

May 4, 2012

Mr. Mano K. Nazar, Senior Vice President
and Chief Nuclear Officer
Florida Power and Light Company
Mail Stop NNP/JB
700 Universe Blvd
Juno Beach, FL 33408-0420

SUBJECT: TURKEY POINT UNITS 6 AND 7 COMBINED LICENSE APPLICATION REVIEW
SCHEDULE

Dear Mr. Nazar:

The U.S. Nuclear Regulatory Commission (NRC) staff has identified two significant issues that are affecting the staff's ability to complete its safety and environmental reviews of Florida Power and Light Company's (FPL) application for combined licenses (COL) for new Units 6 and 7 at the Turkey Point site. The affected areas are (1) geology, seismology, and geotechnical engineering and (2) the alternative sites. The first area impacts the safety review and the second impacts the environmental review. Each issue is discussed in more detail below.

Geology, Seismology and Geotechnical Engineering

The NRC staff issued requests for additional information (RAIs) in the areas of geology, seismology, and geotechnical engineering in September and October 2011 as part of its review of Sections 2.5.1 - 2.5.5 of your combined license application (COLA) for Turkey Point Units 6 and 7. Many of the RAI responses are either unclear, incomplete, or based on conclusions that are not supported by the references provided. Further, in some cases, FPL's responses reflect a re-interpretation of the data and results of peer reviewed publications, which has resulted in dismissal of certain geologically recent deformations. Dismissal of such information could result in minimizing the potential seismic hazard in the region without providing sufficient justification. Based on the technical information provided to date, significant technical issues remain.

Before the NRC staff will restart its review in the geology, seismology, and geotechnical areas, FPL needs to revise the RAI responses and make substantial modifications to Final Safety Analysis Report (FSAR) Sections 2.5.1-2.5.5. Specific examples (but not an all inclusive list) of deficiencies are provided in Enclosure 1. The staff also requests that FPL: 1) conduct an internal audit of its quality assurance processes and management oversight processes that were in place when FPL performed the work submitted as part of its COLA application in these areas; 2) conduct an "extent of condition" quality assurance audit of FPL's contractor that performed this work and any other work that FPL's contractor has performed on the Turkey Point Units 6 and 7 COLA, and 3) inform NRC of its findings and any corrective actions taken in the development of its revised application materials for FSAR Sections 2.5.1-2.5.5 to mitigate the deficiencies.

The NRC will issue a new schedule to FPL following the staff's evaluation of revised FSAR Sections 2.5.1-2.5.5 of the Turkey Point Units 6 and 7 COLA. The staff requests a public meeting with FPL following receipt of FPL's revised responses to discuss FPL's corrective actions and its resolution of the identified technical issues.

Alternative Sites

As part of its review of Section 9.3 of the environmental report (ER) the NRC staff issued in April 2011, RAIs related to FPL's site selection process and alternative sites. Based on the body of technical information reviewed to date, and the response to the RAIs received, the NRC staff has determined that at least three significant issues remain regarding identification of the inland alternative sites (Martin, Glades, and Okeechobee 2) and the process used to select them. FPL will likely have to perform substantial work to resolve the identified issues before the staff can make further progress in its review.

First, FPL has failed to provide an adequate basis regarding the availability of water for the three inland alternative sites (Martin, Glades, and Okeechobee 2). The NRC staff contacted the South Florida Water Management District (SFWMD) in regard to this issue, and in a letter dated February 23, 2012, SFWMD provided its views on the availability of water in the vicinity of those three sites. Based on that letter and on other available data, the NRC staff cannot conclude that the necessary water use permits could be obtained for the three inland sites from the sources identified by FPL in its responses to RAIs on the issue. Therefore, absent substantial additional information, the NRC staff cannot conclude that these alternative sites are viable.

In addition, FPL has not provided an adequate response regarding the potential to use treated waste water at locations other than the Turkey Point site. In selecting alternative sites, FPL used a criterion that a site had to be within 10 miles of a water treatment facility that could provide the necessary volume of water. It is not clear why this restrictive criterion was selected as there is a nuclear power plant licensed in the United States which is located about 35 miles from the source of treated waste water. In addition, building and operating nuclear units at some of the alternative sites recommended in the environmental report would involve land disturbing activities similar to those required for a water pipeline, e.g., road widening for the St. Lucie site (22 miles of State Road A1A) and the Martin site (39 miles of State Road 710).

Lastly, FPL has not provided adequate clarification regarding the use of land area as a screening criterion for sites. For example, the justification for why the Martin site was retained in the site selection process even though it has much less land available than needed, while other sites were eliminated based on insufficient land area has not been provided.

Before the NRC staff will restart its review in the site selection area, the staff requests that FPL (1) revise its site selection process to take into consideration the issues identified by the NRC staff, including the guidance in Regulatory Guide 4.7 regarding water use permits; (2) use the revised process to identify at least three viable alternative sites; and (3) revise the documentation of the site selection process in the ER to reflect the new sites and supporting information.

In summary, the NRC cannot continue to make progress in its reviews of the areas identified above until FPL makes substantial modifications to its COL application. The NRC will reassess FPL's overall review schedule following receipt of the necessary information.

In the interim, the NRC staff is continuing its review on the remaining portions of the Turkey Point Units 6 and 7 COLA. If you have questions concerning the safety review, please contact Mr. Manny Comar of my staff at 301-415-3863 or Manny.Comar@nrc.gov. If you have any questions concerning the environmental review, please contact Ms. Alicia Williamson at 301-415-1878 or Alicia.Williamson@nrc.gov.

Sincerely,

/RA/

David B. Matthews, Director
Division of New Reactor Licensing
Office of New Reactors

Docket Nos.: 52-040
52-041

Enclosure:
As stated

cc w/encl: See next page

Before the NRC staff will restart its review in the site selection area, the staff requests that FPL (1) revise its site selection process to take into consideration the issues identified by the NRC staff, including the guidance in Regulatory Guide 4.7 regarding water use permits; (2) use the revised process to identify at least three viable alternative sites; and (3) revise the documentation of the site selection process in the ER to reflect the new sites and supporting information.

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Sincerely,

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David B. Matthews, Director
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Docket Nos.: 52-040
 52-041

Enclosure:
 As stated

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Examples of Technical Deficiencies in Geology, Seismology and Geotechnical Engineering

Florida Power and Light (FPL) needs to update the requests for additional information (RAI) responses and the Final Safety Analysis Report (FSAR), as appropriate, to include resolution of the technical issues described below for each category, as well as any additional issues identified in your audit.

Geology and Seismology:

1. The FPL has not adequately characterized the Caribbean region Ground Motion Prediction Equation (GMPE).
 - By letter dated August 7, 2009 (FPL L-2209-185), FPL stated that it conducted a Senior Seismic Hazard Analysis Committee (SSHAC) Level 2 study, consistent with the U.S. Nuclear Regulatory Commission (NRC) guidance, to develop the GMPEs for the probabilistic seismic hazards assessment (PSHA) for Caribbean crustal sources. Recently, in response to the RAI dated November 16, 2011, which requested a detailed description of your SSHAC Level 2 analysis, FPL changed the response and stated that FPL only performed a SSHAC Level 1 analysis. A SSHAC Level 1 analysis is inconsistent with guidance in Regulatory Guide (RG) 1.208. FPL has not discussed how the proposed alternative provides an acceptable method of complying with the Commission regulations, or portions thereof, that underlie the corresponding SRP acceptance criteria, as required by 10 CFR 52.79(a)(41). Several possible alternatives to remedy this deficiency have been discussed with you as alternates to RG 1.208, including presenting a bounding sensitivity analysis, and upgrading your SSHAC Level 1 analysis to be similar to a SSHAC Level 2 analysis.
2. In the Turkey Point Units 6 and 7 FSAR, FPL has not adequately presented the current knowledge regarding potential seismic sources in Cuba nor has FPL completely incorporated what is known about the seismic sources in Cuba into the PSHA model. Despite the availability of several published papers on seismic source characterization in Cuba and expert advice FPL received during its SSHAC study for seismic source characterization, FPL opted to represent the seismic sources in Cuba using a single areal source model. In FPL's RAI response, FPL did not provide adequate justification that the seismic hazard calculated using the single areal source model is at least as conservative as what a multiple-source model would produce. In addition, in FPL's Cuba seismic model, FPL failed to take into account active tectonic features, such as the uplifted marine terraces as noted in RAI 6024, Question 2.5.1-22. Therefore, the staff is unable to reach the conclusion that an areal source is either appropriate or conservative.
3. FPL has not clearly and completely reported information regarding the Walkers Cay fault. In your response to an RAI question regarding the Walkers Cay fault, FPL advanced arguments that dismissed the evidence presented in published documents that the Walkers Cay fault extends to the seafloor and may still be active today.

Enclosure

FPL also made the conclusion, without providing justification, that the Walkers Cay fault was last active in the Miocene period. This was not a conclusion reached by the authors of the published papers, and in the absence of any other information, the staff cannot agree with FPL's conclusion.

4. FPL has not clearly or completely reported information regarding two seismic hazard studies published by Garcia et al. (2003 and 2008) for the island of Cuba. FPL extracted only certain limited statements from Garcia et al. (2008) to justify and support FPL's use of a single areal source model for Cuba rather than a seismotectonic type model.

FPL stated that the Garcia et al. (2008) study favors the use of an areal source in Cuba over the use of seismotectonic sources and fault-like sources, even though fault-like sources were used in the earlier study conducted by mostly the same authors (i.e., Garcia et al. 2003). FPL stated this so-called "favoritism" in several statements throughout the RAI responses and FSAR revisions. In fact, given the uncertainties in seismic zone characterization in Cuba, one of the stated purposes of the Garcia et al. (2008) paper was to quantitatively compare seismotectonic probabilism results with the seismicity alone approach and find where they are in agreement and where they are not: "we aim at pinpointing the areas where seismicity data alone do not support the available seismogenic zonation, and at marking the possible corrections for that zonation in future hazard assessments" and "consequently, a mixture of the two approaches would probably be the best solution: a seismotectonic approach for the more seismic areas and only seismicity elsewhere [see, e.g., Frankel et al. 2002]."

In addition, by auditing additional supporting documents provided by FPL, we learned that as part of the SSHAC expert opinion survey, FPL interviewed the primary author, J. Garcia, regarding the use of a two seismic source zone strawman model already developed by FPL for use in the Turkey Point Nuclear Power Plant PSHA analysis. Garcia recommended to FPL to use the Pinar del Rio fault as a possible source zone in western Cuba as well as two onshore source zones in SE Cuba. Garcia also stated that the two-zone model is insufficient and does not represent the real seismicity present in the region. The final model that FPL developed for Cuba is a single, areal source. Based on the information provided or made available by FPL, the staff cannot agree that FPL's approach was appropriate and supported by the views of the informed technical community.

5. FPL has not clearly or completely reported information regarding a basement fault in the southern tip of Florida as described in a published paper by Cunningham et al., (1998) and FPL has not included this feature on a map of tectonic structures within the 200 mile radius of the site (FSAR Figure 2.5.1-229). FPL concluded that the fault as depicted in Cunningham et al. is the result of paleo-topographic or karst process and not tectonic offset. In FPL's basis for this conclusion, FPL stated: "No discussion of the reasoning for the queried structure are [sic] presented in Cunningham et al. (1998)." However Cunningham et al. (1998) has three figures that illustrate the fault offsetting Miocene Arcadia Formation: one cross section and two maps (structure contour and isopach) and a brief description in the text on page 255 of his paper. FPL stated: "It appears that this fault is drawn on the basis of two wells in an area of very low well density (Figure 2)" and "Since only two borings define the geometry of this fault, the uncertainties in the geometry of this structure are large." The staff examined Cunningham et al. (1998), and notes that Figure 17 shows at least 11 'cuttings' sites, 1 'core' site, and 1 'core and logs' site located on the downthrown (southern) side, and 5 'cuttings' sites, 1 'core' site, and 1 'core and logs' site

located on the upthrown (northern) side. The staff also sees that the complete borehole data set shows a far-field offset across the inferred fault (north of fault -130m below sea level and south of fault -210 to 230m below sea level). FPL finally states that “based upon the great uncertainties associated with this fault, the existence of this postulated structure is not substantiated by the available, albeit sparse data.” After carefully reading of Cunningham et al., the staff cannot reach the same conclusion.

Geotechnical Engineering:

6. FPL has less in-situ and laboratory testing data for site soil and rock strata than is typical and FPL has not accurately and completely characterized the site stratigraphy. Sufficient details were not provided to validate how variability and uncertainties were taken into account and how these would ultimately influence the foundation’s stability analysis. With the deficiencies the staff has noted, we cannot agree with the results of FPL’s structural and geotechnical analyses.
 - (a) FPL has not provided sufficient justification on why just four Cone Penetration Test (CPT) measurements were considered adequate and representative of the entire site, especially since these measurements were used to derive most of the soil’s engineering properties.
 - (b) FPL has not clearly or completely addressed how the stochastic model based on a single Best Estimate (BE) velocity profile accounted for sensitivities on the site response for deep soils with limited shear wave velocity data.
 - (c) FPL has not properly justified why the Key Largo and Fort Thompson limestone formations dynamic properties (E and G) will remain constant at small and large strains. FPL has not explained how potential sensitivities of this approach might impact the site response.
 - (d) FPL has not provided sufficient justification to validate the uniformity of the site. For borings located directly beneath the reactors, the measured shear wave velocity, in many locations, exceeded your selected average design shear wave velocity value by more than 20 percent. AP1000 DCD Section 2.5.4.5.3 states that at any location within the layer, the shear wave velocity below the foundation to a depth of 120 feet below finished grade for a layer with a low strain shear wave velocity greater than or equal to 2500 feet per second should not vary from the average velocity within the layer by more than 20 percent. FPL has not explained how this potential DCD deviation will be addressed.
7. Most of FPL’s key safety analyses in the geotechnical area include justifications and assumptions that have not been supported, leading the staff to be unable to agree with the assumptions that FPL has made in these analyses:
 - (a) FPL has not clearly or completely reported how rock mass properties were characterized in the FSAR. In response to RAI 6184, Question 2.5.4-25, FPL stated that rock mass classification systems were not used to evaluate the rock mass characteristics for foundation stability analysis since these methods were developed for indicating the support necessary for tunnels excavated in civil engineering schemes. After carefully reviewing the United States Army Corp. of Engineers (USACE) Rock Foundations Manual and ASTM D5878-08, the staff believes that

site rock should be characterized using a rock mass classification system and the derived properties should be used in the foundation stability analysis.

- (b) In order to estimate the bearing capacity for Seismic Category 1 buildings, FPL used the methodology in Reference 272. However, insufficient details were provided regarding the assumptions used to estimate terms in the bearing capacity equation (FSAR equation 2.5.4-15). For example, FPL stated that the 2nd and 3rd parameter of such equation were neglected for conservatism but FPL did not explain why rock cohesion was accounted for in the bearing capacity calculation especially when the USACE Rock Foundations Manual recommends not including this term for this type of rock conditions. Also, FPL has not explained how calculated static and dynamic factors of safety might change if the USACE recommendations were to be implemented. Also, FPL has not explained how the friction angle for the Key Largo formation was derived.
- (c) To assess the existence of potential cavities and/or voids beneath the safety related structures, FPL conducted several geophysical studies and based on these studies concluded that there are no cavities beneath the nuclear island. However, FPL's geophysical results are inadequate to reach this conclusion. Among the three geophysical techniques FPL used, only the microgravity survey was able to provide FPL some insights on the potential cavities and voids. The other two did not. FPL's microgravity survey analysis, however, is not comprehensive and leaves significant gaps in the region of interest. In addition, FPL's analysis of the gravity data is not comprehensive. The case examples provided do not cover many possible scenarios and gravity data analyses contain flaws in anomaly definitions and modeling. The staff cannot make a safety determination that potential cavities and/or voids do not have an impact on the safety-related foundation based on the data and analyses provided in the FSAR.
- (d) In assessing the static properties, FPL failed to consider the rock mass quality and assigned dynamic low strain elastic and shear modulus as static high strain modulus for the rock layers (Response to RAI 6006, Question 2.5.4-6). Also, FPL failed to consider the difference between the soil under dynamic load and static load and utilized the dynamic property of the shear modulus degradation curve to interpret and predict the soil static high strain modulus (Response to RAI 6006, Question 2.5.4-5) and static strain dependent settlement (Response to RAI 6006, Question 2.5.4-19). Therefore, the assumptions in several of FPL's structural and geotechnical analyses do not appear valid.