

ENVIRONMENTAL IMPACT APPRAISAL
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
SUPPORTING AMENDMENT NO. TO FACILITY LICENSE NO. DPR-67
FLORIDA POWER AND LIGHT COMPANY
ST. LUCIE NUCLEAR POWER PLANT
DOCKET NO. 50-335

Description of Proposed Action

By letter dated April 12, 1979, supplemented by letter dated September 10, 1979, Florida Power and Light Company (the licensee) requested an amendment to the Appendix B Environmental Technical Specifications (ETS) for St. Lucie Nuclear Power Plant, Unit 1. The licensee proposes to delete certain water quality requirements from the ETS. The licensee's justification for deleting these requirements is that they are contained in the NPDES permit issued by the U.S. Environmental Protection Agency under the Clean Water Act and are not within the jurisdiction of the NRC.

On September 12, 1979, Region IV of the U.S. Environmental Protection Agency requested NRC review of changes to the St. Lucie NPDES permit proposed by FP&L. These proposed permit changes are for the same parameters proposed to be deleted from the ETS. The licensee provided EPA with an extensive environmental assessment of making the proposed changes.

In responding to EPA's request, the staff reviewed the assessment which FP&L sent to EPA. At the same time, we reviewed the portions of the NPDES permit which contain restrictions similar to those in the ETS. We found that we had no

objections to the proposed changes to the permit. We found that we could rely on the NPDES permit for limiting those parameters which the licensee requested to be deleted from the ETS. On December 4, 1979, we sent a letter to the Chief, Water Enforcement Branch of Region IV-EPA, informing him that we did not object to the permit modifications and that we could rely on the NPDES permit conditions for limiting those parameters to be deleted from our ETS. On March 4, 1980, EPA-Region IV informed us that our proposal to rely on the NPDES permit for regulation of the water quality parameters to be deleted from the ETS was acceptable.

Specifically, the licensee proposes to delete limiting conditions for operation in Sections 2.1.1 Maximum Discharge Temperature, 2.1.2 Maximum Condenser Temperature Rise, 2.2.1 Biocides, and 2.2.2 pH; Surveillance programs in Sections 3.1.A.1 Biocides, 3.1.A.2 Heavy Metals, 3.1.A.3 pH, 3.1.A.4 Dissolved Oxygen and 3.1.A.5 Temperature Usage. In addition, definitions in Section 1.0 associated with the sections to be removed would be deleted.

This appraisal reviews the results of, and provides a basis for, deleting the specifications described above and for relying on the NPDES permit for protection of the aquatic environment in the vicinity of the St. Lucie site.

Environmental Impacts of Proposed Action

Temperature Limits

Specification 2.1.1 requires that the maximum discharge temperature shall not exceed 111°F in the discharge canal. The surface temperature within the zone of mixing is not to exceed a rise of 5.5°F nor a maximum temperature of 93°F

as an instantaneous maximum at any point. In addition, thermal defouling of the intake is allowed subject to a maximum release temperature of 120°F, and conditions for circulating water system outage, which would result in higher discharge temperatures, are limited to 115°F.

Specification 2.1.2 limits the temperature rise across the condenser under full power operation to 26°F. When maintenance or outage of the circulating water system occurs, the temperature rise is limited to 35°F for no greater than a 72-hour period.

The FES for operation of Unit No. 1 (June 1973) summarized the projected impact related to the thermal discharge as follows (p. i):

Planktonic organisms will be eventually killed by thermal shock as they pass through the condenser. However, there appears to be very little marine life in the vicinity of the intake, so the impact on the ecosystem is expected to be minor.

The maximum ocean surface temperature rise at the Atlantic Ocean discharge will be about 6°F. The 3°F isotherm should cover about 35 acres and the 1°F isotherm about 2860 acres. These temperatures may have some unknown effects on the mating habits of turtles in the plume zone and on the activity of turtle hatchlings as they leave their beach nests. Effects on other marine life are expected to be minimal.

The thermal limitations in the permit, as modified on February 18, 1980, are: a maximum discharge temperature for normal operation of 113°F and 117°C during maintenance of the circulating water system (CWS); a maximum condenser temperature rise of 30°F except during maintenance of the CWS when the temperature can be 32°F; and, ambient ocean surface-temperature not to exceed an instantaneous maximum of 97°F.

The licensee's consultant provided an assessment to EPA of the impacts which might occur at the higher discharge limits allowed by the NPDES permit¹. This comprehensive report considered the "worst case" situation of discharging the heated water during the month of September, which is the hottest month for ambient water temperatures and coincides with the highest animal densities in the site vicinity. The impact of the thermal discharge was evaluated with the receiving water under static and dynamic conditions. Thermal effects were evaluated on phytoplankton, zooplankton, ichthyoplankton, benthic invertebrates, fish and turtles.

Reduction in phytoplankton due to increased temperatures are estimated to be less than 2.5% of the total phytoplankton in the region of potential impact. Rapid turnover rates in the community would easily compensate for this reduction.

Zooplankton mortality will increase at the higher discharge temperatures but will largely be offset by a decreased mortality from lower volumes of water pumped through the plant. A maximum effect of a decrease of less than 1% in number of zooplankters was predicted.

Mortality of ichthyoplankton entrained through the plant would decrease at reduced pumping rates while higher discharge temperatures would increase the impact on organisms entrained into the plume. It was projected that impacts of higher temperatures would be offset by reduced impacts at lower flows.

Benthic invertebrates would not be directly influenced by the discharge water as it is directed towards the surface and does not impinge on the bottom near the discharge.

The adult fishes will be primarily affected by the thermal plume by being excluded from an offshore area where they would encounter increased temperatures. Within the thermal plume, total exclusion of adult fishes due to thermal avoidance will probably occur from the point of discharge to the 95°F isotherm, and no exclusion from temperatures less than 90°F. The total volume of water which may limit adult fishes offshore of the plant was calculated by the licensee to be about 65 acre-ft. This volume of heated water is less than 1% of that available as habitat for fishes in the site vicinity.

Marine turtles use the offshore for breeding and the beach for nesting. The adult turtles are mobile and can easily avoid the heated plume. According to the licensee, turtle hatchlings have demonstrated reduced swimming speeds at water temperatures over 86°F. If turtle hatchlings encounter heated areas, they would resume normal swimming after sinking below the heated areas. No adverse effects are anticipated.

In summary, the staff concludes that the impacts from deleting the current ETS thermal limits and relying on the thermal requirements of the NPDES permit are acceptable for the following reasons: (1) The St. Lucie FES conservatively assumed that all entrained organisms would be killed. (2) The thermal impact

of the entrainment of phytoplankton, zooplankton, and ichthyoplankton was not predicted to be significant. (3) In general, low concentrations of ichthyoplankton were recorded in the intake canal thereby confirming the FES prediction that small numbers would be entrained. (4) As discussed above, the increase in ΔT will permit less water to be drawn into the plant, and thereby fewer organisms would be exposed to the higher ΔT .

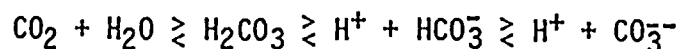
Biocides

Specification 2.2.1 limits the concentration of total residual chlorine at the end of the discharge canal to 0.1 mg/l. Chlorine is also not to be used for more than 2 hours per day. The NPDES permit requirements on the discharge of chlorine are identical to those in ETS 2.2.1. The staff concludes that no environmental impact will result from reliance on the NPDES permit values as the chlorine discharges allowed by the permit are the same as those allowed by the ETS.

PH

Specification 2.2.2 limits the pH of the cooling water in the discharge canal not to be less than 6.0 nor greater than 9.0 standard units. The NPDES permit restricts the pH of the neutralization basin discharge to the intake canal to not less than 6.0 standard units. No upper limit is provided. Monitoring in the discharge canal since 1976 has shown that the pH of the circulating water ranges from a low of 8.00 to a high of 8.4^{2,3}. These data show that the pH is quite stable which is to be expected for a sea water system which is naturally well buffered. Normal sea water has a pH of approximately 8.0, but can range from 7.5 to 8.4. At a pH of 8.0, the vast amount of the CO₂ present in sea water occurs in bound forms, with most of it occurring as

bicarbonate ion. Sea water containing weak acids, such as carbonic acid and to a lesser extent boric acid, has a strong buffering action compared with pure water. Thus the addition of acid to the system:



shifts the equilibrium to the left and the resulting carbonic acid ionizes to a small extent so the pH remains relatively stable.

The staff concludes that Specification 2.2.2 limiting the pH of the cooling water in the discharge canal can be deleted, as acids or bases released into the CWS would be diluted many times by the flow of the CWS, and because the buffering action of the sea water will help to neutralize releases of acid or bases. The combination of dilution and the buffering action of sea water will assure that releases of acids or bases will not affect the biotic community in the site vicinity.

Environmental Surveillance

Specification 3.1.A.1 requires monitoring of total residual chlorine in the discharge canal on a weekly schedule. Section 2.2.2 required monitoring of TRC at the plant discharge, however, Specification 3.1.A.1 requires monitoring in the discharge canal to determine the decay of chlorine in the canal. The licensee has measured residual chlorine in the canal since March 1976^{2,3}. Levels measured have ranged from 0.01 to 0.08 mg/l. All measurements have been below the 0.1 limit of Specification 3.1.A.1.

The NPDES permit requires monitoring of total residual chlorine in the discharge canal prior to discharge to the Atlantic Ocean. Compliance with the NPDES permit level of 0.1 mg/l and monitoring will assure that impacts to organisms from the discharge of chlorine are within those discussed in the St. Lucie FES.

Specification 3.1.A.2 requires monthly monitoring of the heavy metals, Mercury, Arsenic, Chromium, Copper, Iron, Lead, Nickel and Zinc, in the intake and discharge canals to detect any measurable increase in these metals. Sampling conducted by the licensee during 1977 and 1978 has shown levels at or below the level of detectability with no measurable increases due to plant operation^{2,3}. The NPDES permit does not require routine monitoring for heavy metals. However, based on the results of the licensee's monitoring, the staff concludes that heavy metal monitoring is no longer necessary and can be deleted from the ETS.

Specification 3.1.A.3 requires monitoring for pH. This specification is redundant to that in Limiting Condition for Operation 2.2.2, pH, and is deleted on the basis of that provided for Section 2.2.2.

Specification 3.1.A.4 requires surveillance of the dissolved oxygen (DO) in the intake and discharge canals to determine whether the cooling water being returned to the ocean has been depleted of oxygen. Dissolved oxygen has been monitored since early 1976^{2,3} and found to be normally within the range of 6.00 and 8.00 ppm. DO levels in the two canals have been found to be very similar throughout the year. The NPDES permit does not require DO monitoring. The staff finds, however, that the DO surveillance program can be deleted as plant operation has not significantly affected the concentrations in the intake canal.

Specification 3.1.A.6 requires temperature monitoring in the intake and discharge canals and in the offshore thermal plume by continuous self-contained thermographs. In addition, the licensee was to conduct a study using aerial infrared photography to demonstrate compliance with the temperature rise limitations outside the zone of mixing.

The licensee conducted the aerial infrared photography study in 1977. Four infrared flights were performed approximately three months apart to reflect seasonal conditions. Each quarter's flight was scheduled to occur during low and high tide conditions. The results of three of the quarters showed compliance with the ETS limit of 4°F temperature rise outside the 400 acre mixing zone. The flight during the summer months showed that the ETS limit of 1.5°F temperature rise outside the 400-acre mixing zone was complied with during the months June through September. The licensee's study satisfied the requirements of the overflight study and demonstrated that compliance with the limitations on temperature rise outside the mixing zone could be met. The staff concludes that this section of Specification 3.1.A.6 is complete and can be deleted.

The NPDES permit requires monitoring at the intake and discharge canals for compliance with the permit temperature limitations, but does not require continuous monitoring of the ocean surface temperature. The permit, however, contains a limit of 36.1°C for the instantaneous surface maximum at any point in the thermal plume. The permit does not indicate how compliance of the surface limitation can be met. The staff finds that the ETS requirements can

be deleted and the NPDES permit relied on for monitoring of the discharge temperature. However, for monitoring of the surface thermal plume, the staff considers that the aerial overflights have demonstrated compliance with the requirements of Specification 2.1.1, and may be deleted on that basis.

Minimum Effective Chlorine Usage

Specification 4.3 requires that the licensee study ways to minimize the amount of chlorine needed to maintain condenser cleanliness while avoiding unnecessary discharge of chlorine to the environment. Starting in 1977, the licensee began testing different injection rates of chlorine and generally has found that lower injection rates result in fouling in circulating water system parts other than the condenser. The fouling of components of the circulating water system have been found to be unacceptable and rates had to be returned to normal. Studies conducted during 1978 are incomplete in that results from other chlorine injection rates must wait until plant shutdown allows for inspection of the circulating water system. These results should be available in the annual report for 1979.

In the licensee's supplemental submittal of September 10, 1979, it was stated that Specification 4.3 could be deleted because the NPDES permit "...contains provisions dealing with this subject..." The NPDES permit states on page 2 of Part I that in the event that the station cannot be operated at or below the 0.1 mg/l, the licensee can submit a demonstration that discharge of higher levels of chlorine are consistent with requirements of the Florida Water Quality Standards. Evidently the NPDES permit does not require a chlorine

minimization study, but rather provides for studies for the use of higher chlorine concentrations. The staff finds that because the chlorine discharge concentration in the permit is the same as that in the ETS and that initial attempts by the licensee have not shown effective defouling of the CWS at lower injection rates, the chlorine minimization program can be deleted from the ETS. However, the staff has added to the ETS a requirement that when changes are proposed to be made to the NPDES permit, the NRC be notified and the supporting justification for the proposed limitations required by EPA be submitted to us. In this way, the staff can update the chlorine environmental impact analyses made in the St. Lucie FES.

Conclusion and Basis for Negative Declaration

On the basis of the foregoing analysis, it is concluded that there will be no environmental impact attributable to the proposed action other than has already been predicted and described in the Commission's FES or described in this analysis for St. Lucie Nuclear Power Station, Unit 1. Having made this conclusion, the Commission has further concluded that no environmental impact statement for the proposed action need be prepared and that a negative declaration to this effect is appropriate.

References

1. Effects of Increased Water Temperature on the Marine Biota of the St. Lucie Plant Area. Applied Biology, Inc. 106 pp. February 1979.
2. Annual Environmental Report No. 2 For The Year 1977. Florida Power and Light Company. St. Lucie Plant Unit No. 1.
3. Annual Non-Radiological Monitoring Report 1978. Volume 1 Abiotic Monitoring. Florida Power and Light Company.