FPL

L-2011-236
10 CFR 52.3

June 27, 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
Response to NRC Request for Additional Information Letter No. 021 (eRAI 5643)
Standard Review Plan Sections 02.04.12 and 02.04.13 – Groundwater

Reference:

1. NRC Letter to FPL dated May 13, 2011, Request for Additional Information Letter No.021 Related to SRP Sections 02.04.12 and 02.04.13 – Groundwater for the Turkey Point Nuclear Plant Units 6 and 7 Combined License Application

Florida Power & Light Company (FPL) provides, as attachments to this letter, its response to the Nuclear Regulatory Commission's (NRC) Requests for Additional Information (RAI) 02.04.12-5 and 02.04.12-6 provided in the referenced letter. 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 27, 2011

Sincerely,

William Maher
Senior Licensing Director – New Nuclear Projects

WDM/RFB

Attachment 1: FPL Response to NRC RAI No. 02.04.12-5 (eRAI 5643)

Attachment 2: FPL Response to NRC RAI No. 02.04.12-6 (eRAI 5643)

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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-021**

**SRP Section: 02.04.12 - Groundwater**

Question from Hydrologic Engineering Branch (RHEB)

**NRC RAI Number: 02.04.12-5 (eRAI 5643)**

The applicant estimated dewatering rates in the power block areas using a calibrated groundwater model. The hydraulic conductivity used in the model for the Freshwater Limestone is 0.0004 cm/s (FSAR Rev. 2 App. Table 2CC-205) which is substantially smaller than the geometric mean of 0.17 cm/s (FSAR Rev. 2 App. 2CC 2.7.1). Also, the thickness of this less-permeable formation appears to be significantly thicker under the excavation areas than elsewhere (FSAR Rev. 2 Figure 2CC-225). The applicant's construction dewatering rate of 9000 gpm per unit could be increased significantly depending on how the absent, fractured, or very thin nature of the Freshwater Limestone is considered. In order to meet the regulatory requirements of 10 CFR 100.20(c) and the guidance of RG 1.206, the staff requests the following information with markups for FSAR updates as applicable:

(1) Estimates of construction dewatering rates to demonstrate a more realistic set of values consistent with the site characteristics.

(2) Description of the bases for construction-stage subsurface hydrostatic loading analyses and the dewatering methods to be employed in achieving these loading limitations.

(3) Discussion of the bases for subsurface hydrostatic loadings important to the integrity of safety related structures during the construction stage as guided by RG 21.206, C.I.2.4.12.5 (1)).

**FPL RESPONSE:**

**<u>Part 1:</u>**

The numerical groundwater model developed for the Turkey Point Units 6 & 7 COL application has been revised and submitted (Reference 1). The revisions include changes to the conceptual model, numerical model, model calibration and validation, predictive runs and sensitivity analysis. These revisions are further discussed in Reference 1, Section 2.3.

The Freshwater Limestone is not considered to be laterally continuous across the Turkey Point plant property (Reference 1, Section 2.3). Figure 22 of Reference 1 shows the interpretation of the extent of the Freshwater Limestone in the numerical groundwater model domain. Table 4 in Reference 1 presents site and literature values for the Freshwater Limestone while Table 6 in Reference 1 presents horizontal and vertical hydraulic conductivity values used for the Freshwater Limestone in the model. The horizontal hydraulic conductivity used in the model is on the low end of the range of values in Table 4 and the vertical hydraulic conductivity used in the model is approximately an order of magnitude lower than the lowest value presented in Table 4. The values used in the updated model are based on model calibration results.

To support excavation control and construction groundwater dewatering, concrete cut-off walls (diaphragm walls) will be installed around the planned excavations for Units 6 & 7. The diaphragm walls are expected to extend to an elevation of approximately -60 feet NAVD 88, approximately 25 feet deeper than the base of the Units 6 & 7 excavations (elevation of -35 feet NAVD 88) as documented in Reference 1, Section 3.3.8. The hydraulic conductivity assumed for the diaphragm walls is 1.0E-08 cm/s as discussed in Reference 1, Section 3.3.8.

In addition, grout will be injected into the rock beneath the base of the excavation to approximately the base of the diaphragm walls to form a grout plug underneath each nuclear island as described in Reference 1, Section 5.1. The purpose of the grout plug is to reduce the hydraulic conductivity of the rock, thereby lowering the required construction dewatering rates. A hydraulic conductivity of 1.0E-04 cm/s is assumed for the grout plug. The inclusion of the approximately 25-foot-thick grout plug (see Reference 1, Figure 50) essentially removes the sensitivity of the dewatering rates to the hydraulic properties of the Freshwater Limestone.

Predictive modeling runs were performed to estimate groundwater discharge rates required to maintain the water table below the base of the excavation during Units 6 & 7 construction. The two excavations were dewatered sequentially to represent the construction schedule. For each unit, the model was run to steady-state, starting with steady-state heads previously derived under no pumping conditions. ZoneBudget was used along with the simulation to determine the quantity of water being extracted from the excavation. Constant head cells were added to the layer below the excavation to represent sump pumps, which would be used to maintain dry working conditions in the base of the excavation. The constant head level was set to -35 feet NAVD 88 (the floor of the excavation) and pumping rates were calculated from the simulated inflows to the constant head cells.

Seepage into the excavation is expected to be about 200 gpm or less with both engineered barriers (diaphragm walls and grout plug) in place. During the initial phases of construction for each unit, while isolated seepage points are identified and plugged and material is excavated, dewatering rates may be higher (i.e., up to 1,000 gpm). The dewatering system design, rates of water removal and durations for removal of water during excavation and under steady state excavated conditions will be finalized as part of detailed design prior to Units 6 & 7 excavation activities.

**Part 2:**

As described in FSAR Subsection 2.5.4.5.4 and 2.5.4.6.2, the excavation for each new unit will be surrounded by a reinforced concrete diaphragm wall that will act as a cut-off for horizontal groundwater flow into the excavation. The reinforced diaphragm walls are designed to resist lateral earth and hydrostatic pressures while limiting groundwater inflow. The wall design may include tiebacks and/or other reinforcing methods to provide resistance to the lateral earth and hydraulic pressures. The completed reinforced diaphragm walls will effectively impede any overturning or sliding from the lean concrete fill, which is provided as a sub-basement for Category I seismic structures.

The deepest, temporary groundwater elevation as the result of construction dewatering is expected to be at or below the base of the excavation, which is approximately -35 feet NAVD 88. The diaphragm walls will be placed at an elevation from approximately -60 feet NAVD 88 to approximately 2 feet NAVD 88. At steady state dewatering conditions, a head difference of approximately 35 feet will be present from outside of the diaphragm walls to the inside, excavation dewatering level. This head difference creates a maximum pressure of approximately 2,300 psf. The diaphragm wall will be designed to withstand the hydrostatic load required for dewatering and excavation. With the diaphragm walls and grout plug installed as described in Reference 1, Section 5.1, excavation seepage can be controlled using sumps and discharge pumps.

The description of these features within the COL application and Reference 1 are conceptual.

**Part 3:**

The diaphragm walls and the grout plug are not safety-related features but are permanent features that will assist with the excavation, construction, and backfilling of Units 6 & 7. Once the Units 6 & 7 nuclear island footprints have been excavated and groundwater dewatering is in place, construction of both non-safety and safety-related structures will begin. The diaphragm walls and grout plugs will remain in place after completion of site construction activities.

The dewatering methods, grout plug, and diaphragm walls will be designed for expected site groundwater conditions. Based on a pre-construction groundwater elevation of near sea level and a temporary construction dewatering elevation of approximately -35 feet NAVD 88, a maximum hydrostatic pressure of approximately 2,300 psf would be placed on the diaphragm walls surrounding the Units 6 & 7 excavations.

This response is PLANT SPECIFIC.

**References:**

1. FPL Letter to NRC, L-2011-082 dated February 28, 2011, Submittal of Groundwater Model Development and Analysis: Units 6 & 7 Dewatering and Radial Collector Well Simulations, Revision 1.

**ASSOCIATED COLA REVISIONS:**

FSAR Subsections 2.4.12 and Appendix 2CC, 2.5.4.5.4, and 2.5.4.6.2 will be updated in a future COLA revision to incorporate the modeling performed in Reference 1.

**ASSOCIATED ENCLOSURES:**

None

**NRC RAI Letter No. PTN-RAI-LTR-021**

**SRP Section: 02.04.12 - Groundwater**

Question from Hydrologic Engineering Branch (RHEB)

**NRC RAI Number: 02.04.12-6 (eRAI 5643)**

In order to meet the regulatory requirements of 10 CFR 100.20(c) and 10 CFR 20 App. B, provide information related to the analysis of the following accidental release of liquid radioactive effluents into surface and groundwaters. Assuming that one of the plausible conservative effluent release scenarios is that the wall of the Auxiliary Building is breached and the effluent is released through the gaps in the wall to the groundwater and then to the cooling canal or to the Biscayne Bay directly, explain whether this scenario could result in concentrations that exceed the effluent concentration limits (ECLs) provided in 10 CFR Part 20 (especially for Ba-137 and Cs-134).

In relation to the Biscayne Bay pathway, Turkey Point FSAR Rev. 1 states that "cooling canals are a groundwater sink and there is no net outflow to the Biscayne Bay." However, FSAR Rev. 1 Figures 2.4.12-222 through 226 show many higher groundwater levels at the Lower Biscayne Aquifer than the sea level, suggesting a positive hydraulic gradient towards Biscayne Bay occasionally. Therefore, revise the analysis provided in FSAR Section 2.4.13 to incorporate the pathway through the breached wall to the canal system or Biscayne Bay directly or provide adequate justification for not considering this pathway as plausible.

**FPL RESPONSE:**

As described in FSAR Subsection 2.4.13.1.2, the accidental release of radioactive liquid effluent analyses neglect the presence of the auxiliary buildings' floor drain system, sealed 3-foot-thick exterior walls and the 6-foot-thick basemat. The analyses assume radioactive liquid effluent is released outside the auxiliary building and travels vertically downward through the concrete fill that underlies the auxiliary building. Given these analyses do not take credit for the presence of the auxiliary building, a scenario assuming a breach of the auxiliary building wall with an effluent release through the gaps in the wall, is bounded by the analyses presented in Revision 2 of the FSAR.

Two basic pathway analyses are presented in FSAR Subsection 2.4.13. The primary pathway assumes a release discharges to the cooling canal system. The alternative pathway analysis assumes a release bypasses the cooling canal system and discharges to Biscayne Bay directly as suggested in the last sentence of RAI 02.04.12-6. As described in FSAR Subsection 2.4.13, the predicted radionuclide concentrations for both the primary and alternative pathways are below the effluent concentration limits provided in 10 CFR Part 20, including Cs-137 and Cs-134, therefore a revision to the accidental release analysis is not required. Note that 10 CFR Part 20 does not provide an ECL for Ba-137.

As discussed in the response to RAI 02.04.12-5, the numerical groundwater model developed for the Turkey Point Units 6 & 7 COL application has been revised and submitted (Reference 1). The following assumptions regarding recharge within the plant area and the approach to construction dewatering have been revised.

- For the plant area, a spatially-distributed recharge is assumed, ranging from 0 to 10 inches per year as described in References 1 and 2. The previous groundwater model assumed zero recharge within the plant area.
- Grout will be injected into the rock between the base of the excavation and the base of the diaphragm walls to form a grout plug underneath each nuclear island to facilitate dewatering as described in References 1 and 2.

As a result of these revisions to the groundwater model, a reanalysis of the accidental release scenario is required. This reanalysis will also address a breached auxiliary building wall scenario. The results of the reanalysis will be provided in a future COLA revision.

This response is PLANT SPECIFIC.

**References:**

1. FPL Letter to NRC L-2011-082 dated February 28, 2011, Submittal of Groundwater Model Development and Analysis: Units 6 & 7 Dewatering and Radial Collector Well Simulations, Revision 1.
2. FPL Letter to NRC, L-2011-165 dated May 5, 2011, Proposed Turkey Point Units 6 and 7, Response to NRC Request for Additional Information Letter No. 011 (eRAI 5190) Standard Review Plan Section 02.04.12 – Groundwater.

**ASSOCIATED COLA REVISIONS:**

FSAR Subsection 2.4.13 will be updated in a future COLA revision to reflect the revised accidental release of radioactive liquid effluent analysis.

**ASSOCIATED ENCLOSURES:**

None