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Mary Ann Poole
Director

(850) 410-5272
(850) 922-5679 FAX

Managing fish and wildlife resources for their long-term well-being and the benefit of people.

620 South Meridian Street
Tallahassee, Florida
32399-1600
Voice: (850) 488-4676

Hearing/speech impaired:
(800) 955-8771 (T)
(800) 955-8770 (V)

MyFWC.com

August 6, 2008

Mr. Mike Halpin, P.E.
Siting Administrator
Department of Environmental Protection
2600 Blair Stone Road, Mail Stop 48
Tallahassee, FL 32399-2400

Re: Turkey Point Units 3 & 4 Uprate Project, Dade County

Dear Mr. Halpin:

The Division of Habitat and Species Conservation, Habitat Conservation Scientific Services Section, of the Florida Fish and Wildlife Conservation Commission (FWC) has coordinated agency review of the referenced application for site certification in accordance with the Florida Electrical Power Plant Siting Act, Sections 403.52- 403.501, Florida Statutes.

The Turkey Point Plant lies approximately 8 miles east of Florida City, Florida and 4.5 miles east of the southeastern municipal limits of Homestead, Florida. It is approximately 9 miles east of the intersection of U.S. Highway 1 and Palm Drive (SW 344th Street). The Turkey Point Plant is adjacent to the 13,000-acre Everglades Mitigation Bank (EMB), also owned by Florida Power & Light (FPL). Turkey Point Units 3 and 4 are located on 30 acres within part of the larger FPL Turkey Point Plant located on 11,000 acres in unincorporated Miami-Dade County, Florida. The Turkey Point Units 3 and 4 Uprate Project would not change the existing footprint of the plant, and operations would remain within the existing regulatory limits for the plant. FPL has determined that these two units can be modified or "uprated" to increase their electrical output in a cost-effective and environmentally friendly manner. The Turkey Point Uprate Project would involve changes to several existing main components within the facilities in order to expand their capacity to produce steam for the generation of electricity.

While there would be no change in the actual footprint of the facility, this uprate project is expected to increase both temperature and salinity within the cooling canals. The maximum increase in temperature is expected to be $0.9^{\circ} - 2.5^{\circ}$F and salinity is expected to increase by 2-4 parts per thousand (ppt).

Potentially Affected Resources

There is a large population of American crocodiles (*Crocodylus acutus*) that live and breed in this cooling canal system. The potential affects of increases in temperature and salinity on adult and juvenile crocodiles are explained below, and are adapted from comments by J. Perran Ross in the attached letter "effects on crocodiles of proposed changes in cooling water canals at Florida Power and Light – Turkey Point plant".

Increase in Temperature. The current upper levels of temperature in the cooling canals exceed the preferred range (82-88° F) for crocodiles and approaches lethal temperatures (95° F). Adults respond to this variation by distributing themselves to locations of

preferred temperature to thermo-regulate. Because temperature varies by season within the canal (Golder Fig. 19) and along the length of the canal (Golder Fig. 20), any additional increases in temperature are likely to reduce the length of the canal system that is suitable for crocodiles during the warmest times of the year. This could reduce the extent of available habitat for adult crocodiles and force them to crowd suitable habitat that may already be occupied by other crocodiles. Because the social hierarchy of crocodiles rewards dominance with access to the most suitable sites for thermoregulation, reducing suitable habitat would be expected to displace crocodiles lower on the social hierarchy.

Hatchling crocodiles are less able to behaviorally thermo-regulate, and they are less tolerant to temperature extremes. The greatest expected increases in temperature occur when crocodile nests are hatching, and the expected change may reach temperatures that are lethal to hatchlings. This increase could therefore leave some parts of the canal unsuitable for hatchling survival.

Increases in Salinity. The canal system is currently hypersaline (40-50 ppt) and the crocodiles at Turkey Point live and breed in the cooling canal waters. While the crocodiles may survive in hypersaline conditions, they need regular access to fresh water. They are likely finding fresh water somewhere outside of the system or are using the fresh water that accumulates on top of the berms within the canal system. Because of this, the slight increase in salinity is unlikely to change the crocodiles' ability to live and breed within the system.

On the other hand, hatchling crocodiles have a limited ability to excrete salt and require fresh water. Like the adults, the hatchlings are likely using the fresh water that accumulates on top of the berms within the canal system. Access to this fresh water is essential for hatchling crocodiles and is a strong indicator of nearby nesting. Because the changes to the plant are not expected to affect the freshwater pools, the change in salinity should have little effect.

Recommendations

In order to assess the effects of the changes in temperature and salinity within the system, and to determine if there is an overall negative affect on the crocodile population at Turkey Point, it is necessary to continue with current monitoring efforts within the system as well as increase efforts to include spatial distribution data and growth and survival data.

We recommend approval of certification for the Turkey Point Unit 3 and Unit 4 uprate with the understanding that the applicant will comply with the following Conditions of Certification:

1. The applicant shall continue with current monitoring efforts including identification surveys, breeding surveys, nest locations monitoring, and captures, and these efforts shall continue throughout the Unit 3 and Unit 4 uprating process. Data and statistical analyses shall be reported to the FWC annually in order to assess changes in the population.

2. In addition to current monitoring efforts, the applicant shall:

    a) Collect additional data to determine changes in spatial distribution within the canal system. Data shall be collected monthly from the entire system. Monthly events shall consist of 3 to 4 nights per event, and data collected shall include animal size, GPS location, salinity, and air and water temperatures. These data shall be included in the annual report submitted to the FWC.

    b) Collect additional data to determine changes to growth and survival. The entire system shall be monitored at least twice a year for five days and four nights per event. Data collected shall include biometric data for each individual hand captured or trapped. These data shall be included in the annual report submitted to the FWC.

As discussed in meeting with FPL and U.S. Fish and Wildlife Service (USFWS), specific protocols for monitoring crocodiles within the Turkey Point system can be obtained from Mazzotti and Cherkiss (in press). While these protocols are still in press at the time of this letter, they have been made available to FPL, who is in discussions with Mazzotti and USFWS concerning site-specific adaptations to these protocols. These protocols shall be followed during monitoring at the Turkey Point Plant.

3. Per conversations with FPL and the U.S. Fish and Wildlife Service, it would be feasible to conduct these surveys both pre- and post-uprate to determine the effects of temperature and salinity changes. Surveys shall be initially conducted for a one-year period, after which protocols shall be reviewed for appropriateness. Any changes shall be submitted to the FWC.

If it is determined that there is a negative effect on crocodiles within the cooling canal system, the applicant shall monitor the crocodile population outside of the system, particularly in the FPL mitigation areas, to determine if there is no net negative effect. If growth and survival is affected within the system, then using telemetry data on crocodiles moving into and out of the system may show whether or not there is an overall change in the crocodile population at Turkey Point. A summary of monitoring efforts and results shall be submitted to the FWC.

Conclusions

While the predicted environmental changes within the Turkey Point cooling canal system appear to be relatively small, they have the potential to be significant to the crocodile population by affecting the habitat suitability of the canal system. By including the recommended supplemental data collection with the ongoing monitoring efforts, FPL may be able to demonstrate that the overall effect on the crocodile population at Turkey Point is negligible; however, without the proposed monitoring efforts, it is likely that the currently collected data would indicate a negative effect *within* the confines of the cooling canal system. Given that the conditions requested above are included in the certification, FWC recommends approval of this certification application.

We look forward to working with FPL to identify protection measures, mitigation and habitat management options for the proposed Turkey Point Units 3 and 4 Uprating Project. If you or your staff would like to coordinate further on the recommendations contained in this report, please contact me at (850) 410-5272 or email me at maryann.poole@MyFWC.com, and I will be glad to help make the necessary arrangements. If you or your staff has any specific questions regarding our comments, I encourage them to contact Jennifer Goff at 561-625-5122 or by email at Jennifer.Goff@MyFWC.com.

Sincerely,

Mary Ann Poole

Mary Ann Poole, Director
Office of Policy and Stakeholder Coordination

map/jdg
Turkey Point_1241_uprate letter
ENV 2-11-2/3
Enclosure

Reference

Mazzotti, F.J. and M.S. Cherkiss. In press. Status and Conservation of the American Crocodile in Florida: Recovering an Endangered Species While Restoring an Endangered Ecosystem. MS 481. *Ecological Indicators.*

UNIVERSITY OF FLORIDA

IFAS

Department of Wildlife Ecology and Conservation

307A Newins Ziegler Hall
P.O. Box 110430
FL 32611
(352) 392 7137
Fax: (352) 392 6984

Rossp@wec.ufl.edu

Cindy Schultz
US Fish and Wildlife Service
Vero Beach Field Office

12 May 2008

Re: Effect on crocodiles of proposed changes in cooling water canals at Florida Light and Power-Turkey Point plant

Dear Cindy,
At your request I am pleased to offer the following comments regarding the proposed increase in capacity and water cooling operations at the Turkey Point electrical generation plant. I have reviewed the material you sent comprising chapters 3 and 5 of the FPL application, a consultant report by Golder Assocs. (13 Jan 2008) and e-mails from Fl. Fish and Wildlife Conservation Commission and S. Foster of FPL. I make these comments in my capacity as a knowledgeable private citizen and expert on crocodilian biology.

The question I address is whether the proposed increase in water temperature and salinity in the turkey point (TP) water cooling canal system will affect the population of American crocodiles (*Crocodylus acutus*) living and nesting there. We need to keep in the forefront of consideration that the primary reason for the excellent crocodile population and successful breeding is the presence of suitable nesting habitat (high sand/limestone berms and associated fresh water pools). Both water temperature and salinity may currently be suboptimum at some times of the year.

Temperature. The project proposes an maximum increase in temperature of 0.9^0 - 2.5 ^{0}F in the canal water, however this does not adequately address the seasonal and spatial distribution of the warm water as it is likely to affect crocodiles. Adult and non-hatchling crocodiles thermo regulate by moving between warmer and cooler environments. The upper levels of temperature in the canals currently exceed the known crocodilian preferred range of 28-31^{0}C (82- 88F) and approach lethal temperatures of 35^{0}C (95F). Adult crocodiles appear to respond to this by distributing themselves in preferred areas of the canal where the temperatures meet their preferences, and presumably by moving between water/air/shade/sun to regulate their temperature. There is a marked seasonal variation in reported temperatures in the canal (Golder Fig. 19) and along the length of the canal (Golder Fig. 20). The effect of increasing temperature overall can be predicted to reduce the part of the canal system in which a sufficient variation and level of temperature available to crocodiles meets their needs at the warmest times of the year.

This could in turn cause movement of crocodiles from areas previously tolerable. As the canal system has a finite lower end, this could conceivably reduce the habitat availability to adult crocodiles. Crocodiles are also reported to maintain well defined social hierarchies based on access to preferred temperature regimes (basking positions, warm and cool areas). Changes in the thermal distribution along the canal system may therefore displace crocodiles lower on the social hierarchy.

The effect of increased water temperature on hatchling crocodiles is likely to be more severe as their tolerance and capacity to behaviorally thermoregulate is less. The greatest expected increases fall in the season when crocodile nests are hatching. The range of expected change falls directly within the range between preferred and lethal temperatures that may render some parts of the canal system unsuitable for survival of hatchlings.

Salinity. The salinity throughout the canal system is currently hyper saline 40-50 ppt and is predicted to slightly increase. American crocodiles routinely live in saline water and at one location, Lago Enriquillo in Domincan Republic, live and breed in hyper saline waters of 40-50ppt. Other coastal localities reported where *C. acutus* occurs in Nicaragua and Cuba may become hyper saline. Obviously, crocodiles in Turkey Point live and breed in high salinity water and the relatively small increase is unlikely to change this situation. However, crocodiles have a finite capacity to physiologically osmoregulate in salt water by excreting salt through glands in their tongue, and as a result continue to need freshwater sources to persist in hyper saline environments. It seems likely that crocodiles in Turkey Point access fresh water somewhere in the system or outside it to periodically balance their water needs.

Additionally, hatchling and young crocodiles have a limited salt excretion capacity and require freshwater. This is reported to come from two sources in the south Florida/Everglades region 1) surface water films of fresh water occurring after heavy rain and 2) isolated freshwater pools. At Turkey Point, researchers believe that successful nesting and survival of hatchlings is closely associated with the presence of freshwater pools that form in depressions in the berms between the canals. The presence of these pools is a strong predictor of nearby crocodile nesting. Assuming that rainfall remains similar to historic levels (Golder fig. 9) and that the changed cooling operations will not change the occurrence of freshwater pools, then changes in salinity of the canal water should have small effect. However two additional interacting factors may change this result. If rainfall changes due to predicted climate change then the fresh pool occurrence may change. If the change in water temperature renders areas close to current fresh pools too hot for adult crocodiles, some nesting areas may become non-viable.

This does suggest a relatively easy mitigation. If areas of the canal with optimal thermal regime can be identified, then additional berm pools could be constructed.

Overall then I concur with comments from the FWC, the situation merits cautious concern, and perhaps some more study directed specifically at conditions in the locations crocodiles occur and breed (which is neither at the intake or outlet of the cooling system where the temperatures are measured). As crocodiles successfully adapt to and manage

the current conditions in Turkey Point, it seems likely they will adapt to and manage the relatively modest changes predicted, however this does not mean such changes will be without effect. Changes in crocodile location, changes in nesting and possibly reduced hatchling survival are possible, should be monitored and may possibly be mitigated as I suggest above.

The statements presented above can all be supported from the literature if necessary. I hope these comments are helpful.

Yours truly,

James Perran Ross

cc. K. Enge, Paul Moler, Allan Woodward