chapter II, Procedures and Criteria for Reviewing Applications for Provisional Variances of the Illinois Environmental Protection Agency (the "IEPA"), Illinois Power Company ("IPC") submits this application for a provisional variance to temporarily suspend, for a period of 45 days, the effluent temperature limitations for discharges to Clinton Lake at IPC's Clinton Power Station ("Station"). IPC requests a provisional variance, for a period of 45 days from the date of granting, from the effluent temperature limitations imposed by the Illinois Pollution Control Board ("Board") in its Order of May 28, 1981 under PCB 81-82 (the "Order"), that the daily average discharge temperature of discharges to Clinton Lake from the Station shall

not exceed 99°F during more than 12 percent of the hours (approximately 44 days) in twelve-month periods ending with any month and at no time exceed 108.3°F. The information required by the IEPA provisional variance application procedure in support of IPC's request is presented as follows:

1. Applicable Thermal Limitations

The effluent temperature limitations for discharges to Clinton Lake at the Station were imposed by the Board in the Order, as stated above. The Order was issued by the Board on May 28, 1981, and it provided that "the daily average discharge temperature [for effluent discharges to Clinton Lake from the Station] shall not exceed 99°F during more than twelve percent of the hours in twelve-month periods ending with any month and shall at no time exceed 108.3°F." With the instant application, IPC requests a provisional variance from these limitations. As of July 3, 1988, IPC had experienced 13 days in which the discharge temperature at the station exceeded 99°F during the present twelve-month period, with 31 more days allowed through July 31, 1988 under current limitations. The maximum daily average discharge temperature observed most recently was 100°F on June 21, 1988.

IPC has been monitoring water intake temperatures at the station screenhouse to (1) characterize the severity of the 1988 summer with respect to the 1955 summer, another extremely warm and dry period, and (2) anticipate when the thermal limitations of the Board will be approached. A

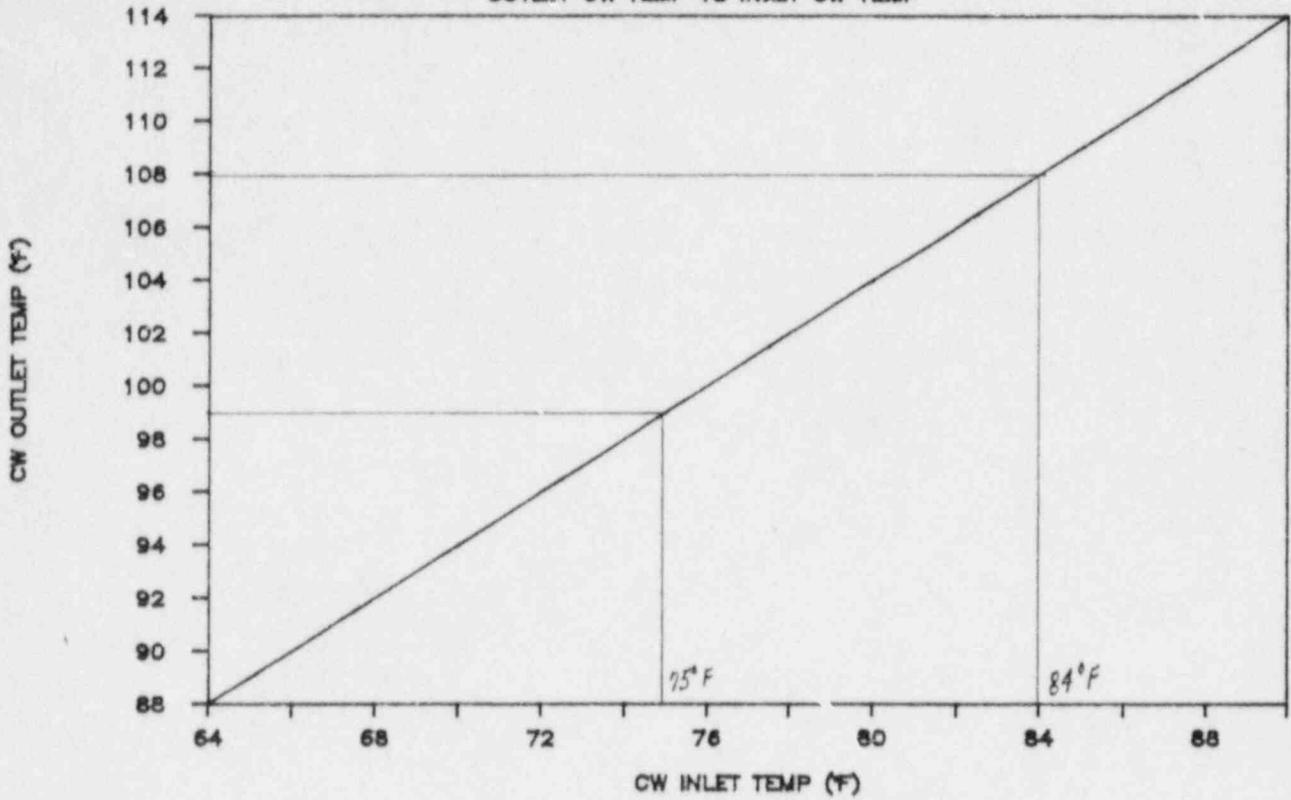
plot of these intake water temperatures and a correlation between cooling water condenser inlet and outlet temperatures are shown on Figure 1.

Excluding the cooling that may occur in the discharge flume, discharge flume temperatures should approach the 108.3°F limitation of the Board as intake water temperatures approach 84°F. The most recent modeling suggests this might occur by mid July, based on 1955 meteorological conditions, and extend throughout the third week in August. IPC is concerned that because the summer of 1988 may be as severe as 1955 actual intake water temperatures will approach the simulated temperatures thus resulting in discharge flume temperatures approaching 108.3°F.

IPC recognizes that, as of the date hereof, there are 31 days remaining of the 44 days allowed. IPC also recognizes that the next Board meeting at which the request could be granted is July 13 and the Board does not meet thereafter until August 4. As the Agency is undoubtedly aware, this summer has been both hot and extremely dry. Currently, Clinton Lake is one foot below normal pool level. While conceivably, during the 22 days between the Board's meetings, the 99° limit may not be exceeded enough times to exceed the 44 day limitation, that event creates no risk for anyone. By contrast, however, if the Board does not act on this provisional variance on July 13, it is equally conceivable that the 108.3°F maximum limitation could be exceeded during that 22 day period yet there would be no way IPC could obtain any relief during those 22 days. Similarly, the 31 days yet remaining of the 44 days allowed, even allowing for the ten days

# PREDICTED '88 SUMMER DISCH TEMPERATURES

OUTLET CW TEMP VS INLET CW TEMP



ACTUAL AND PREDICTED CW INLET TEMPS

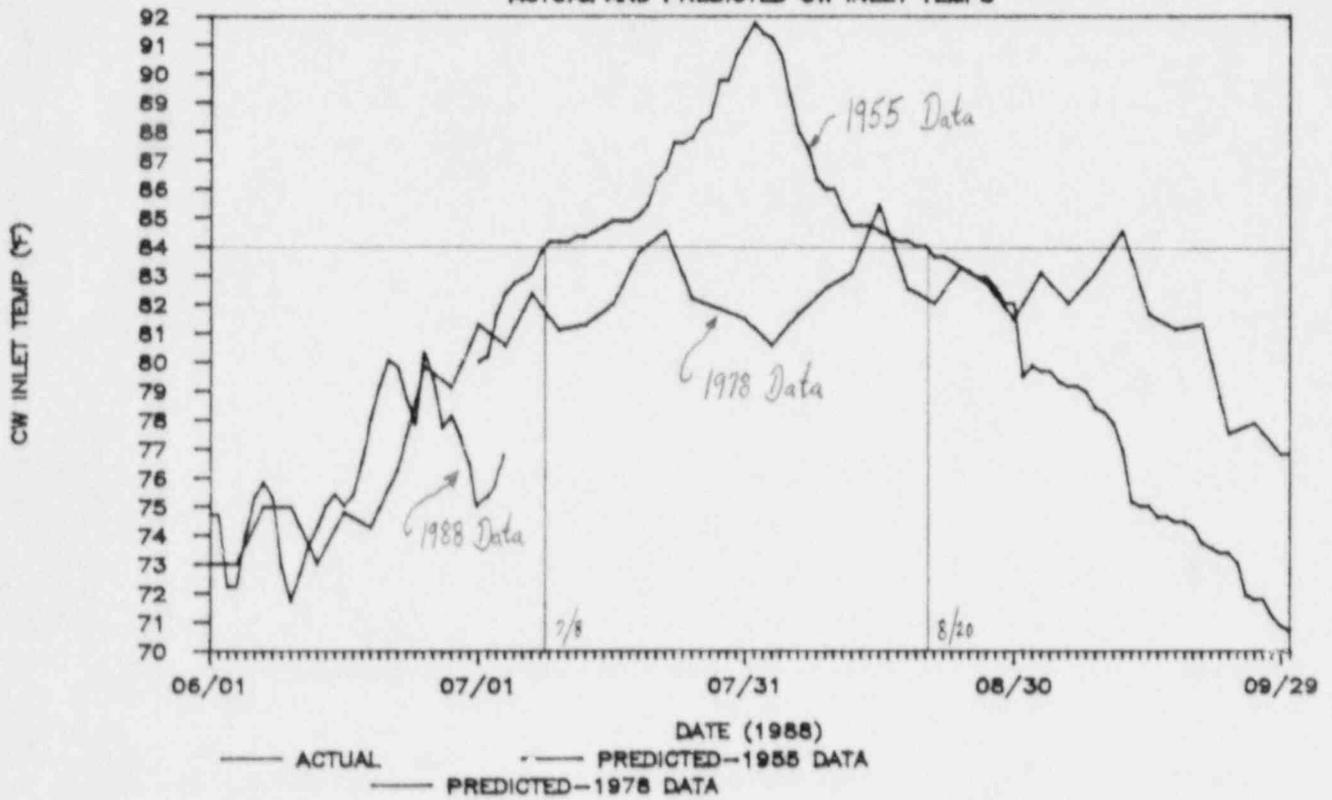


FIGURE 1

to be recovered by mid-September from 1987, will not likely be sufficient to allow unconstrained station operation through September 30.

IPC has previously filed with the Board, pursuant to Section 37(a) of the Act and 35 Ill. Adm. Code Part 104, a Petition for Variance, (the "Petition") requesting relief, until October 1, 1990, from both of the limitations imposed by the Board on its Order. The Petition was filed on June 3, 1988, and a copy of the Petition and Exhibits A through H thereto (collectively, the "Exhibits") were served upon the IEPA on that date. The Petition was docketed for hearing as PCB 88-97. The Petition and the Exhibits are hereby incorporated by reference as if fully set forth herein. The primary purpose of the variance requested in the Petition was to enable IPC to collect two years of actual operating data from the Station and lake temperature and meteorological data. This data will be evaluated with a refined, more sophisticated thermal model and, based on this evaluation, IPC will formulate long-term strategies with respect to thermal effluent discharges at the Station. See paragraph 16 of the Petition. However, due to the longer time frame for approval of petitions filed pursuant to Section 37(a) of the Act, the Petition, if granted at all, will not be granted in time to enable IPC to avoid the probable exceedance of the 44-day limitation and the almost certain exceedance of the 108.3°F limitation this summer. Thus, the instant provisional variance is needed to negate the possibility that the maximum daily average temperature will be exceeded before the Board has an opportunity to rule on the Petition and to avoid the need to again request the Board later for relief from the 44-day limitation.

## 2. Station and System Descriptions

The major process components of the nuclear-fueled electrical generating station at Clinton include one boiling-water reactor, one steam-turbine generator, normal operating and emergency shut down heat dissipation systems and various electrical transmission facilities. The instant application is primarily concerned with the circulating cooling water system, which is a part of the normal operating heat dissipation system. The circulating cooling water system is designed to deliver water from Clinton Lake to the main condenser in sufficient quantities to condense the turbine exhaust steam, the turbine bypass steam, and other turbine cycle flows. (The individual components of the circulating cooling water system are discussed in somewhat greater detail in Exhibit H to the Petition.) The heat from the turbine cycle flows is then transferred to the circulating cooling water system flow, which is pumped to the discharge flume and thereby conveyed to Clinton Lake, together with the service water flow. (The service water also is drawn from Clinton Lake.) The lake then acts as a heat sink, dissipating the heat transferred from the condenser and down the discharge flume by the combined service water and circulating water flows. These combined flows constitute the thermal effluent discharge which is subject to the Board's Order.

## 3. Activity Description (Materials Used and Wastewaters Discharged)

The thermal effluent discharge which is subject to regulation by the Board is basically attributable to the normal operation of the Station.

The Station is designed to generate 933 net megawatts of electricity. This corresponds to a heat rejection rate to the discharge flume of  $6.71 \times 10^9$  Btu/hr. This is the amount of heat which, after allowing for some heat dissipation in the discharge flume itself, is eventually transferred to Clinton Lake by the combined service water and circulating cooling water flows (collectively, these flows are hereinafter referred to as the "discharge flume flow"). During a severe and prolonged dry period, such as currently being experienced, IPC believes the elevation of the lake may fall to 683.5 to 685.5 m.s.l. Total intake water flows corresponding to the 683.5 feet m.s.l. lake elevation would approximate 1387.5 cfs, of which 79.7 would be attributable to service water flow and 1307.8 cfs would be attributable to circulating cooling water flow.

Thus, subject to the above assumptions, under normal operating conditions the Station will be discharging  $6.71 \times 10^9$  Btu/hr (less any heat dissipated in the discharge flume) to Clinton Lake, with a discharge flume flow of 1387.5 cfs. See paragraph 11 of the Petition.

#### 4. Assessment of Adverse Environmental Impacts

IPC retained J. E. Edinger Associates, Inc. ("Edinger") to perform a hydrothermal modeling study to determine the impact which operation of the Station under the conditions specified in paragraph 3, above, would have upon water temperatures at Clinton Lake. The modeling study utilized the Laterally Averaged Reservoir Model ("LARM") to generate two-dimensional

temperature profiles of Clinton Lake at a number of locations. The results of Edinger's newly-generated LARM study, together with a brief description of the modeling technique and the underlying assumptions, are included as Exhibit E to the Petition.

As is clear from the Exhibit, LARM predicts the maximum daily average discharge temperature under one-unit operation at 100 percent load during the worst case summer to be 111.7°F (44.3°C). This value is subject to an allowance of ±1.5°F to account for the use of off-site (Springfield, Illinois) average daily meteorological data. This predicted maximum exceeds the present maximum limitation imposed by the Order, 108.3°F, by only 3.4°F. (The 108.3°F value also derives from the assumption of one-unit operation at 100% load.) In addition, LARM also predicts that the daily average discharge temperatures will exceed 99°F (37.2°C) during 18.9 percent of the hours in the twelve-month period encompassing the worst case summer (with an allowance of ±2.5 percent), as compared to the limitation imposed by the Order of 12 percent of the hours in twelve-month periods ending with any month. A direct comparison of the 18.9 percent value with the 12 percent limitation is deceptive, however, in that the 18.9 percent value corresponds to operation at 100 percent load over the course of the entire worse-case summer, whereas the 12 percent limitation derives from the assumption of a 92 percent load over that summer. See paragraph 10 of Petition. (Please note that while this brief summary of the LARM results focuses on the impact which operating the Station under the above-specified

conditions will have on temperatures at the discharge, the newly-generated LARM results also estimate water temperatures at various points throughout the lake.)

In connection with the updated modeling study, IPC also retained Environmental Science and Engineering ("ESE") as its consultant to assess the biological impacts of the thermal effects expected under the newly-generated LARM results. The results of ESE's biological study are included as Exhibit F to the Petition. Sections 5 and 7 of Exhibit F contain the impact analysis of thermal addition to Clinton Lake fish using U.S.E.P.A. protocol and procedures. The U.S.E.P.A. protocol and procedures are, by their very nature, conservative. In spite of these conservatisms the analysis shows that bluegill, largemouth bass, gizzard shad, carp, and channel catfish are expected to produce and maintain good populations in Clinton Lake under worst-case meteorologic conditions like those of 1955, the worst-case summer. According to the U.S.E.P.A. protocol white crappie could be eliminated from the lake during the warmest summer. The protocol would also indicate white crappie may be eliminated from the lake with no Station heat load under 1955 conditions. However, projections based on the protocol may be overly pessimistic. Data from another Illinois cooling lake indicates crappie have survived temperatures higher than those predicted under 1955 conditions. If white crappie were severely impacted in a worst-case year, IPC maintains several fish rearing ponds adjacent to the lake and from these would supplement or reestablish the crappie population.

Due to the slow rate of cooling, and residual heat removed and discharged from the Station even after the generation of electricity is shut down, no adverse impacts due to cold shock are anticipated. Ongoing monitoring and fish management programs by the Illinois Department of Conservation and IPC will assure maintenance of a diverse fishery.

The results of the above analysis are similar to those predicted under the current thermal limitations in effect at Clinton Lake. See Section 6 of Exhibit F to the Petition. Therefore, allowing the Station to operate under the conditions requested by this provisional variance will not result in effects which are significantly different or worse than the effects already found to be acceptable by the Board, in its Opinion of June 25, 1981 (the "Opinion") supporting the present limitations. The Opinion was filed as Exhibit B to the Petition. See Opinion at 4 ("The Board is satisfied that one-unit operation will not produce unacceptable lake conditions.")

##### 5. Hardship Created

The arbitrary and unreasonable hardship created by requiring the Station to comply with the 44-day and 108.3°F maximum daily average limitations imposed by the Board's Order is the same as that described in the Petition, at paragraphs, 16 through 18. Based on the data from 1987 operations at the Station and the newly-generated LARM results, IPC is as yet unable to determine with complete confidence whether, or under what

conditions, one-unit operation of the Station may result in flume discharge temperatures in excess of the thermal limitations imposed by the Order. To make such a determination, IPC needs to more precisely evaluate the newly-generated LARM results with actual operating station data. Once the LARM results are evaluated, IPC can assess whether and under what operating and meteorological conditions the thermal limitations may be exceeded, and if necessary, take the required corrective actions. The present inability to accurately predict thermal effects prevents IPC from assessing the relative value of alternative corrective actions corresponding to those effects and thereby imposes an arbitrary and unreasonable hardship, however.

As an additional arbitrary and unreasonable hardship, the current thermal limitations may require IPC to derate even though the effects of the elevated flume discharge temperatures may be inconsequential. So far as IPC has been able to determine, the 99°F value for the temperature limitation is a historical result from earlier Board thermal proceedings and is not biologically necessary or significant. The current modeling results suggests derating of at least fifteen percent may be required to maintain compliance with the existing 108.3°F thermal limitation. This could be avoided if the present thermal limitations were suspended and IPC were allowed to operate the Station at normal design conditions for the duration of the 45-day provisional variance period.

## 6. Proposed and Alternate Methods to Achieve Compliance

As explained in paragraph 5 above, IPC presently lacks sufficient data to select the most efficient method of achieving compliance with the 44-day limitation, and with the 108.3°F maximum temperature limitation imposed by the Board. Until IPC obtains the data necessary to satisfactorily assess its options for ensuring compliance with the thermal limitations at Clinton Lake, its only alternative to seeking this provisional variance would be to derate and operate the Station at less than full capacity. However, this alternative is uneconomical and the biological evaluations demonstrate that the effects of the elevated flume discharge temperatures may be inconsequential (see Exhibit F to the Petition). Furthermore, IPC presently lacks the necessary data to precisely determine the extent that it must derate at the Station in order to achieve compliance with the existing thermal limitations or to determine the duration over which this derating must continue. Unless and until IPC obtains additional station operating data, it will not be able to derate at the Station in the most efficient and cost-effective manner.

Given the above considerations, IPC's proposed plan for achieving compliance is as follows: IPC would rely on the instant provisional variance to negate the possibility of an exceedance of the 44-day and 108.3°F limitation until after the Board has had an opportunity to render a decision on the pending Petition. Assuming the Board grants the Petition, IPC would then be able to operate the Station under normal conditions until

October 1, 1990 free from existing thermal limitations. During this interim period of approximately two years, IPC would be monitoring Clinton Lake, and obtaining actual station operating data and lake temperature and meteorological data for use by IPC in assessing its long-term options for achieving compliance with the thermal effluent limitations at the lake. These options could include, without limitation, adding another pump to increase the water flow and thus reduce the temperature of the discharge; operating the plant at less than full capacity under specified conditions; seeking regulatory relief from the Board; or installing some form of supplemental cooling.

#### 7. Provisional Variance

IPC requests a 45-day provisional variance period beginning on the day such provisional variance is granted by the Board, and terminating 45 days thereafter. If the daily average discharge temperature at the discharge flume shall exceed 99°F on any day during this provisional variance period, such day shall not be counted toward the 44-day limitation imposed by the Board's Order.

In the pending variance (PCB 88-97), IPC has not proposed any interim temperature limitation but has proposed that the Clinton Station be required to operate in its normal operating mode except during malfunctions or breakdowns. Based on our discussions with the Agency, however, IPC

recognizes that the Agency would prefer a specific numerical limitation and IPC would not object, for purposes of the provisional variance, to a maximum daily average temperature of 111.7°F.

8. Current Provisional Variance

IPC has not been granted any other provisional variances by the Board in 1988.

9. Current Status of Thermal Limitations

As stated previously, the current limitations on thermal effluent discharges from the Station to Clinton Lake were imposed by the Board's Order of May 28, 1981, under PCB 81-82 (R81-82). The terms of the present limitations are set out in paragraph 1 of this application, supra. These limitations remain in effect at Clinton Lake, although IPC presently has a Petition for Variance pending before the Board in regard to these limitations. See paragraph 1 of the application, supra.

10. Other Related Board Orders and Matters Currently Pending

The Board order (R81-82) and the proceeding currently pending before the Board (PCB 88-97) which are most relevant to the instant application are discussed paragraph 9, supra, and elsewhere throughout the application. There have been numerous other Board orders issued regarding IPC's

activities but there are none currently in effect involving the Station. In addition, although IPC has participated in a number of pending rule-making proceedings, where only the proponent is generally considered a party, it is not a party to any pending Board proceeding other than PCB 88-97.

Illinois Power Company appreciates the Agency's consideration of this request for a provisional variance. Please call this office at (217)424-6834 if you should have any questions regarding this request. We would be happy to meet with you and other members of the Agency staff to discuss this matter if that is believed necessary.

Respectively,

ILLINOIS POWER COMPANY



Jene L. Robinson  
Manager Environmental Affairs  
Department

JLR8:lem

bc: P. J. Womeldorff - B-20  
D. P. Hall/J. S. Perry - V-275  
J. Wilson - T-31A  
R. Freeman/E. Kant - V-928C  
F. A. Spangenberg/D. W. Wilson - V-920  
D. Logan - V928B  
J. A. Smithson - T-33  
J. L. Robinson/R. L. Cruse/CPS Hydrothermal Modeling File - A-17