FPL.

L-2013-022
10 CFR 52.3

July 8, 2013

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 120830
(eRAI 6353 Rev. 2) Related to ESRP Section 9.3.1 – Alternative Site Selection

References:

1. NRC Letter to FPL dated August 30, 2012, Environmental Request for Additional Information Letter 120830 Related to ESRP Section 9.3.1, Alternative Site Selection, for the Combined License Application Review for Turkey Point Units 6 and 7

2. FPL Letter L-2013-145 to NRC dated April 29, 2013, Revised Schedule for Response to NRC Request for Additional Information Letters 120830 (eRAI 6353 Rev. 2) and 121114 (eRAI 6879) Related to ESRP Section 9.3.1 – Alternative Site Selection Process

Florida Power & Light Company (FPL) provides, as an attachment to this letter, its response to the Nuclear Regulatory Commission's (NRC) Request for Additional Information (RAI) EIS 9.3.1-11 provided in Reference 1. The schedule for this response was provided by FPL in Reference 2. The attachment identifies 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 July 8, 2013.

Sincerely,

William Maher
Senior Licensing Director – New Nuclear Projects

D097
NRO

Florida Power & Light Company

700 Universe Boulevard, Juno Beach, FL 33408

WDM/RFO

Attachment: FPL Response to NRC RAI EIS 9.3.1-11 (eRAI 6353 Rev. 2)

Enclosure: Water Alternatives Analysis – Inland Sites

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

NRC RAI Letter No. 120830 Dated August 30, 2012

SRP Section: EIS 9.3.1 – Alternative Site Selection Process

Question from Environmental Projects Branch 1 (EPB1)

NRC RAI Number: EIS 9.3.1-11 (eRAI 6353)

As discussed in ESRP § 9.3, the viability of the alternative sites depends upon the availability of cooling water. In order for the NRC staff to evaluate the environmental impacts of the project at the inland alternative sites (Glades, Okeechobee, and Martin), FPL needs to describe how it will obtain water for the sites in sufficient detail to make clear what those impacts will be. Please provide a description of a plan to obtain cooling water at these sites considering current water use restrictions, and describe the associated environmental impacts.

Background. (FPL Response to NRC RAI No. 9.3-10; RAI 5589, L-2011-395 Attachment 6, Letter #1104121, dated 9/30/11, Responses 1 & 2.) FPL's response states: "...Contact with regulators/owners of waters assumed as sources for the alternative sites is considered beyond the level of reconnaissance information appropriate for alternative site evaluations,..." This response does not provide adequate support for a determination of water availability at the alternative sites and thus does not support the viability of the alternatives sites. The staff notes that FPL's statement conflicts with the guidance in Regulatory Guide (RG) 4.7, which states on page 3, "In the site selection process, coordination between applicants for nuclear power stations and various Federal, State, local, and Native American tribal agencies will be useful in identifying potential problem areas." And RG 4.7, page 6, regarding water availability in particular states, "Regulatory agencies should be consulted to avoid potential conflicts." Please provide more detail regarding how cooling water will be obtained for the inland alternative sites.

The staff acknowledges that some of the current water use restrictions in effect around the three inland sites were not in effect at the time that FPL performed its initial site selection study in 2006. However, the staff performs its evaluation based on the most up-to-date information that is readily available. So, for example, since 2008 the South Florida Water Management District (SFWMD) has restricted water usage "from Lake Okeechobee, and the surface waters hydraulically connected to Lake Okeechobee in the integrated conveyance systems, to those uses which have historically occurred, the base condition water use." This means that it would be challenging for FPL to obtain sufficient surface water at the three sites unless it finds some way to obtain access to existing allocations. Obtaining sufficient groundwater may also be challenging according to SFWMD.

In order for the NRC staff to evaluate the environmental impacts of the project at the alternative sites, FPL should describe how it will obtain water for the sites in sufficient detail to make clear what those impacts will be. So, for example, a statement that water will be obtained from nearby surface water bodies is insufficient without an explanation of how the water will be obtained and stored under SFWMD regulations.[1] Similarly, if groundwater is to be the source, then potential impacts to other users in the area (who typically rely on artesian flows) should be addressed. FPL may also develop a water supply solution that involves more than one source. But whatever approach FPL chooses, FPL needs to explain how it will obtain a water supply that is dependable enough to support baseload operation of the two nuclear units. The staff strongly urges FPL to discuss whatever approach it chooses with SFWMD, as recommended in RG 4.7, before submitting a revised evaluation.

FPL RESPONSE:

As is reflected in this RAI, the Nuclear Regulatory Commission's (NRC) review of a COL Applicant's site selection process has two distinct phases. First, the NRC reviews the applicant's site selection process for reasonableness, to ensure that the candidate sites are "among the best that can reasonably be found" (Reference 1). As is explained in NUREG-1555, "[t]he overall goal of the review is to understand *the applicant's site-selection methodology* so that an eventual evaluation can be made of the reasonableness and capability of this process to identify candidate sites that are among the best that can reasonably be found in the ROI" (Reference 1 [emphasis added]). Thus, the NRC does not conduct its own site selection study based on currently available information.

Second, the NRC performs its own independent comparisons of the environmental impacts of alternatives (Reference 1). The reasonableness of an applicant's site selection process should be judged on the basis of how it incorporated the information available to the applicant at the time it performed the site selection study, identified alternative sites, and selected a preferred site. Evaluation of the reasonableness of the applicant's process using later information not available to the applicant at the time of site selection is both contrary to the guidance of NUREG-1555 and to the intent of NEPA, which requires consideration of environmental issues early in the project decision process. With this in mind, FPL believes water restrictions that post-date the site selection study are not material to the NRC's review of the reasonableness of FPL's site selection process.

However, FPL understands that the NRC may properly consider current information that post-dates the site selection process in the second step as part of its independent comparison of the alternative sites with the applicant's proposed site in order to determine whether there is an obviously superior site. FPL understands that the NRC needs a description of water source scenarios for the inland alternatives that reflect the current regulatory framework in order for it to evaluate current environmental impacts associated with these sites in its EIS. For this

[1] SFWMD has indicated, for example, that it might be possible to obtain surface water by buying out existing agricultural users. If this approach is considered, the staff would need to know how much agricultural land would be taken out of cultivation to obtain a reliable supply of water, the associated impacts to agriculture in the region, and the impacts associated with storing such water. If one or more of the other alternatives suggested by SFWMD (e.g. storage of excess stormwater, or use of reclaimed water or deep saline aquifers) are considered, the staff would also need to know the impacts associated with such actions or a combination thereof.

purpose, FPL postulated and evaluated the following three water supply scenarios, each distinguished by unique backup water sources. Each scenario, even under the current more restricted water use policy regime in effect in south Florida, is potentially licensable.

- Scenario 1 (UFA/APPZ Backup Sources) – Maximize the amount of water available by capturing and storing high excess surface flows during wet seasons (cropping) and minimize the reallocation of existing water use permits by using the Upper Floridan Aquifer (UFA) and the Avon Park Producing Zone (APPZ) without treatment as backup supplies during dry conditions. Since use of the UFA at the Martin site is under a restricted allocation, some reallocation of existing water use permits at locations other than the project site would be required for Martin only. Other minor water balance contributors include capturing onsite rainfall runoff, recycling higher quality plant wastewaters, and obtaining reclaimed water from nearby municipalities.

- Scenario 2 (Reallocated Permit Backup Sources) – Provides an option that does not use the APPZ as a backup source, but rather requires reallocation of existing water use permits at locations other than the project site. Since use of the UFA at the Martin site is under a restricted allocation, the majority of the cooling water requirement at the Martin site would come from reallocation of existing water use permits. Other minor water balance contributors include capturing onsite rainfall runoff, recycling higher quality plant wastewaters, and obtaining reclaimed water from nearby municipalities.

- Scenario 3 (APPZ Backup Source) – Provides an option that does not use the UFA as a backup source and requires reverse osmosis treatment of the APPZ source to reduce total dissolved solids (TDS) concentrations. This scenario maximizes the amount of water available through cropping of excess surface flows and includes no reallocation of existing water use permits at locations other than the project site. Other minor water balance contributors include capturing onsite rainfall runoff, recycling higher quality plant wastewaters, and obtaining reclaimed water from nearby municipalities.

In developing this RAI response, FPL engaged in meetings and discussions with the South Florida Water Management District (SFWMD), the local water use regulatory agency. The water use scenarios and water balance estimates discussed below generally reflect suggestions offered by SFWMD representatives during these meetings and discussions. The SFWMD representatives acknowledged and reaffirmed their June 2012 written assessment that these scenarios are potentially licensable under the reasonably foreseeable regulatory framework.

Neither these scenarios, nor the environmental impact analysis associated with them, conflict with the water use information and associated impact analyses presented in ER 9.3 Rev. 4 and applicable RAI responses previously submitted. Rather, this RAI response provides detail and insight about the feasibility of obtaining water at these sites that allows the 'potentially licensable' determination.

For the purposes of evaluating the environmental impacts associated with obtaining the required cooling water supply at the inland alternative sites, FPL identified Scenario 3 as a representative cooling water supply scenario that could be implemented. Scenario 3 was chosen over Scenario 1 because the UFA is a heavily utilized water source, and use of this source while protecting other existing users could lead to increased project risk. Scenario 3 was chosen over Scenario 2 because the acquisition of existing water use permits at locations other than the project site would be subject to negotiation and could also lead to increased project risk.

The enclosure provides a more detailed description and analysis of water source alternatives at the three inland alternative sites. This analysis of water alternatives for these sites provides a description of potentially licensable water sources, considering potential water use restrictions that may be applicable to some water sources. Below is a summary description of the enclosure water source options and attributes postulated under Scenario 3.

- ***Cropping Excess Surface Water***: The primary water source for all three inland alternative sites is Lake Okeechobee and the various rivers and canals hydraulically connected to Lake Okeechobee. Since 2008, surface water availability has been restricted for new allocations from sources that are hydraulically connected to Lake Okeechobee. However, according to the SFWMD, there are periods (during wet seasons) when large quantities are released from Lake Okeechobee to maintain regulated levels. This greater volume of water flowing through the surface water system can alter the salinity and chemical balance of some ecosystems and habitats receiving this water. This released water is ultimately lost to the Atlantic Ocean or the Gulf of Mexico. Cropping excess surface waters during wet periods can provide the project with needed cooling water while helping to avert estuarine ecosystem and habitat instabilities brought about by an otherwise unnatural and excessive flow of water. Because wet season high-flows only occur during a fraction of the year (estimated annual average duration of 2 months), capture and storage of these waters would require a large storage reservoir. The conceptual plant layouts prepared for the inland alternative sites have included a reservoir approximately 3,000 acres in size.

- ***Avon Park Producing Zone (with treatment)***: During dry periods (an estimated one year every three to ten years), adequate cooling water will not be available from cropping excess surface water. Therefore, the APPZ is used as a backup cooling water source during these periods. The APPZ is a highly productive aquifer (high transmissivity) and is not heavily utilized due to its higher TDS concentrations (approximately 10,000 mg/L). The APPZ source water would be utilized, together with treatment technologies (namely reverse osmosis [RO]), to reduce the TDS concentrations to an acceptable level (estimated at approximately 5,000 mg/L). Treatment of the APPZ source water would be expected to result in reduced adverse cooling tower drift effects on sensitive plant and animal communities in the area surrounding each inland site. RO reject water, and other plant wastewaters, would be discharged to the Boulder Zone of the Lower Floridan Aquifer (LFA).

- ***Reallocation of Existing Water Uses***: Existing water allocations would be terminated or reduced and reallocated under current SFWMD regulations. These reallocations from nearby surface waters, the surficial aquifer, or the UFA would be assigned to the purchase of tracts of land for the site area and reservoir that have been in irrigated agricultural production. Note: the land use impacts associated with the base reallocations in Scenario 3 (i.e., the conceptual site area, including the reservoir area) are accounted for in ER Rev. 4. This scenario does not include reallocations in addition to those associated with land needed for the site and reservoir.

- ***Other Minor Water Balance Contributors***: Capturing onsite rainfall runoff, recycling higher quality plant wastewaters, and contracting reclaimed water from nearby municipalities are water source additions that would be included to complete the water supply.

An evaluation of the environmental impacts from each of the major elements of the cooling water system in Scenario 3 is provided below. Reconnaissance-level design assumptions used in evaluating environmental impacts of cooling water supply under the current regulatory framework are provided in Table 1. The capture of onsite rainfall runoff and the recycling of higher quality plant wastewaters are not significant contributors to the plant cooling water balance estimates and are not anticipated to result in environmental impacts beyond those previously identified for the proposed project. Additionally, due to the rural location of the inland alternative sites, the quantity of reclaimed wastewater treatment plant effluent in the vicinity of the sites is currently limited (as described in in FPL's response to EIS 9.3.1-16 (RAI 5588) (Reference 2)). However, any significant increases in availability of this source would likely be sought for use at the inland alternative sites as it would help reduce the dependence on other water sources.

The discussion of environmental impacts from primary cooling water sources is organized into separate sections addressing impacts from construction and operation, each of which includes the following:

- Impacts applicable to all three inland alternative sites, by major area of impact (e.g., land use, water quantity and quality, ecology). Because some impacts are common to all three inland sites given the potential cooling water sources, the contributing quantities and associated implementation activities would be similar at each site.
- Additional site-specific information, where relevant, such as that relating to the 3,000-acre reservoir previously evaluated in ER 9.3 Rev. 4.

<u>Construction Impacts</u>

Land Use

The cooling water storage reservoir would occupy approximately 3,000 acres at each inland alternative site. ER Rev. 4 Section 9.3.3.1.1 (Glades), 9.3.3.2.1 (Martin) and 9.3.3.3.1 (Okeechobee) address onsite land use impacts for the conceptual site area as a whole (approximately 3,362 acres), including the reservoir, pump station/intake structure and cooling water intake/makeup pipeline corridors; as well as summary tables providing a detailed breakout of land use types (based on FLUCCS codes) for the entire plant site (and conceptual transmission corridors). In addition, FPL previously provided figures of the assumed conceptual site layout and GIS shape files and land use cover type (with FLUCCS Level III data) broken out for each individual project component at each alternative site, including the reservoir and intake/makeup pipeline corridors, in its response to EIS 9.3-1 (RAI 5563) (Reference 3). Information specific to existing land uses at the proposed reservoir location and cooling water intake/makeup pipeline corridor at each site, as summarized from the original FLUCCS Level III data provided to NRC (Reference 3), is provided below.

- ***Glades***: The majority of the conceptual reservoir area at the Glades site has been cleared and is planted in sugar cane (approximately 2,500 acres); the next largest land uses include approximately 57 acres each of exotic wetland hardwoods and mixed wetland hardwoods, improved pastures (approximately 140 acres), and ditches (approximately 135 acres), and smaller land uses include wet prairies, freshwater marshes, mixed wetland hardwoods, extractives, and small holding ponds. Intake/makeup water pipeline corridors would require approximately 3.4 acres to connect the reservoir to the nearby C-43 canal at the Glades site; land uses along the conceptual pipeline corridor include mixed wetland hardwoods and sugar cane.
- ***Martin***: The majority of the conceptual reservoir area at the Martin site has been cleared and is planted in citrus groves (approximately 2,700 acres); the next largest land use is pine flatwoods (approximately 165 acres), and smaller land uses include herbaceous dry prairie, shrub and brushland, palmetto prairies, Brazilian pepper, hardwood-coniferous mixed, mixed wetland hardwoods, wetland forested mix, freshwater marshes, fill areas and transmission lines. Intake/makeup water pipeline corridors would require approximately 22 acres to connect the reservoir to the nearby C-44/St. Lucie canal at the Martin site; land uses along the conceptual pipeline corridor include approximately 7 acres of palmetto prairie, and smaller acreages split between herbaceous dry prairie, mixed rangeland, pine flatwoods, hardwood-coniferous mixed, freshwater marshes, wet prairies, and filled areas.
- ***Okeechobee***: The majority of the conceptual reservoir area at the Okeechobee site has been cleared and is characterized as improved pastures (over 1,700 acres); the next largest land uses include over 945 acres in wet prairies and approximately 160 acres in freshwater marshes, and smaller land uses include mixed wetland hardwoods, holding ponds and ditches. Intake/makeup water pipeline corridors would require approximately 22.5 acres to connect the reservoir to the Kissimmee River at the Okeechobee site; the majority of land use along the conceptual pipeline corridor is improved pastures (approximately 20 acres), and smaller acreage habitat types include woodland pasture, herbaceous dry prairie, freshwater marshes, wet prairies, and Brazilian pepper.

During dry periods, the APPZ would be the backup cooling water source. The required well field and associated pipelines would be placed around the perimeter of the reservoir within the conceptual site boundary such that no additional land area would be disturbed. Additionally, the RO treatment facility could be constructed within the conceptual site boundary such that no additional land area would be disturbed. Finally, cooling water blowdown and RO wastewater would be disposed via underground injection to the Boulder Zone of the LFA. These underground injection wells and associated pipelines would be located within the conceptual site boundary such that no additional land area would be disturbed.

Affected land uses of the well field and water treatment facility areas would be expected to be similar to those impacted by the reservoir itself since they would be located immediately adjacent, along the reservoir's perimeter. Because the APPZ well field and RO water treatment facility would be located within the conceptual site boundary, and the RO reject water and other plant wastewaters would be discharged to the Boulder Zone of the LFA, construction of the new well field and wastewater treatment facility would not add a significant incremental impact to existing land use impacts beyond those documented for plant construction in the ER 9.3.3 Rev 4.

As summarized in the ER 9.3.3 Rev 4, construction of the plant, including the cooling water system components, would include clearing, dredging, grading, excavation, spoil deposition, and dewatering activities. An area of approximately 3,362 acres, predominantly the main plant site and reservoir, would be permanently impacted. Project construction would have a long term land use impact (shift to industrial use) as much of the three inland alternative sites are now used for agriculture and farm activities.

Construction at the proposed pipeline corridors would have temporary, minor effects on land use during actual construction due to localized trenching, equipment movement and material laydown. The ability to access lands for their existing uses along the proposed pipeline corridor would be suspended during construction. Pipelines would be buried, and disturbed portions of the corridor would be graded to the contours of the surrounding landscape and revegetated or returned to previous land uses.

Water Quantity and Quality

ER Rev 4 Sections 9.3.3.1.3 (Glades), 9.3.3.2.3 (Martin), and 9.3.3.3.3 (Okeechobee) address water use and water quality impacts from construction of the proposed plant as a whole, and capture the potential impacts from all construction activities relating to cooling water Scenario 3. In summary, minimal impacts to water quantity and water quality are predicted for plant construction activities at the inland alternative sites.

Ecology

ER Rev. 4 Sections 9.3.3.1.4 (Glades), 9.3.3.2.4 (Martin) and 9.3.3.3.4 (Okeechobee) identify species that may be found at each site and address the ecological impacts for the conceptual site area as a whole, including the reservoir and intake pipeline corridors. In general, construction of a new reservoir would primarily result in a loss of agricultural land that may serve as habitat to various common terrestrial species. Land use information relating to the proposed reservoir and intake/makeup water pipeline corridor is provided under the land use impacts above; it included acreages for the largest contributing land use(s) at each site. Site-specific acreages relating to relatively undisturbed habitats are described below, to allow a comparison across sites of potentially impacted ecological (primarily terrestrial) habitat.

- ***Glades***: Potentially affected acreages (approximate) for the relatively undisturbed habitat areas within the conceptual reservoir include: 57 acres of exotic wetland hardwoods, 58 acres of mixed wetland hardwoods, 23 acres of freshwater marshes, and 35 acres of wet prairies; holding ponds and ditches also account for approximately 35 acres and 136 acres, respectively. The intake/makeup water pipeline corridor would include approximately 1.2 acres of mixed wetland hardwoods.
- ***Martin***: Potentially affected acreages (approximate) for the relatively undisturbed habitat areas within the conceptual reservoir include: 165 acres of pine flatwoods, 40 acres of palmetto prairies, 29 acres of herbaceous/dry prairie, 19 acres of hardwood-coniferous mixed, 16 acres of shrub and brushland, 10 acres of Brazilian pepper, 13 acres of wetland forested mix, 5 acres of mixed wetland hardwoods, and 2 acres of freshwater marshes. The intake/makeup water pipeline corridors would include approximately 7 acres of palmetto prairie, and smaller acreages split between herbaceous dry prairie, mixed rangeland, pine flatwoods, hardwood-coniferous mixed, freshwater marshes, and wet prairies as noted previously.
- ***Okeechobee***: Potentially affected acreages (approximate) for the relatively undisturbed habitat areas within the conceptual reservoir include: 947 acres of wet prairies, 161 acres of freshwater marshes, 87 acres of mixed wetland hardwoods, and 43 acres of woodland pastures; ditches and ponds also account for approximately 11 acres and 3 acres, respectively. The intake/makeup water pipeline corridors would include approximately 3 acres (total, with each contributing less than an acre) of woodland pasture, herbaceous dry prairie, freshwater marshes, wet prairies, and Brazilian pepper as noted previously.

As discussed in ER 9.3 Rev 4, wetlands impacted during construction would be mitigated and field surveys would be conducted for protected species before land preparation of construction activities would begin. In addition, land preparation and construction activities would be conducted in accordance with federal and state regulations, permit conditions, FPL procedures, good construction practices and established best management practices. These controls would also apply to construction of the APPZ well field and RO water treatment facility, which would be located around the perimeter of the reservoir and within the conceptual site boundary previously analyzed. Because the APPZ well field and RO water treatment facility would be located within the conceptual site boundary, and the RO reject water and other plant wastewaters would be discharged to the Boulder Zone of the LFA, construction of the new well field and wastewater treatment facility is not expected to add a significant incremental impact to the existing terrestrial ecology impacts beyond that associated with plant construction already evaluated in the ER 9.3.3 Rev 4.

<u>Operation Impacts</u>

Land Use

Land use impacts associated with operation of the reservoir are addressed in ER 9.3 Rev 4, and would include a permanent change to industrial land use and unavailable for other purposes. The reservoir area, the APPZ well field, and the RO facility, whose current land uses have been identified in the discussion of construction impacts, would be excluded from agricultural and recreational use for the estimated 60-year plant life.

Water Quantity and Quality

Capture and use of excess surface waters in the operation of the plant cooling system would not have a detrimental impact to other water users since the excess surface waters are currently ultimately lost to the Atlantic Ocean or the Gulf of Mexico. Cropping excess surface waters during wet periods can help to avert estuarine ecosystem and habitat instabilities brought about by an otherwise unnatural and excessive flow of water.

Reallocation of existing water uses for the reservoir and plant areas are not expected to result in adverse impacts to water quantity or water quality since such transfers would require permitting by SFWMD and would not be allowed if SFWMD determines that existing use and water quality would be negatively affected.

Similarly, groundwater withdrawals (associated with the operation of the backup water supply) that would result in unacceptable water use impacts to other APPZ users would not likely be permitted by SFWMD; however, the APPZ is not heavily utilized and unacceptable adverse impacts associated with groundwater withdrawal are not anticipated. Use of the APPZ could increase TDS levels in the APPZ due to intrusion of replacement groundwater with higher TDS concentrations; however, this would not create a new water quality impact as the TDS concentrations in the APPZ are already elevated such that water treatment must be considered. Additionally, the high transmissivity of this aquifer could mitigate the intrusion effect through mixing of groundwater within the aquifer.

Operation of the RO treatment facility would result in generation of RO reject wastewater. Because RO reject wastewater would be injected to the Boulder Zone of the LFA, operation of a new water treatment facility would not add a significant incremental impact to existing water quality impacts beyond that associated with plant operation already evaluated in the ER 9.3.3 Rev 4.

As indicated in ER 9.3.3 Rev 4 for all inland alternative sites, impacts to water quality would be SMALL because plant operation activities would be performed under the authorization of an Underground Injection Control (UIC) (groundwater) permit issued by the FDEP which would ensure that adequate measures are applied to protect water quality.

Ecology

Capture and use of excess surface waters in the operation of the plant cooling system would require construction of a new reservoir. While terrestrial species would be displaced during reservoir construction, the reservoir would provide new habitat for birds and waterfowl that would not be adversely affected by plant operation.

Use of the APPZ with RO treatment would reduce environmental impacts from cooling tower drift (from what would occur without treatment), by reducing TDS concentrations in the groundwater supply from approximately 10,000 mg/L (brackish) to approximately 5,000 mg/L (slightly brackish). For comparison, typical TDS concentrations in freshwater environments are approximately 1,000 mg/L. This is particularly important at the inland sites which include freshwater environments surrounded by agricultural land, including important economic crops at the Glades and Martin sites, that could be adversely affected by prolonged exposure to cooling tower drift with high TDS concentrations (>40,000 mg/L). Generally, drift from cooling towers using fresh water has low salt concentrations and, in the case of mechanical draft cooling towers, falls mostly within the immediate vicinity of the towers, representing little hazard to vegetation off-site (as cited in NUREG 1437, Vol. 1, page 4-35).

TDS concentrations of approximately 5,000 mg/L – expected in the cooling tower makeup from using treated water from the APPZ water under Scenario 3 at all three inland alternative sites – would be considered to be slightly brackish water, but the use of mechanical draft cooling towers would help ensure that drift would fall mostly within the immediate vicinity of the towers. Optimal placement of the cooling towers within the conceptual site boundary could further mitigate drift impacts. In tropical climates such as Florida, abundant rainfall during wet seasons will wash off salts deposited on vegetation, which could help further reduce potential drift effects, particularly on nearby crops (sugar cane at Glades site and citrus at Martin), although given that water would be pulled from the APPZ during dry periods, exposure could be more significant during periods when rainfalls are less frequent. However, given the reduced TDS levels (following treatment) and the fact that the dissolved salt from drift would be expected to be deposited in a localized area around the proposed cooling towers, widespread damage to offsite vegetation or crops is unlikely. In addition, the drift effects are expected to be even less of a concern for the citrus crop at the Martin site given reduced production levels in the area as a result of widespread disease (canker). The salt drift could have minor effects (e.g., leaf damage) in the immediate vicinity of the cooling towers, but it would not be expected to noticeably affect habitat for wildlife that might reside in the area.

Because RO reject water would be injected to the Boulder Zone of the LFA, operation of a new water treatment facility would not add a significant incremental impact to existing terrestrial or aquatic ecology beyond that associated with plant operation already evaluated in the ER 9.3.3 Rev 4.

Socioeconomics

Adverse socioeconomic impacts would occur by the permanent removal of agricultural production. These impacts include adverse economic effects in the host county with respect to lost crop sales and direct/indirect worker wages. For the Glades site, operation of the reservoir would remove approximately 2,500 acres of sugar cane from production. This compares to 25,049 acres of sugar cane harvested in Glades County in 2007 (approximately 10 percent), and 378,587 acres harvested in the state of Florida (roughly 0.7 percent) (Reference 4). For the Martin site, operation of the reservoir would remove approximately 2,700 acres of citrus groves. This compares to 39,655 acres planted in orchards in Martin County in 2007 (6.8 percent) and 677,403 harvested in the state of Florida (roughly 0.4%) (Reference 4). Both sugar cane and citrus are important to the agricultural economy of Florida. No crop or orchard production would be affected by reservoir operation at the Okeechobee site, although livestock inventories could be potentially affected, depending on how the over 1,700 acres of improved pasture land is currently being used. It should also be noted that any reduction in agricultural production levels could be offset by the benefits afforded to local communities as a result of the plant's presence (e.g., tax revenues, local emergency planning support, and educational program support), as previously discussed in the ER 9.3 Rev 4.

On a smaller scale, there would be local socioeconomic impacts associated with the project's cooling water uses. The existing landowners whose property (for reservoir development) and existing water rights are purchased would voluntarily lose existing livelihood, although they would be willing sellers at a negotiated price for their land and water rights, and the proceeds could be used to find a new employment, if desired. Any workers employed by the landowners to farm the land would presumably find work on another farm and/or a new job (direct or indirect) such as those created by the nuclear power plant project itself.

Table 1. Reconnaissance-Level Design Assumptions for Cooling Water Supply Scenario 3

Cooling System Component	Design Assumptions
Primary Supply – Cropping Excess Surface Waters and Reallocations within Site Boundaries	
Water Quantity	Cropping: 50 MGD (annual average) Base Water Reallocations (within conceptual site boundary): 10 MGD (annual average)
Storage Reservoir	3,000 acre reservoir (based on conceptual site layouts) Pumping station and pipeline to connect surface water source to storage reservoir (based on conceptual site layouts)
Backup Supply – APPZ Groundwater with RO Treatment	
Water Quantity/Quality	APPZ: 63 MGD (accounts for RO treatment of ½ APPZ supply [and generation of RO reject wastewater] and blending with remaining ½ of untreated APPZ supply) at an assumed TDS concentration of 10,000 mg/L. Base Water Reallocations (within conceptual site boundary): 10 MGD (annual average)
Groundwater Well Field	Estimated 14 groundwater wells (plus 2 backup wells) required. Assumed 1,000-ft to ¼ mile separation between groundwater wells. Placement of wells and associated pipelines around/outside the perimeter of the storage reservoir.
RO Treatment Facility	Facility size approximately 1-3 acres. Facility placement within the conceptual site boundary.
RO Reject Disposal via Underground Injection	Similar to underground injection requirement for cooling tower blowdown. Total of 4 injection wells (plus 1 backup well) required for cooling tower blowdown and RO reject wastewater disposal. Assumed placement of injection wells and associated pipelines within the conceptual site boundary.

This response is PLANT SPECIFIC.

References:

Reference 1: U.S. Nuclear Regulatory Commission, NUREG-1555, Environmental Standard Review Plan, Section 9.3, Site Selection Process, Revision 1, July 2007. Available at: http://pbadupws.nrc.gov/docs/ML0718/ML071800223.pdf. Accessed on June 26, 2013.

Reference 2: FPL Letter to NRC L-2011-336 dated September 1, 2011, Response to Environmental Request for Additional Information Letter 1104071 (RAI 5588) Environmental Standard Review Plan Section 9.3.1 – Alternative Site Selection Process.

Reference 3: FPL Letter to NRC L-2011-335 dated September 2, 2011, Response to Environmental Request for Additional Information Letter 1103094 (RAI 5563) Environmental Standard Review Plan Section 9.3 – Alternative Sites.

Reference 4: USDA Census of Agriculture, Florida County Level Data, Table 26 (Field Crops: 2007 and 2002) and Table 31 (Land in Orchards: 2007 and 2002). Available at: http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_County_Level/Florida/. Accessed June 26, 2013.

ASSOCIATED COLA REVISIONS:

No COLA changes have been identified as a result of this response.

ASSOCIATED ENCLOSURES:

Water Alternatives Analysis - Inland Sites (7 pages)

ENCLOSURE

TURKEY POINT NUCLEAR PLANT UNITS 6 AND 7
COL APPLICATION

WATER ALTERNATIVES ANALYSIS – INLAND SITES

WATER DEMAND AND WATER SOURCES

The amount of water required for two AP1000 units is approximately 60 million gallons per day (MGD) based upon requirements of the following systems: Cooling System Makeup, Service Water, Demineralized Water, and Potable Water.

A number of water sources are available at the inland sites to obtain the necessary quantities for the operation of two AP1000 units. A combination of water sources likely would be required to reliably meet the total water demand. Potential water sources include:

- Capturing onsite rainfall runoff with storage in a reservoir
- Cropping excess surface water flow during the wet season, with storage in a reservoir
- Recycling higher quality plant wastewaters (this source already has been incorporated into the water demand estimate)
- Obtaining reclaimed and potable water from nearby municipalities
- Groundwater from the surficial aquifer
- Groundwater from the Upper Floridan Aquifer (UFA)
- Groundwater from the Middle Floridan Aquifer [a.k.a., Avon Park Producing Zone (APPZ)]
- Groundwater from the Lower Floridan Aquifer (LFA)

These potential water sources are described further below.

Surface waters in the vicinity of the inland alternative sites include Lake Okeechobee and various canals hydraulically connected to Lake Okeechobee.

Since 2008, surface water availability has been restricted for new water allocations from sources that are hydraulically connected to Lake Okeechobee. However, FPL could pursue available water during the wet season by cropping excess high flows. In addition, FPL could request re-allocation of unassigned, terminated or reduced base condition water use allocations, as discussed in the South Florida Water Management District (SFWMD) Basis of Review (BOR) Section 3.2.1(G)(3)(c)(iv).

A water storage reservoir could be constructed for storing onsite rainfall runoff, reclaimed water and excess surface water flow during the wet season. Based on previous FPL analysis, the wet season (i.e., the time of the year when excess surface flow from Lake Okeechobee is probable) is estimated to be approximately two months. Consequently, the water storage reservoir may have to be as large as 3,000 acres.

A surface impoundment will have some loss or gain due to evaporation and rainfall, and some loss due to seepage. Most of the seepage loss can be recovered from the surficial aquifer by using wells or by placing toe drains around the dike. Average annual lake evaporation is about 49.5 inches at the Martin and Okeechobee Sites and about 51 inches at the Glades Site (Fernald & Patton, 1984). Annual average rainfall is about 48.4 inches at the Martin and Okeechobee Sites and approximately 50.1 inches at the Glades Site (SFWMD, BOR, Part B Section V, Table SCR-2). Consequently, annual excess rainfall (annual average precipitation minus annual average lake evaporation) is approximately the same for all three inland sites and as discussed below, the quantities are relatively small.

A potential alternative water storage technology is aquifer storage and recovery (ASR). However, implementation of ASR would be challenging in this situation for several reasons. First, the withdrawal rate required to crop wet season flows is very large. Based on the Project water demands and a probable two-month wet season window, the required pumping capacity likely would be between 200 MGD and 360 MGD. The capacity of a large ASR well is typically between 5 MGD and 10 MGD. Therefore, the ASR system would require many wells and impacts would be regionally extensive. At this scale, ASR technology has not been proven; if the Upper Floridan aquifer (UFA) were used, potential interference with existing legal users, existing and future tribal allocations and rights under federal/state compacts and future Comprehensive Everglades Restoration Plan (CERP) ASR wells must be considered. Alternatively, if a reservoir is used to temporarily store water before injection the rate of injection and the number of ASR wells that are required would be reduced. However, the primary advantage of using ASR technology with this alternative is lost. Second, if the aquifer used for storage is an underground source of drinking water (USDW) [generally defined as an aquifer having a total dissolved solids (TDS) concentration less than 10,000 milligrams per liter (mg/L)], then the water must be treated to drinking water standards before injection. Also, the dissolution of arsenic is a recognized problem, and at this time, the arsenic issue has not been resolved. While it may be possible to identify an aquifer below the USDW that would eliminate the requirement to meet drinking water standards, including arsenic, and the need to treat the water before injection, an aquifer with the right combination of capacity (i.e., transmissivity) and water quality for this specific application would have to be identified. For these reasons, ASR technology does not provide a significant advantage over surface storage for this Project and is not considered further.

Nearby municipalities could be a source of potable water and reclaimed water. However, the population densities near the inland sites are very low. Consequently, reclaimed water supplies are limited. Based on wastewater/reuse capacity and flow data from the FDEP Reuse Inventory (FDEP, 2011) the quantity of reclaimed water, if available, would likely be no more than approximately 1.0 MGD at any of the inland sites. However, if in the future this source could be increased, it would be a useful alternative source of cooling water.

Groundwater available in the vicinity of the inland sites can be developed from two aquifers with sufficient quality to be used as a primary cooling water source without significant treatment: the surficial aquifer and the UFA. The surficial aquifer is of good quality, but is the primary source of drinking and agricultural water in the area. For this reason, it is not available in quantities sufficient for cooling water, but could be used for service water. In addition, a surficial well system could recapture reservoir seepage for use.

The Floridan Aquifer system can be divided into the UFA, the APPZ and the LFA. The UFA is brackish (TDS concentrations typically between 2,000 mg/L and 5,000 mg/L) and the aquifer could be used as a primary source for cooling water. The UFA, however, is under consumptive pressure at all the alternative sites, is heavily used by agriculture, and on the east side of Lake Okeechobee this aquifer is under restricted allocation. Florida law requires the use of the lowest quality water for the intended purpose and potable demands will be favored over industrial use (SFWMD Basis of Review 3.0). Consequently, groundwater from this source is generally not available and generally not permitted as a source of industrial consumptive use. However, under current SFWMD regulations, it sometimes can be used as a backup source, and existing base condition allocations can be terminated and re-allocated. Agricultural users in the vicinity of the inland alternative sites utilize both groundwater and surface water and are often classified as existing legal users under authorizations from SFWMD. Under SFWMD rules, existing base condition water use allocations can be terminated and re-allocated to FPL. The water alternatives developed herein also consider the potential to successfully permit the various water sources. For example, while new water allocations from the UFA in Martin County are potentially licensable under the SFWMD rules (SFWMD BOR 3.2.1 D.3), the probability of satisfying permit criteria is very low due to existing use. Consequently, new allocations from the UFA in Martin County are not considered further in this analysis.

The APPZ is very productive and not heavily utilized. The TDS concentrations are likely between 5,000 mg/L and 10,000 mg/L (brackish). This is the shallowest aquifer that likely could supply the required cooling water without impacting existing legal users, tribal rights under existing compacts, or proposed CERP projects. Since the base of the aquifer in many places is only 50 to 100 ft above the depth where TDS concentrations reach 10,000 mg/L, it should be assumed for planning purposes that the TDS concentrations will be approximately 10,000 mg/L from a well field in this aquifer. Because of the high TDS concentrations, water from this aquifer is not suitable without significant water treatment as a primary source of cooling water due to the potential impacts of prolonged exposure of sensitive vegetation (native and agricultural crops) to cooling tower drift with high TDS concentrations [>40,000 parts per million (ppm)]. However, it could be used without significant treatment as a backup source for a limited duration, or for longer durations, if blended with other water sources to reduce the average TDS concentration. Water from this aquifer could be used as a primary cooling water source if it is first treated using reverse osmosis (RO) or other water treatment methods to reduce the TDS concentration. RO systems using brackish water typically reject approximately 30 percent of the influent (FDEP, 2010). Consequently, for planning purposes, if this aquifer is used as a primary cooling water source, the cooling water demand should be increased by 43 percent to account for the additional wastewater that will be generated. The RO reject water and the other plant wastewaters could be discharged to the Boulder Zone of the LFA.

The LFA, below the APPZ, will have even higher TDS concentrations: at least 10,000 mg/L and more likely 35,000 mg/L (salinity of seawater) or more. Because of the high TDS concentrations, water from this aquifer system is not suitable as a primary source of cooling water without significant water treatment. Even as a backup source, this aquifer would not be used without treatment at the inland sites for the reasons discussed above. Seawater RO systems typically reject approximately 50 percent of the influent (FDEP, 2010). Consequently, for planning purposes, if this aquifer is used as a primary cooling water source, the cooling water demand should be increased by 100 percent to account for the additional wastewater that will be generated.

As described above, existing base condition water allocations can be terminated or reduced and re-allocated under current SFWMD regulations. These existing allocations may be from nearby surface waters, the surficial aquifer or the UFA. These re-allocations could be associated with the purchase of large tracts of land that have been in agricultural production and have had consumptive use permits since before January 1, 2008. As discussed in the SFWMD BOR, the Governing Board of the SFWMD reserves the right to restrict these re-allocations if it determines that the transfer is not in the public interest.

WATER SUPPLY ALTERNATIVES

Based on the water availability of the eight sources described above, water budgets at three inland sites were developed from existing data, literature, and regulations in the region. The water budgets developed considered wet, normal and dry years. Dry years are defined, for the purpose of water budgeting, as years when no excess surface water flows are available. The return period for the dry year is estimated to be between one-in-three years and one-in-ten years. In addition, three distinct scenarios were developed that provide an adequate and reliable water supply for two AP1000 units at the inland sites:

- Scenario 1 is based on maximizing the amount of water available through cropping of high excess surface flows and minimizing the re-allocation of existing water use permits by using the UFA (Glades and Okeechobee sites only) and the APPZ (all three sites) as backup supplies during dry conditions (i.e., low flow periods).

- Scenario 2 provides an option that does not use the APPZ as a backup source during dry years.

- Scenario 3 provides an option that does not use the UFA as a backup source. This scenario requires RO treatment for a portion of the APPZ flow to limit cooling tower TDS concentrations.

Scenarios 1 and 3 use a 3,000 acre reservoir. In scenario 2, the reservoir capacity for the Glades and Okeechobee sites can be much smaller (approximately 1,000 acres) because cropping of surface water flow is significantly less. No reservoir is needed for the Martin site under this scenario because cropping of surface flow is not feasible without a backup water source during dry years.

The base allocation (10.3 MGD for Scenarios 1 and 3 at all three sites and 4.1 MGD for Scenario 2 at the Glades and Okeechobee sites) is conceptualized as a re-allocation of existing agricultural base condition water use permits associated with the land to be acquired for the power plant site and the 3,000 or 1,000 acre reservoir. The re-allocation per acre of agricultural land was estimated using the SFWMD Supplemental Crop Requirement and Withdrawal Calculation, which is described in the BOR, Part B Section V. Monthly data for the Okeechobee Rainfall Station (SFWMD, BOR, Part B, Section V, Table SCR-2) was used in the calculation because this station is representative of all three potential inland sites. The monthly crop coefficient (SFWMD, BOR, Part B, Section V, Table SCR-1) used in the calculation is the average for citrus, sugarcane, turf grass and pasture because these are the dominant crops in the Lake Okeechobee Basin. The net depth of application value used in the calculation is 0.8 inches because this is the dominant value in the three counties near Lake Okeechobee (SFWMD, BOR, Part B, Section V, Figures SCR-4, 8 and 10) and this value is conservatively low for an average value in the Lake Okeechobee Basin. The Allocation Coefficient Multiplier (ACM) was obtained from the SFWMD BOR Table 2-1. The ACM value is the average for overhead sprinklers, excluding nursery containers.

The maximum withdrawal from the UFA at the Glades and Okeechobee sites is estimated to be 15 MGD based on an impact analysis done for the FPL Glades Power Park (FGPP). The maximum withdrawal from the APPZ is estimated to be much higher because the transmissivity of this aquifer is reported to be an order of magnitude higher than the UFA (Reese & Richardson, 2004) and there are few existing users. However, withdrawals over approximately 40 MGD likely would require RO treatment to control salt drift impacts from the cooling towers.

In Scenario 1, the Martin site requires 12 MGD of additional water re-allocation because the UFA is under a restricted allocation in Martin County. As discussed above, while new water allocations from the UFA in Martin County are potentially licensable under the SFWMD rules, the probability of satisfying permit criteria is very low. Consequently, the UFA is not considered a viable backup source at the Martin site. To obtain the required water, approximately 3,900 acres of additional agricultural land (i.e., land not required for the plant site or the reservoir) would have to be removed from production, the water use associated with the agriculture operation would be terminated and FPL would have to obtain the re-allocation for the Project.

Scenario 2 provides an option that does not use the APPZ as a backup source. Under this scenario, the reservoirs likely could be much smaller (approximately 1,000 acres) for the Glades and Okeechobee sites, and there would be no need for reservoir for the Martin site because cropping is not feasible without a backup water source. Consequently, greater water re-allocations would be required. At the Martin site, FPL would have to obtain water re-allocations to cover the entire 60 MGD water demand. This likely would require at least 20,000 acres of agricultural land be removed from production. At the Glades and Okeechobee sites at least 13,200 acres of additional land would have to be removed from production to obtain the needed water re-allocations.

Scenario 3 relies exclusively on the APPZ as the backup water source in the dry years; the UFA is not used in this scenario. Consequently, to control salt drift impacts an RO system capable of treating approximately half the cooling water demand is required. Under these conditions, the withdrawal rate from the APPZ would be approximately 63 MGD.

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