316(a) = OK unless Uses a diff alternative approach
316(b) = NO to V entrain damage

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV

XIII

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In The Matter Of	)	NPDES Permit No. FL0000159
Florida Power Corporation Crystal River Power Plant Units 1, 2, and 3 Citrus County, Florida	)	Findings and Determinations Pursuant to 33 U.S.C. §1326

Statutory and Regulatory Authority

Section 301(b)(1)(c) of the Clean Water Act (CWA), 33 U.S.C. §1311(b)(1)(c), requires that National Pollutant Discharge Elimination System (NPDES) permits contain sufficient limitations ". . .to meet water quality standards, treatment standards, or schedules of compliance, established pursuant to any State law or regulations. . .". Environmental Protection Agency (EPA) regulations implementing the above statutory provision are found at 40 C.F.R §122.44(d).

Pursuant to the above authorities, EPA must apply the following requirements for thermal surface water discharges found in §17-3.05(1) of the Florida Administrative Code (FAC) in issuing an NPDES permit, unless a variance is granted under §316(a) of the CWA, 33 U.S.C. §1326(a), (see discussion below):

(a) Heated water discharges existing on July 1, 1972: 1/

1. Shall not increase the temperature of the RBW [receiving body of water] so as to cause substantial damage or harm to the aquatic life or vegetation therein or interfere with beneficial uses assigned to the RBW,

2. Shall be monitored by the discharger to ensure compliance with this rule, and

3. If the Department, pursuant to notice and opportunity for hearing, finds by preponderant evidence that a discharge has caused substantial damage, it may require conversion of such discharge to offstream cooling or approved alternate methods. In making determinations regarding such conversions, the Department may consider:

1/ The definition of "existing discharge" found at §17-3.05 (1)(c)(iv) of the FAC includes any thermal discharge which was under construction or for which a construction or operation permit was issued prior to the effective date of the rule.

a. The nature and extent of the existing damage;

b. The projected lifetime of the existing discharge;

c. Any adverse economic and environmental (including non-water quality) impacts which would result from such conversion; and

d. Such other factors as may be appropriate.

316(a)

Under §316(a) of the CWA, EPA may impose alternative effluent limitations with respect to the thermal component of a point source discharge ". . .whenever the owner or operator of any such source. . .can demonstrate to the satisfaction of the Administrator. . .that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made. . .".

316(b)

The CWA at §316(b), 33 U.S.C. §1326(b), requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

Factual Background

On December 31, 1974, EPA issued a permit to the Florida Power Corporation (FPC) for its Crystal River Power Plant, Units 1, 2 and 3, which permit required offstream cooling subject to consideration of a variance and alternative limits under §316(a). Since the Agency found that adequate data were not available to determine whether alternative limits for the thermal component could be allowed, the §316(a) determination was deferred pending the completion of adequate engineering and biological studies. FPC requested an adjudicatory hearing on the permit in January, 1975.

In settlement of the hearing request, EPA issued a modified permit on July 9, 1979, with an effective date of July 23, 1979 and an expiration date of February 28, 1980. The Florida Department of Environmental Regulation (FDER) certified the permit on February 7, 1979. The modified permit imposed a discharge flow limitation of 100 MGD subject to implementation or modification consistent with the Regional Administrator's final §316 determination. (The current discharge is 1898 MGD). The permit also contained a schedule of compliance which required, among other things, thermal/biological post-operational monitoring (following the start-up of Unit 3) and

§316(a) and §316(b) studies. Further, the permit stated that [b]ased on these [§316(a) and §316(b)] studies, the Regional Administrator shall make a determination as to the possible need for procedure modification, facility construction, reduced thermal discharge or reduced intake flow."

On August 30, 1979, prior to the expiration date of its modified permit, FPC submitted a permit renewal application to EPA. Until now, EPA has not acted on that application; however, pursuant to the Administrative Procedures Act, the previous permit remains effective until EPA reissues a permit to FPC.

In January 1985, FPC submitted its final report of the §316(a) and §316(b) studies which were required by its July 23, 1979, modified permit and which were conducted from June 1983 to August 1984. On September 11, 1985, FPC submitted an updated version of its August 30, 1979 renewal application. FPC submitted a proposal for certain mitigation measures on August 21, 1986. These included: creation of marshes, planting of seagrasses, construction and operation of a hatchery, and conduct of a monitoring program. On January 23, 1987, FPC submitted an alternative proposal to extend the existing discharge canal. Additional information regarding that proposal was provided on April 17, 1987. FPC proposed a second alternative plan on August 25, 1987 comprising the installation of helper cooling towers 2/, reduction of intake flow and hatchery construction and operation. Additional information was provided on January 27, 1988, and the proposal was modified on March 1, 1988 to include a seagrass monitoring and planting program and a limitation on plant operations to maintain a three-hour average temperature not to exceed 96.5° F and an instantaneous maximum temperature not to exceed 97.0° F.

2/ In the proposed helper cooling tower system, a portion of the plant's heated effluent will be cooled and returned to the discharge canal where it will mix with the remainder of the uncooled effluent. In a recirculating (offstream or closed cycle) cooling tower system, the entire volume of thermal effluent is cooled (with the exception of a relatively small amount of "blowdown", which is discharged to maintain an acceptable chemical equilibrium in the towers), recycled to the plant for reuse, and subsequently returned to the towers for additional cooling. Recirculating cooling towers for Units 1, 2, and 3 would reduce the plant intake flow by approximately 85% (85% of the water is recirculated and 15% is evaporated or blown down). No reduction in intake flow occurs with the proposed helper cooling towers.

Findings of Fact and Determinations

Pursuant to §316 of the CWA and under authority delegated by the Regional Administrator on March 15, 1985, the Director of the Water Management Division, Region IV, Environmental Protection Agency makes the following findings relative to the Crystal River Power Plant, Units 1, 2 and 3:

1. The Crystal River generating facility is located adjacent to Crystal Bay, an estuarine nursery area between the community of Crystal River and the Cross Florida Barge Canal. At this facility, the Florida Power Corporation operates five generating units. Historically these units were placed into operation in the following sequence:

   Unit 1, 1966
   Unit 2, 1969
   Unit 3, 1977
   Unit 4, 1982
   Unit 5, 1984

   Units 4 and 5 employ closed cycle cooling with the use of natural draft cooling towers, whereas, Units 1, 2 and 3 each rely on once-through flow for cooling the condensers.

2. A combined daily flow of 2936 cfs (1898 MGD) is required for the cooling systems of the two coal-fired units (Units 1 and 2) and the nuclear unit (Unit 3). Approximately 50 percent of the total flow is directed to the nuclear unit. Water for the once-through mode of operation is drafted from an intake channel extending westerly into Crystal Bay. Separating the intake channel from the discharge area of the facility is a seven-mile long dike which flanks the northern side of the intake channel. This channel also serves barge traffic for the delivery of coal to the plant site. Heated water from the condenser cooling systems is returned to the bay on the northern side of the seven-mile dike.

3. From June 1983 through August 1984, FPC conducted §316(a) and §316(b) studies according to a plan of study approved by EPA and FDER. The operational effects of Units 1, 2 and 3 on the marine biota of Crystal Bay were the subject of those studies.

4. Seasonally, the maximum temperature regime for the area of Crystal Bay supplying water for condenser flow occurred in mid-July to mid-August. Temperatures of inshore and offshore waters not impacted by the thermal plume at this time averaged about 86°F with maximum ranges of about 84.2°F to 89.6°F. Maximum average 24-hour discharge temperatures at the point of discharge (POD) were in the range of 102.9°F to 103.8°F.

8. A representative view of the plume dimension for the period of seasonally maximum temperature was depicted in the records of intensive temperature sampling of August 13, 1983. At this time Units 1, 2 and 3 were operating at 77 percent of maximum thermal output. The average 24-hour discharge temperature was 99°F. The seaward boundary of the plume (87.8°F isotherm) extended approximately 2.8 miles offshore of the POD and encompassed approximately 2100 acres (3.3 square miles) of bay bottom. At 100 percent capacity, water temperatures within the 2100 acres of the plume would be equal to or greater than 91.8°F.

6. Seagrass and attached macroalgal communities were adversely impacted by heated water discharges from Units 1, 2 and 3. Within a 2-mile radius of the POD, an area of approximately 1100 acres of bay bottom was shown to be virtually barren of attached seagrasses and macroalgae. This area of severe thermal impact represented nearly a three-fold increase in the acreage of barren bay bottom since Unit 3 was placed into operation in 1977.

7. The benthic community of macroinvertebrates living upon and within the sediments of Crystal Bay were adversely impacted in a 3000-acre zone of the discharge area. The benthic impact was attributed to the following:

    a. Thermal stress;

    b. Reduction and loss of attached seagrass and macroalgal habitat;

    c. Siltation resulting from materials carried in the discharge plume as well as wind and discharge induced turbulence acting upon the bay bottom which has lost the stabilizing benefits of attached macroalgae and seagrasses.

8. The Crystal Bay region associated with the power station was shown to be a spawning and nursery area for numerous species of fish and shellfish. These species included animals of recreational, commercial, and forage value.

9. Trawl and seine sampling studies show that during much of the year over 50 percent of fish and invertebrate species normally indigenous to Crystal Bay are excluded from the thermally impacted area.

10. Annual impingement of finfish and shellfish species having recreational, commercial and/or forage value approximated 23 tons including 3.4 tons of pink shrimp and 14.3 tons of blue crab. No system is provided for the return of viable organisms to the bay.

11. The entrainment of fish eggs and larvae of fish and shellfish by Units 1, 2 and 3 was considerable. Annual entrainment involved billions of animals most of which were anchovies and crustaceans, i.e. stone crab, Callinectes crabs, and penaeid shrimp. The Callinectes crab includes the commercially important blue crab and the penaeid shrimp classification includes the three commercially important white, brown, and pink shrimp.

12. The FPC modeling efforts to forecast the effects of entrainment on adult populations of fish and shellfish at large are flawed and provide an inadequate basis to judge the full impact of entrainment on fishery resources.

13. Section 17-3.05(1)(a) of the FAC is applicable to discharges existing on July 1, 1972 or under construction prior to that date. Units 1 and 2 were in operation on that date and Unit 3 was under construction prior to that date, therefore, that section applies to the Crystal River Power Plant discharge from those units.

Based upon the above authorities and findings, I hereby determine the following:

1. The §316(a) and §316(b) studies conducted by FPC were sufficient to demonstrate significant adverse biological effects associated with the siting and operating of Crystal River Units 1, 2 and 3.

2. Approximately 3000 acres (4.7 square miles) of Crystal Bay are adversely affected by the thermal discharge from the facility. Within this 3000 acres, at least 800 acres (1.2 square miles) of seagrass and attached macroalgal communites have been destroyed because of the excessive temperatures created by the operation of Units 1, 2 and 3. An additional 300 acres (0.5 square miles) were barren at the start of the §316 studies, all or a portion of which was due to the previous operation of Units 1 and 2. In addition, major components of locally indigenous fish and invertebrate species are excluded from the thermally impacted area.

3. The §316(a) study demonstrates that the existing thermal discharge has caused substantial damage in Crystal Bay in violation of the FAC at §17-3.05(1)(a). The draft permit proposed on December 18, 1986 contained effluent limitations which were consistent with installation of an off-stream cooling system, such as recirculating cooling towers, on Units 1, 2, and 3. Those limitations would have assured compliance with the FAC and would have been consistent with §316(a).

4. The FPC proposal to install helper cooling towers will produce a maximum instantaneous discharge temperature of 97.0° F. and a maximum three-hour average temperature of 96.5° F. The helper cooling towers are expected to return the discharge area to the approximate thermal levels in existence prior to the operation of Unit 3 beginning in 1977. The thermal discharge from Units 1 and 2 is known to have impacted an area not greater than 300 acres of bay bottom. Based on an evaluation of new information submitted by FPC, I have tentatively determined that the thermal effluent limitations proposed in the December 18, 1986 draft permit were "more stringent than necessary to assure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made. . .". Accordingly, the previous tentative determination to deny the request for a §316(a) variance is hereby revised. I have tentatively determined that a variance for a 300-acre area would assure the protection and propagation of a balanced, indigenous population in Crystal Bay.

5. The level of entrainment and impingement demonstrated by the §316(b) study constitutes an adverse impact to the biota of Crystal Bay and environs. The intakes of the Crystal River Power Plant are located in an estuarine nursery area. The capacity of Units 1, 2 and 3, based on a once-through cooling mode, is 2936 cfs (1898 MGD). There are no design features incorporated in the facility which would minimize impact of the large volume of flow (capacity) and poor location. The location, capacity and design of Crystal River Units 1, 2 and 3 do not reflect the best technology available for minimizing adverse impacts as required by §316(b) of the Clean Water Act.

6. Helper cooling towers will not reduce the present intake flow or the entrainment of aquatic organisms associated with that flow. However, the proposed reduction in plant intake flow during the months of November through April will proportionately reduce entrainment during that period. Installation of closed cycle cooling towers would reduce entrainment damage by about 85 percent, however, the increased cost (about $150 million more that the system proposed by FPC) is considered to be wholly disproportionate to the environmental benefits to be derived.

7. To minimize the adverse impact of the Crystal River Plant intake structures, installation of fine mesh screens and a return mechanism (similar to that in operation at the Big Bend Station in Tampa) would constitute best available technology under §316(b) of the Act. However,

this modification is not considered to be technically feasible due to the use of the intake canal for coal delivery. Ambient silt from the Gulf of Mexico, which settles in the intake canal and is resuspended by coal barges; would collect on the intake screens (0.5 mm mesh would be necessary to remove fish eggs and larvae). Even if silt did not clog the screens and render them inoperable, return of the removed solids to Salt Creek (necessary for return of aquatic organisms at the Crystal River site) would cause unacceptable siltation in the small creek.

8. No other practical technological modification of the cooling water intake structures is available which would minimize the environmental impacts to an acceptable level. Therefore, I have tentatively determined that (1) reduction of plant flow by 15 percent during the months of November through April, in conjunction with, (2) construction and operation of a fish hatchery over the remaining operating life of the three units (in an attempt to replace fish and shellfish eggs, larvae, and juveniles entrained by the plant) will constitute minimization of the environmental impacts of the cooling water intake as required by Section 316(b) of the Act for the Crystal River Power Plant, Units 1, 2, and 3.

DATE: SEP 1 1988

Bruce R. Barrett

BRUCE R. BARRETT, Director
Water Management Division