FPL.

L-2011-247
10 CFR 52.3

June 28, 2011

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Re: Florida Power & Light Company
Proposed Turkey Point Units 6 and 7
Docket Nos. 52-040 and 52-041
Revised Response to NRC Request for Additional Information Letter No. 014
(eRAI 5309) Standard Review Plan Section 02.03.02 - Local Meteorology

Reference:

1. NRC Letter to FPL dated January 11, 2011, Request for Additional Information Letter No. 014 Related To SRP Section 02.03.02 Local Meteorology for the Turkey Point Nuclear Plant Units 6 and 7 Combined License Application
2. FPL Letter L-2011-052 dated February 9, 2011, Response to NRC Request for Additional Information Letter No. 014 (eRAI 5309) Standard Review Plan Section 02.03.02 - Local Meteorology
3. NRC Letter to FPL dated March 7, 2011, Environmental Request for Additional Information Letter 1103071 Related to ESRP Section 5.7, Meteorological and Air Quality Impacts, for the Combined License Application Review for Turkey Point Units 6 and 7
4. FPL Letter L-2011-155 dated April 20, 2011, Response to NRC Environmental Request for Additional Information Letter 1103071 (eRAI 5498) Environmental Standard Review Plan Section 5.7 - Meteorology and Air Quality Impacts

Florida Power & Light Company (FPL) provides, as attachments to this letter, its revised responses to the Nuclear Regulatory Commission's (NRC) Requests for Additional Information (RAI) 02.03.02-1 and 02.03.02-2. Revision bars are provided to indicate the changes. Although there were no changes required for RAI number 02.03.02-1, it is included in the revised response for completeness.

In response to NRC Request for Additional Information (RAI) 02.03.02 Local Meteorology (Reference 1), Florida Power & Light Company (FPL) provided its response in letter L-2011-052, dated February 9, 2011 (Reference 2).

Additionally, in RAI Letter 1103071, RAI EIS 5.7-2 (Reference 3), NRC requested FPL provide an explanation as to why one cooling tower particle size distribution is different from that of the other five towers. In FPL's response Letter L-2011-155 dated April 20, 2011 (Reference 4), FPL indicated that the particle diameter size distribution listed for

D097
NRO

cooling tower "TP7W01" was incorrect and that the particle diameter size distribution is identical for all six cooling towers.

Additionally, FPL reviewed the COLA to determine if other information in the COLA needed to be revised as a result of the incorrect particle diameter size distribution.

The review determined that the response to NRC Request for Additional Information Letter No. 014 (eRAI 5309) Standard Review Plan Section 02.03.02 RAI number 02.03.02-2 would require a revision as a result of the following: (1) an error in the conversion from kg/ha/month to mg/cm^2/month and (2) new values for salt deposition and the occurrences of visible plumes as a result of the particle diameter size distribution being identical for all six cooling towers.

The attachments identify changes that will be made in a future revision of the Turkey Point Units 6 and 7 Combined License Application (if applicable).

If you have any questions, or need additional information, please contact me at 561-691-7490.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 28, 2011

Sincerely,

William Maher
Senior Licensing Director – New Nuclear Projects

WDM/RFB

Attachments: Attachment 1 - FPL Response to NRC RAI No. 02.03.02-1 (eRAI 5309)
Attachment 2 - FPL Response to NRC RAI No. 02.03.02-2 (eRAI 5309)

cc:
PTN 6 & 7 Project Manager, AP1000 Projects Branch 1, USNRC DNRL/NRO
Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant 3 & 4

NRC RAI Letter No. PTN-RAI-LTR-014

SRP Section: 02.03.02 – LOCAL METEOROLOGY

Questions from Siting and Accident Consequence Branch (RSAC)

NRC RAI Number: 02.03.02-1 (eRAI 5309)

Please clarify whether there is a typographical error in the third paragraph of PTN COL FSAR Section 2.3.2.1.6. The first sentence of the paragraph states that Table 2.3.2-201 contains information on 17 climatological observing stations; please clarify whether this paragraph should instead cite PTN COL FSAR Table 2.3.1-201.

FPL RESPONSE:

The typographical error in the first sentence of the third paragraph in FSAR Section 2.3.2.1.6 will be corrected to state that Table 2.3.1-201 (instead of Table 2.3.2-201) contains information on 17 climatological observing stations.

This response is PLANT SPECIFIC.

References:

None

ASSOCIATED COLA REVISIONS:

The first sentence of the third paragraph in FSAR Section 2.3.2.1.6 will be revised as follows:

> Subsection 2.3.1.3.4 addresses historical precipitation extremes (i.e., rainfall and snowfall), as presented in Table 2.3.2-208 for the 17 nearby climatological observing stations listed in Table ~~2.3.2~~ **2.3.1**-201.

ASSOCIATED ENCLOSURES:

None

NRC RAI Letter No. PTN-RAI-LTR-014

SRP Section: 02.03.02 – LOCAL METEOROLOGY

Questions from Siting and Accident Consequence Branch (RSAC)

NRC RAI Number: 02.03.02-2 (eRAI 5309)

SRP 2.3.2 Review Procedures 3c and 3d state, in part, that the impact of plant heat and moisture sources on plant design and operation should be determined. In FSAR Section 2.3.2.2, "Potential Influence of the Plant and Its Facilities on Local Meteorology", please discuss:

1. The effects, if any, of salt and moisture deposition from the cooling towers on electrical transmission lines and other onsite electrical equipment, including transformers and the switchyard.

2. The potential, if any, for the cooling towers to increase the temperature and humidity at the HVAC intakes.

FPL RESPONSE:

Question 1. **Please discuss the effects, if any, of salt and moisture deposition from the cooling towers on electrical transmission lines and other onsite electrical equipment, including transformers and the switchyard.**

Salt Deposition

The potential impacts on Units 6 & 7 electrical transmission lines and other onsite electrical equipment due to salt deposition from the normal operation of the plant cooling towers were assessed using the EPA-approved AERMOD air dispersion model. The two cell service water cooling towers (one each per unit) use fresh water and have annual particulate matter emissions of approximately 0.5 tons per year (2.8 pounds per day)—versus a 1961 pounds per day particulate emission rate for the evaluated circulating water system (CWS) cooling tower with a saltwater source; thus, fogging and drift is considered to be negligible for these two service water cooling towers and they were not further evaluated. Therefore, only the six mechanical draft CWS cooling towers (3 per unit) were included for the effect of salt deposition. The following inputs were made in the AERMOD model for the mechanical draft cooling towers:

1) Drift loss rate is 0.0005 %

2) Total dissolved solids concentration of the cooling water is 5.0×10^{-2} gram salt/cm^3 solution (to provide a bounding analysis, a salt water source was assumed)

3) Tower exhaust air is heated to 10 °F above the ambient air temperature

Salt deposition from the CWS cooling towers has the potential to build up on bushings of electrical equipment such as the Units 6 & 7 transformers, switchyard equipment, and transmission lines. A maximum salt deposition rate of 0.25 $mg/cm^2/month$ was predicted to occur at the Unit 7 transformers, and a rate of approximately 0.20 $mg/cm^2/month$ was predicted to occur at the transmission lines and switchyard, during the summer season. At this maximum monthly predicted salt deposition rate, the environment in the Unit 7 transformer area, due to the contribution of salt deposition from the cooling towers, could be classified as a "Heavy Contamination Level" environment. Whereas the environment at the transmission lines and switchyard areas, due to the contribution of maximum monthly summer salt deposition from the cooling towers, could be classified as a "Medium Contamination Level" environment. Typical equivalent salt deposition density levels, defined by the applicable IEEE Standard, "Guide for Application of Power Apparatus Bushings", are 0.08 – 0.25 mg/cm^2 and 0.25 – 0.6 mg/cm^2 for medium and heavy contamination levels, respectively (Ref.1). However, it is not anticipated that the salt deposition from the CWS cooling towers will accumulate to the point where it would have an adverse effect on electrical equipment based on the following:

- The salt deposition model assumed the radial collector wells were operated on a full-time basis. However, the radial collector well system is a back-up system; the primary CWS cooling makeup water system is reclaimed water, with a lower salinity (total dissolved solids concentration). For example, the maximum measured total dissolved solids value reviewed for Biscayne Bay was 34,000 ppm—accounting for approximately 1.5 cycles of concentration, 50,000 ppm was assumed in the model—versus a total dissolved concentration for the reclaimed water source of 960 ppm –accounting for 4 cycles of concentration, the total dissolved solids concentration for the CWS towers for the reclaimed water source may reach approximately 3840 ppm.
- The salt deposition model assumed the salt was transported as liquid droplets and did not account for evaporation of these droplets—essentially traveling the plume further out from the CWS cooling towers. The model also did not account for wet deposition.
- As depicted in FSAR Figure 2.3.2-204, the transformer, switchyard, and transmission lines are located north/northwest of the CWS cooling towers and the summer season prevailing wind direction is from the east.

It is anticipated that existing equipment condition monitoring programs would be able to recognize any degradation resulting from the cooling towers before it adversely affects the equipment.

Moisture

The potential impacts on Units 6 & 7 transmission lines and electrical equipment due to moisture deposition from normal operation of the CWS cooling towers were assessed using the following methodologies:

- Temperature of exhaust plume and relative distance from CWS cooling towers under low wind conditions
- Local meteorological conditions, including atmospheric stability and wind direction/speed
- EPA approved CALPUFF air dispersion model

The temperature of the exhausted plume from the CWS cooling tower is designed to be 10 °F higher than the ambient temperature. The shortest distance between the cooling towers and the transformer area is approximately 1400 feet. The switchyard and transmission lines are located to the north of the transformer area, which is a greater distance from the CWS cooling towers. Therefore, considering the 10 °F temperature difference under low wind conditions, the thermal vapor plume from the cooling towers will be buoyant and without direct contact with the transformers, switchyard equipment, or transmission lines.

For circular mechanical towers, fogging and icing usually occur under high wind conditions (wind speed > 12 m/s) (Ref. 2). Under these high wind conditions, the vapor plume may be directed towards the ground, creating ground-level fogging and icing conditions. However, under such conditions, the vapor plume would undergo rapid dispersion and result in lower moisture concentration at the ground level, and, because of the warm climate in southern Florida, ground-level icing is expected to occur infrequently. According to the Turkey Point joint frequency distributions (JFDs) of wind direction, wind speed and atmospheric stability (FSAR Section 2.3.2; Table 2.3.2-205), only 22 hours, over the three years of meteorological data (about 7 hours per year), contain wind speeds greater than 10 m/s prevailing from the south-southeast (SSE), south (S), and south-southwest (SSW) sectors. Only winds coming from these sectors would have the potential to create fogging at the electrical equipment or transmission lines, based on the location of the CWS cooling towers in relation to this equipment.

The CALPUFF analysis indicated that the winter season has the highest frequency of elevated cooling tower plumes. This is expected because the lower ambient temperature enhances the plume rise. The CALPUFF results also indicated that during the occurrences of elevated visible plumes approximately 56% are shorter than 984 feet regardless of the plume height. Thus for a large fraction of time, the plume distance is less than the distance from the CWS cooling towers to the closest electrical equipment (i.e. transformers) which is located approximately 1400 feet away.

Based on the plume temperature differential and shortest distance to electrical equipment, local meteorological conditions, and CALPUFF results, the moisture impact to electrical transmission lines and other onsite electrical equipment would be minimal.

Question 2. **The potential, if any, for the cooling towers to increase the temperature and humidity at the HVAC intakes.**

The evaluation of the CWS cooling towers potential impact at the HVAC intakes was based on the following conditions:

- Exhaust plume temperatures of the CWS cooling towers is no greater than 104.7 °F
- Cooling tower height is approximately 67.9 feet above grade
- The control room HVAC air intake height is approximately 65.6 feet above grade (Ref. 3)

The Turkey Point Units 6 & 7 site 100-year return value for ambient dry-bulb temperature is 103 °F. The maximum air safety temperature is 115 °F (AP1000 DCD Chapter 2, Revision 18, Table 2-1). If this maximum air temperature is considered the limiting outside air design condition dry-bulb temperature for the control room HVAC intakes, the CWS cooling tower plumes would need to increase the local ambient temperature associated with the surrounding air at the control room HVAC intakes by approximately 12 °F to exceed the design value, considering the 100-year return value. Since the cooling tower plume is only about 2 °F higher than the 100-year return dry-bulb temperature, the plume temperature is not high enough to exceed the HVAC design temperature, and would not adversely impact the control room HVAC.

The Turkey Point Units 6 & 7 control room HVAC intakes are at a lower elevation than the exhaust plumes of the CWS cooling towers. As previously discussed, the cooling tower plume temperature is higher than the 100-year return ambient dry-bulb temperature, so buoyancy causes the plume to rise even higher under low wind conditions. If high wind conditions are considered regarding the plume, which could direct the plume downwards towards the HVAC intakes, rapid dispersion and mixing would occur, both which would cool the plume. These factors together are expected to prevent increased local ambient air temperature and humidity effects at the control room HVAC intakes.

This response is PLANT SPECIFIC.

References:

1. IEEE Guide for Application of Power Apparatus Bushings, Reaffirmed 9 December 2003, IEEE Standards Board, Reaffirmed April 26, 2004, American National Standards Institute, IEEE Std C57.19.100-1995 (R2003).
2. User's Manual; Cooling-Tower-Plume Prediction Code, EPRI CS-3403-CCM, Prepared by Argonne National Laboratory, April 1984.
3. AP1000 Design Control Document, Tier 2 Material, Rev. 18.

ASSOCIATED COLA REVISIONS:

Add the following text at the end of first paragraph in Section 2.3.2.2.2:

The vapor plume from the circular mechanical draft circulating water system (CWS) cooling towers (3 per unit) could be directed towards the ground under high wind conditions, creating ground-level fogging and icing. However, under high wind conditions the vapor plume would undergo rapid dispersion and result in lower moisture concentration at the ground level. Because of the warm climate in southern Florida, icing at the ground level is expected to be infrequent. For circular mechanical draft cooling towers, fogging and icing usually occur under high wind conditions (wind speed > 12 m/s) (Reference 210). Because the CWS cooling towers are located to the south of the plant site, only winds coming from the south-southeast (SSE), south (S), and south-southwest (SSW) sectors would have the potential to create fogging at the switchyard, transformer areas, or transmission lines. Based on the 10-meter level joint frequency distributions (JFDs) provided in Table 2.3.2-205, only 22 hours (about 7 hours per year) have the wind speed greater than 10 m/s coming from SSE, S and SSW sectors. The shortest distance between the transformer areas and the cooling tower is about 1400 feet. Considering this long physical separation and low frequency of the southern winds, the potential fogging impact to the transformer areas, electrical equipment in the switchyard, and transmission lines is minimal.

Add the following text between the 2nd and 3rd paragraphs in Section 2.3.2.2.3:

The temperature of the exhaust plume from the CWS cooling towers is designed to be 10°F higher than the ambient temperature. With this temperature difference, under low wind conditions, the thermal vapor plume from the cooling tower will be elevated and without direct contact with the transformers, the switchyard equipment, transmission lines, and HVAC air intakes. As discussed in Section 2.3.2.2.2, under high wind conditions, the vapor plume would undergo rapid dispersion and result in decreasing moisture in the plume. These factors, together with the low frequency of the southern sector winds, would cause the moisture impact to the transformers, switchyard equipment, and transmission lines from operation of the CWS cooling towers to be minimal. Since the cooling tower plume is only about 2 °F higher than the 100-year return dry-bulb temperature, the plume is not hot enough to exceed the HVAC design temperature, as shown in DCD Table 2-1, and would not adversely impact the control room HVAC intakes.

Add the following text between the 6th and 7th paragraphs in Section 2.3.2.2.3:

Salt deposition from the CWS cooling towers has the potential to build up on bushings of electrical equipment such as the Units 6 & 7 transformers, switchyard equipment, and transmission lines. A maximum salt deposition rate of 0.25 mg/cm^2/month was predicted to occur at the Unit 7 transformers,

and a rate of approximately 0.20 mg/cm^2/month was predicted to occur at the transmission lines and switchyard, during the summer season. At this maximum monthly predicted salt deposition rate, the environment in the Unit 7 transformer area, due to the contribution of salt deposition from the cooling towers, could be classified as a "Heavy Contamination Level" environment. Whereas the environment at the transmission lines and switchyard areas, due to the contribution of maximum monthly summer salt deposition from the cooling towers, could be classified as a "Medium Contamination Level" environment. Typical equivalent salt deposition density levels, defined by the applicable IEEE Standard, "Guide for Application of Power Apparatus Bushings", are 0.08 – 0.25 mg/cm^2 and 0.25 – 0.6 mg/cm^2 for medium and heavy contamination levels, respectively (Reference 211). However, it is not anticipated that the salt deposition from the CWS cooling towers will accumulate to the point where it would have an adverse effect on electrical equipment based on the following:

- **The salt deposition model assumed the radial collector wells were operated on a full-time basis. However, the radial collector well system is a back-up system; the primary CWS cooling makeup water system is reclaimed water, with a lower salinity (total dissolved solids concentration). For example, the maximum measured total dissolved solids value reviewed for Biscayne Bay was 34,000 ppm—accounting for approximately 1.5 cycles of concentration, 50,000 ppm was assumed in the model—versus a total dissolved concentration for the reclaimed water source of 960 ppm –accounting for 4 cycles of concentration, the total dissolved solids concentration for the CWS towers for the reclaimed water source may reach approximately 3840 ppm.**
- **The salt deposition model assumed the salt was transported as liquid droplets and did not account for evaporation of these droplets—essentially traveling the plume further out from the CWS cooling towers. The model also did not account for wet deposition.**
- **As depicted in FSAR Figure 2.3.2-204, the transformer, switchyard, and transmission lines are located north/northwest of the CWS cooling towers and the summer season prevailing wind direction is from the east.**

It is anticipated that existing equipment condition monitoring programs would be able to recognize any degradation resulting from the cooling towers before it adversely affects the equipment.

Add the following references to Section 2.3.2.4:

210. User's Manual; Cooling-Tower-Plume Prediction Code, EPRI CS-3403-CCM, Prepared by Argonne National Laboratory, April 1984.

211. IEEE Guide for Application of Power Apparatus Bushings, Reaffirmed 9 December 2003, IEEE Standards Board, Reaffirmed April 26, 2004, American National Standards Institute, IEEE Std C57.19.100-1995 (R2003).

ASSOCIATED ENCLOSURES:

None