United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

July 29, 2014

David J. Wrona
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-001

Service CPA Code: 2014-CPA-0267
Service Consultation Code: 2014-I-0177
Date Received: July 25, 2014
Project: Operation License Amendment for Turkey Point Power Plant
County: Miami-Dade

Dear Mr. Wrona:

The U.S. Fish and Wildlife Service (Service) has reviewed your letter dated July 25, 2014, and other information submitted by the U.S. Nuclear Regulatory Commission (NRC) for the project referenced above. This letter is submitted in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.).*

PROJECT DESCRIPTION

The NRC is reviewing a proposal from Florida Power and Light (FPL) to amend their operation license for existing nuclear power units 3 and 4 at the Turkey Point Power Plant. The license amendment would increase the Ultimate Heat Sink (UHS) temperature limit for the Cooling Canal System (CCS) from 100 degrees Fahrenheit (°F) to 104 °F. In addition, FPL is implementing a strategy to address blooms of cyanobacteria that are affecting water quality in the CCS and plant operations. The project site is located in Florida City, Miami-Dade County, Florida.

THREATENED AND ENDANGERED SPECIES

The project site occurs within the geographic range of the threatened American crocodile (*Crocodylus acutus*; crocodile) and is located within designated critical habitat for this species. Crocodiles are known to occur and nest within the 5,900-acre CCS, located immediately west of the of nuclear power units 3 and 4 at FPL's Turkey Point Nuclear Power Plant. The CCS is a closed system and does not discharge water to either Biscayne Bay or adjacent freshwater wetlands. Originally filled with seawater from Biscayne Bay, the CCS is now augmented only by rainfall, groundwater exchange, and freshwater pumped periodically from the interceptor ditch (located along the western boundary of the cooling canal system) during the dry season. Heated water is currently discharged into the discharge canal located at the north end of the

CCS from nuclear power production units 3 and 4, and from oil-burning power production unit 1 (located immediately north of the units 3 and 4) periodically when the unit is needed to meet power demands. The heated water circulates to the south through the CCS, then east and northward back to the intake canal for reuse in cooling units 1, 3, and 4. The water temperature of the CCS is greatest near the discharge canal and cools as it circulates to the southern end of the CCS.

The Service notes the CCS currently supports a large population of crocodiles because the berms constructed in association with the canal system provide high quality nesting habitat. However, the water in the CCS provides a harsh environment for crocodiles. Due to the original use of sea water for cooling purposes, the ongoing deposition of heated water from power production, and the limited influx of freshwater, the water in CCS is hyper-saline. At times during the year, sections of the CCS may exhibit salinities and water temperatures above the known limits of tolerance for the crocodile. Crocodiles respond to high water temperatures by moving into areas of lower temperature within or outside of the cooling canal system. Crocodiles are also able to survive the hyper-saline environment by excreting salt through salt glands in their tongue, but require access to freshwater to persist. Sources of freshwater are known to occur at various localities within the CCS (*i.e.*, depressions and specially constructed ponds that collect rainwater runoff and are located on the canal system's berms), and outside of the CCS within the adjacent interceptor ditch and freshwater marsh.

In August 2012, FPL noticed turbidity of the water in the CCS was increasing. Water samples indicated that a bloom of cyanobacteria (also known as blue-green algae) had occurred, and a cell count of approximately 680,000 cyanobacteria cells/ml of water was observed. In September 2012, the count had decreased by approximately 55% to about 374,000 cells/ml of water; however, in November 2012, FPL observed the turbidity of the water and the concentration of cyanobacteria had increased to levels previously observed in August 2012. The increase in cyanobacteria within the CCS was likely a result of two factors. First, units 3 and 4 were temporarily shut down, one unit at a time for a total of 17 months in 2012, in order to be modified as part of the permitted uprating of the units (*i.e.*, modifications made to increase power production by 20 percent to meet current and future demand) conducted by FPL. The shutdown of units 3 and 4 significantly reduced the water flow in the CCS during this time. Cyanobacteria blooms are known to form in warm, slow-moving waters that are rich in nutrients. Although, the causes of cyanobacteria blooms are not well understood, it is thought that reducing the flow of water in an aquatic system tends to improve light availability and possibly the nutrient environment for cyanobacteria growth. Secondly, because there was below normal precipitation in the region, the water level in the CCS was likely reduced during this time. Data from the meteorological station located in the middle of the CCS collected 52.18 inches (in) and 74.25 in of rainfall during 2011 and 2012, respectively. However, only about 20 in of rainfall was recorded in 2013; in 2014, to date, there have only been 4.04 in of rainfall. Furthermore, compounding the first two factors, the cyanobacteria bloom itself is believed to have reduced the ground water exchange within the CCS and further reduced the water levels as a result of an accumulation of sediment from dead cyanobacteria in the canal bottoms.

The increase in cyanobacteria has significantly affected the water quality in the CCS by increasing turbidity, salinity (> 90 parts per thousand [ppt] during certain times of the year) and temperature (>110 °F is some locations during certain times of the year). Consequently, the water in the CCS is now much less efficient in releasing heat given off by units 1, 3, and 4. The bloom has also fouled the heat transfer equipment at the power units resulting in an increase in needed maintenance and a reduction in the efficiency of power generation. These water quality and operations problems, and the fact that FPL could not exceed the UHS temperature limit in the CCS stated in its current license for operation of units 3 and 4, compelled FPL to request that the NRC amend their operational license as discussed above.

The effect of increased turbidity, salinity, and temperature in CCS to the crocodile population is unclear. However, an increase in water temperature could conceivably reduce the amount of habitat suitable for crocodiles during the warmest part of the year. As discussed, crocodiles located within areas of the CCS containing excessively high water temperatures may relocate to sections of CCS that contain cooler, more favorable water temperatures. Because crocodiles are known to maintain well defined social hierarchies based on access to resources such as preferred temperature regimes, animals lower in social hierarchy could be displaced from the CCS. The effect of increased water temperature and salinity could also reduce hatchling survival because hatchlings are more limited in their ability to behaviorally thermo-regulate and excrete salt than adult crocodiles. If not treated, the cyanobacteria bloom within the CCS could threaten the long-term viability of the crocodile population within and near the CCS.

Based on the adverse impacts to power production, and the potential adverse effects to the crocodile, FPL has proposed to reduce cyanobacteria within the CCS. The immediate eradication of cyanobacteria within CCS is not desirable because a sudden die-off and decay of cyanobacteria would result in a spike in biological oxygen demand and a rapid release of toxins that could harm crocodiles. Following conversations with the Service and approval by the Florida Department of Environmental Protection (FDEP), FPL began a gradual treatment to reduce the cyanobacteria within the CCS by applying doses of Earthtec® (a commercially available bactericide containing 5 percent copper as the active ingredient; 5,200 to 7,000 gallons [gal] per treatment), hydrogen peroxide (4,000 gal per treatment), and a bio-stimulant (a combination of bacteria, enzymes, and polymers; 1 gal per million gal) into the outflow canal located at the north end of the CCS. The bactericide and the bio-stimulant will reduce the cyanobacteria population and the bio-stimulant will enhance the decomposition of sediment within the canal bottoms. Hydrogen peroxide will be introduced to the CCS prior to and following the applications of bactericide and the bio-stimulant to increase the decomposition rate of the dead cyanobacteria, increase the dissolved oxygen content of water, increase the decomposition rate of sediment, and prevent a reduction in water quality. To determine the success of the treatment, two initial applications have already been completed and consisted of applying doses of the bactericide, hydrogen peroxide, and the bio-stimulant during two consecutive days followed by five days of non-application. Based on the results of the initial treatments, FPL has determined the efficacy of the treatment will improve if the constituents described above are applied with greater frequency. Therefore, future weekly applications of

the bactericide, hydrogen peroxide, and the bio-stimulant will be made for five consecutive days followed by two days of non-application. The weekly treatments will continue for seven to eight consecutive weeks.

At elevated concentrations, copper is known to have lethal and sub-lethal effects on fish and wildlife (Eisler 1998). The Service notes that the copper and other constituents used to treat the cyanobacteria will be applied in low concentrations over a short time period. In addition, the hyper-saline environment in the CCS will likely reduce the toxicity of the copper because, in general, an increase in salinity has been found to reduce the toxicity of copper to fish and invertebrates. Furthermore, despite a lack of toxicological data assessing the impacts of aqueous copper on crocodilians, the concentration of copper resulting from the treatment is not anticipated to exceed drinking water standards and therefore, the addition of copper to the CCS is not expected to harm the crocodile.

The reduction of cyanobacteria described above is considered a temporary solution to the salinity, temperature, and water quality issues of water in the CCS. As a long-term solution, FPL is requesting permission from the FDEP to install six new wells at the Turkey Point Power Plant and pump up to 14 million gal per day of brackish water from the Floridian aquifer into the CCS. The periodic (as needed) introduction of brackish ground water, in concert with natural rainfall, is anticipated to reduce the salinity of the water in the CCS to approximately 34 ppt (the salinity of the water in the CCS when it was originally built and the current salinity of Biscayne Bay adjacent to the Turkey Point Power Plant), reduce the likelihood of cyanobacteria blooms, and prevent the seepage of hyper-saline water into Biscayne Bay. Modeling conducted by FPL's consultant and the South Florida Water Management District indicate that the salinity threshold of 34 ppt will be met in approximately two years. FPL will continue to conduct long-term sampling of water within the CCS to ensure that the salinity threshold and water quality are maintained. In addition, to address overall water quality, FPL is in the process of developing and implementing a long-term operation and maintenance plan for the CCS that will include periodic dredging and removal of the canal bottom sediments and installation and operation of aeration devices to increase the dissolved oxygen in the waters of the CCS.

To protect the crocodile, FPL will continue their crocodile monitoring efforts in the project area. Specifically, FPL will continue to evaluate growth, survival, abundance, and spatial distribution of crocodiles at the Turkey Point Power Plant following the uprating process and the temporary treatment of cyanobacteria. FPL has committed to an additional 2 years of crocodile monitoring following approval of the license amendment by the NRC. FPL will provide a report to the Service detailing the results of crocodile monitoring on a semi-annual basis. Should the monitoring reveal measurable negative effects on the crocodile in this area, it will be considered additional information regarding effects on a listed species and NRC (or FPL on their behalf) will contact the Service to reinitiate consultation.

The NRC has determined the license amendment to increase the UHS temperature limit in the CCS from 100 °F to 104 °F "may affect, but is not likely to adversely affect" the American

crocodile and not affect critical habitat designated for the crocodile. The Service notes FPL's short and long term efforts to treat cyanobacteria, reduce salinity and water temperature, and improve water quality in the CCS will improve and maintain habitat for the crocodile. Based on the information provided, we concur with the NRC's determination and find the proposed action will not result in an adverse modification to critical habitat designated for the crocodile.

This letter fulfills the requirements of section 7 of the Act and further action is not required. If modifications are made to the project, if additional information involving potential effects to listed species becomes available, or if a new species is listed, reinitiation of consultation may be necessary.

Thank you for your cooperation in the effort to protect federally listed species. If you have any questions regarding this project, please contact John Wrublik at 772-469-4282.

Sincerely yours,

for Craig Aubrey
Field Supervisor
South Florida Ecological Services Office

cc: electronic only

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LITERATURE CITED

Eisler, R. 1998. Copper hazards to fish, wildlife, and invertebrates: a synoptic review. U.S. Geological Survey, Biological Resources Division, Biological Science Report USGS/BRD/BSR--1997-0002. 98 pp.