

**UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION**

**Before the Atomic Safety and Licensing Board**

In the Matter of	)	
	)	
Florida Power & Light Company	)	Docket Nos. 52-040-COL
	)	52-041-COL
(Turkey Point Units 6 and 7)	)	
	)	ASLBP No. 10-903-02-COL
(Combined License)	)	

**DECLARATION OF RICHARD J. POWELL IN SUPPORT OF FLORIDA POWER &  
LIGHT COMPANY'S MOTION FOR SUMMARY DISPOSITION OF JOINT  
INTERVENORS' AMENDED CONTENTION 2.1**

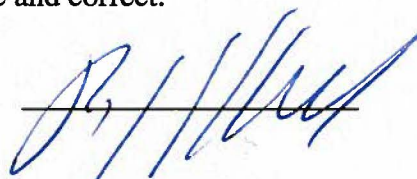
Richard J. Powell states as follows under penalties of perjury:

1. My name is Richard J. Powell. I am a Principal Engineer at Environmental Consulting & Technology, Inc. I have a Bachelor of Science degree in Chemical Engineering from the University of Missouri-Rolla and I am a registered professional engineer in the state of Florida. I have over 44 years of experience in environmental permitting for electric utilities, chemical plants, and manufacturing facilities. This includes extensive experience with potable water and industrial wastewater treatment systems. Further details on my education and experience are provided in my resume included as Exhibit 9.
  
2. In support of Florida Power & Light Company's Motion for Summary Disposition of Contention 2.1, I prepared Attachment 5 to that motion titled "Expert Report of Richard J. Powell". That report is a true and accurate representation of my views on the concentrations of toluene, ethylbenzene, tetrachloroethylene, and heptachlor (collectively the "Constituents") contained

FPL's environmental report ("ER") supporting its application to the Nuclear Regulatory Commission ("NRC") for a combined construction permit and operating license ("COLA") for Turkey Point.

3. The opinions expressed in my expert report are based on my extensive environmental permitting experience, my review of the relevant portions of the Turkey Point ER and the explanation of the derivation of the Constituent Concentrations provided by David M. Wagner his declaration previously filed in this proceeding.<sup>1</sup>

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



Richard J. Powell

Executed on December 11, 2015

---

<sup>1</sup> Declaration of David M. Wagner in Support of Florida Power & Light's Motion for Summary Disposition of Joint Intervenor's Amended Contention 2.1 ("Wagner Decl.") attached to FPL Motion for Summary Disposition of Joint Intervenor's Amended Contention 2.1, dated July 19, 2012 at 8 ("FPL July 2012 Motion"). ("Wagner Decl.").

**In the Matter of Florida Power & Light Company  
Turkey Point Units 6 & 7 Combined License  
Docket Nos. 52-040-COL and 52-041 COL  
ASLBP No. 10-903-02-COL**

**Expert Report of Richard J. Powell**

**I. Executive Summary**

Florida Power & Light Company (FPL) proposes to use reclaimed water provided by the South District Wastewater Treatment Plant (SDWWTP) in Miami-Dade County, Florida as a source of makeup water for the circulating cooling water system at its proposed Turkey Point Units 6 & 7 (Turkey Point) nuclear power plants. FPL proposes to discharge Turkey Point's wastewater, which would include the reclaimed water, into deep wells that inject into the Boulder Zone of the Florida aquifer system (the "injectate").

In a revision to FPL's environmental report (ER) supporting its application to the Nuclear Regulatory Commission (NRC) for a combined construction permit and operating license (COLA) for Turkey Point, FPL identified the concentrations of four constituents – toluene, ethylbenzene, tetrachloroethylene, and heptachlor (collectively the "Constituents") – that could be found in the injectate. These concentrations were based on SDWWTP's own sampling data from 2007-2011. The NRC's February 2015 Draft Environmental Impact Statement (DEIS) for the Turkey Point COLA relied on that data. DEIS at Table 3-5. FPL has asked me to evaluate whether the concentrations for the Constituents that are reported in the ER and cited in the DEIS are reliable and accurate.

As explained below, in my opinion the concentrations of the Constituents cited in the ER and the DEIS are extremely conservative. In fact, they are unrealistically high. As described below, the probability that detectable concentrations of the Constituents will be present in the reclaimed water that Turkey Point will ultimately inject into the Boulder Zone is so remote as to not warrant further environmental consideration. This opinion is based on my review of the results from a year-long sampling program performed by PACE Analytical Services, Inc. (PACE) on behalf of FPL in 2013-2014. My opinion is also based on the comprehensive treatment that the wastewater receives (1) before it enters the SDWWTP; (2) at the SDWWTP itself; and (3) at the Turkey Point reclaimed water treatment facility.

As described in the affidavit of Mr. Thomas Helton that is being submitted to the NRC simultaneously with my report, PACE's testing (which relied on industry-standard protocols) found that none of the Constituents is present in the SDWWTP's reclaimed water at or above their method detection limits (MDL).<sup>1</sup> These results are not surprising. One of the Constituents

---

<sup>1</sup> The method detection limit is the minimum concentration of a constituent that can be measured and reported with 99 percent confidence that the concentration is greater than zero, but the exact concentration cannot be reliably quantified.

– heptachlor – has not been used in the United States for more than 15 years. In addition, industrial wastewater discharges (the most likely source of the Constituents) are subject to a pre-treatment program that would remove or prevent the addition of the Constituents before that wastewater even enters the SDWWTP. Furthermore, the SDWWTP implements additional treatment processes that would reduce or eliminate any remaining Constituents.

My conclusion that concentrations of the Constituents cited in the ER and the DEIS are so extremely conservative as to be unrealistic is further based on the fact that, in the unlikely event any of the Constituents remain in the reclaimed water after treatment by industrial dischargers and the SDWWTP, the amount of such Constituents will be further degraded and removed by Turkey Point’s own reclaimed water treatment facility. And, if the Constituents were to still somehow enter Turkey Point’s circulating cooling water system despite these redundant treatment mechanisms, Turkey Point’s circulating cooling water system will strip away nearly all such Constituents, leaving no detectable Constituent concentrations remaining before the reclaimed water is injected into the Boulder Zone.

I have formed the opinions in this report based on my 44 years of experience in environmental consulting and, more specifically, my experience with potable water and industrial wastewater treatment systems. My opinion is also based on my review of the relevant portions of the Turkey Point ER and the explanation of the derivation of the Constituent concentrations provided by David M. Wagner in his declaration supporting Florida Power & Light’s Motion for Summary Disposition of Joint Intervenor’s Amended Contention 2.1.<sup>2</sup> Further details on my education and experience are provided in my resume included as Exhibit 9.

## **II. Background**

FPL is proposing to construct and operate two new nuclear power generating units, Units 6 & 7, at its Turkey Point site in Miami-Dade County, Florida. On June 30, 2009, FPL submitted a COLA, which included an ER, to the NRC seeking approval to construct and operate the Turkey Point units. As described in the ER and the DEIS, FPL plans to use reclaimed water from the SDWWTP as the primary supply of makeup water for Turkey Point’s circulating water system.

Specifically, the SDWWTP receives wastewater from homes, commercial buildings, and industrial facilities, and further treats it for discharge under a set of specific conditions under Chapter 62-600, F.A.C., which is Florida’s Domestic Wastewater Facility regulation. This “reclaimed” water will be piped from the SDWWTP to Turkey Point, where it will be further treated at Turkey Point’s own reclaimed water treatment facility and then stored in a makeup water reservoir. The treated reclaimed water will then be used at Turkey Point as cooling tower makeup and reclaimed dilution water. After its use, a portion of the reclaimed water, along with other wastewater, will be injected into the Boulder Zone of the Florida aquifer system using deep well injection pumps. DEIS at 3-10.

---

<sup>2</sup> Declaration of David M. Wagner in Support of Florida Power & Light’s Motion for Summary Disposition of Joint Intervenor’s Amended Contention 2.1 (“Wagner Decl.”) attached to FPL Motion for Summary Disposition of Joint Intervenor’s Amended Contention 2.1, dated July 19, 2012 at 8 (“FPL July 2012 Motion”). (“Wagner Decl.”).

In a revision to its ER, FPL set forth the concentrations of the Constituents that could be present in the wastewater that Turkey Point will ultimately inject into the Boulder Zone. The DEIS cites those concentrations. DEIS at 3-39. The data reported in the ER and the DEIS were based on the concentrations of the Constituents detected by the Miami Dade Water and Sewer Department (“MDWASD”) at the SDWWTP over a five-year period of time (2007-2011). FPL then cycled up<sup>3</sup> the highest of those values to reach the values presented in the ER. Joint Intervenor in the COLA proceeding have alleged that those concentrations may not be accurate and reliable, when in fact these “cycled up” concentration values are actually hyper-conservative, because three of the four Constituents are volatile in nature and therefore not subject to this additive cycling.

### **III. Analysis**

#### **A. Recent Quarterly Sampling of the SDWWTP Effluent Confirms that the Values used in the ER and DEIS are Extremely Conservative**

##### **1. PACE’s 2013-2014 Sampling Program**

The water sampling data FPL relied on in its ER to determine the presence of the Constituents in reclaimed water at the SDWWTP was collected between 2007 and 2011. As the DEIS recognizes, the SDWWTP subsequently implemented a number of improvements to its water treatment processes, including enhanced filtration and additional chlorination disinfection as required by F.A.C. 62-610, Reuse of Reclaimed Water and Land Application. *See* DEIS at 5-87. In order to obtain up-to-date data and to confirm whether the ER data are accurate, from April 2013 through February 2014 PACE performed, at FPL’s request, quarterly sampling of the SDWWTP’s reclaimed water.

The affidavit of Mr. Tom Helton describes PACE’s sampling and testing program. I reviewed that program and its results, and found that the four Constituents were not detected above their respective MDL during any sampling event. I also concluded that the samples had been collected and analyzed using approved methods capable of detecting and quantifying the Constituents. The selected analytical methods are approved for wastewater analyses and mandated for use on wastewater by 40 CFR Part 136.

Furthermore, I determined that the number of samples taken in PACE’s program provided an accurate representation of the future reclaimed water that the SDWWTP will supply to Turkey Point. In particular, PACE’s quarterly sampling was sufficient to capture the potential seasonal variability of the Constituents in the reclaimed water. The primary factor that affects such variability is temperature. Specifically, cold temperatures can inhibit the growth of the biological media that perform the treatment necessary to eliminate contaminants, such as the Constituents. However, temperatures in South Florida do not vary as significantly as they do in colder climates. Accordingly, obtaining quarterly samples is reasonable to account for potential seasonable variability at the SDWWTP.

---

<sup>3</sup> “Cycled up” means an increase in the concentration of non-volatile constituents present in the supplied water as a result of the evaporation of water when used in a recirculation cooling water system.

Of course, one could always perform more frequent sampling, such as monthly, daily or even hourly sampling. In my opinion, however, PACE's sampling was reasonable and typical in the industry. I know of no specific facts regarding the SDWWTP or the entities that discharge into that facility that would lead me to conclude that more frequent sampling is necessary. In addition, as described below, the comprehensive treatment that the wastewater receives by the industrial dischargers, and then by the SDWWTP, provides reasonable assurance that SDWWTP's wastewater will not contain Constituents at or above detection limits, even if unusual weather or other atypical events were to occur.

## **2. PACE's Quarterly Sampling Results are not Unexpected**

PACE's quarterly sampling results for the Constituents are not unexpected. This is the case because: (1) one of the Constituents, heptachlor, has not been used in the United States for almost 30 years; (2) the industrial dischargers that would be the most likely source of the Constituents are subject to strict requirements that provide safeguards against introducing the Constituents into the SDWWTP; and (3) the SDWWTP has its own treatment program that would strip out any remaining Constituents.

### **a. Heptachlor has not been used in the U.S. for More Than 15 years**

As an initial matter, heptachlor has not been used in the U.S. since 1999, and products containing heptachlor have not been used commercially in the U.S. for even longer. In 1974, the U.S. Environmental Protection Agency (EPA) proposed canceling nearly all registered uses of heptachlor with only a few exceptions, including termite and fire ant control, and those uses were subsequently voluntarily canceled in 1983. In 1988, the sale, distribution, and shipment of existing stocks of all heptachlor products were prohibited in the U.S., and heptachlor has not been used in general application since. A limited exception was made for the use of any remaining product for fire ant control in underground power transformers. In 1999, the sole manufacturer of heptachlor in the United States chose not to renew its registration with the EPA.

Indeed, the SDWWTP's testing between 2007 and 2011 reported the presence of heptachlor in only one sample, and that amount was below the applicable MDL. Specifically, the concentration of heptachlor in that one sample was listed as 0.00700 µg/L (parts per billion), which is below the MDL of 0.00710 µg/L that the laboratory analyzing the sample reported for the 3510/608 EPA method used for the analyses.<sup>4</sup> In addition, that measurement was "qualified," meaning that inconsistencies were observed within either the analytical instrumentation or the quality control procedures.<sup>5</sup> Accordingly, it is not surprising that PACE's testing did not detect the presence of heptachlor over its MDL in any of its sampling events.

---

<sup>4</sup> Letter and report from M. Pacheco, Project Manager, Genapure Analytical Services Inc. to C. Powell, Miami Dade Water & Sewer, re: Annual Sampling Log #L246684, dated February 29, 2008. The MDL established by the laboratory for a particular sample varies, depending upon the analytical method used and the quality of the sample.

<sup>5</sup> *Id.* at 13.

## **b. Industrial Wastewater Pretreatment Program**

Another reason I am confident in the conclusions reached in PACE's sampling program is that discharges into the SDWWTP are subject to federally-mandated and state-enforced permitting requirements.

As described above, no industrial or other wastewater discharger should even possess, much less discharge, heptachlor. The most common users of the other Constituents: the solvents toluene, ethylbenzene, and tetrachloroethylene, are industrial facilities. Such facilities seeking to discharge wastewater into publicly-owned treatment works (POTW) like the SDWWTP must obtain a permit from the Miami-Dade County Department of Regulatory and Economic Resources (the "Department"), and must comply with the Department's Industrial Wastewater Pretreatment Program (IWP).<sup>6</sup>

In order to obtain such a permit, the applicant must complete an Industrial Waste Pretreatment Operating Permit Application that addresses the proposed operations of the facility, industrial wastewater discharge information, pretreatment classification of facility operations, industrial wastewater effluent monitoring, wastewater treatment systems, facility storage tanks, raw materials and wastewater disposal information, safety data sheets of materials used on site, and spill/slug discharge control plans. The permit application must also specifically address the presence of various contaminants, including the Constituents, in materials or products stored or used within the industrial facilities. The applicant also must describe the program that will pretreat discharges that could potentially contain those contaminants prior to acceptance by the POTW.<sup>7</sup>

After the permit is issued, the discharging facility is subject to monitoring and reporting requirements that mandate regular sampling and analysis. The permittee is also subject to periodic unannounced monitoring and inspections by the Department, which will test for the Constituents to the extent the particular industrial facility may use them. If the monitoring or inspection reveals the Constituents in an amount above an unacceptable limit, the Department can fine the discharger, require that the discharger cease operations, or require the discharger to take actions necessary to remedy the situation.<sup>8</sup>

---

<sup>6</sup> Miami-Dade County Code of Ordinances, Part III, Chapter 24, Article III, Division I, Section 24-42.4; *See also* State of Florida Domestic Wastewater Facility Permit, FDEP Permit No. FLA042137-020-DW1P, Section VII.

<sup>7</sup> *See* Miami-Dade County Industrial Waste Operating Permit Application available at <http://www.miamidade.gov/permits/library/industrial-waste-pretreatment.pdf>

<sup>8</sup> Miami-Dade County Code of Ordinances, Part III, Chapter 24, Article I, Division I, Sections 24-29 and 30.



### **c. Reclaimed Water Treatment at the SDWWTP**

In addition to the permitting and pretreatment described above, there is reasonable assurance that the SDWWTP itself has the capability to effectively treat the domestic and industrial wastewater that it receives. The SDWWTP has obtained a permit from the FDEP that requires daily monitoring of the effluent concentrations of conventional pollutants.<sup>9</sup> Of these monitored pollutants, the parameters of biological oxygen demand and total suspended solids are used to determine that the treatment system is effectively reducing the pollutant loads. If this monitoring indicates that the treatment system is operating properly, then there is reasonable assurance that the SDWWTP is effectively removing any Constituents that remained in the domestic and industrial wastewater it receives. If the treatment system is not operating properly, the SDWWTP cannot provide reclaimed water to Turkey Point, since it is obligated to provide reclaimed water meeting certain specifications.

The SDWWTP's permit also mandates annual sampling and reporting on certain primary and secondary drinking water standards on an annual basis.<sup>10</sup> These drinking water standards specifically include the Constituents.<sup>11</sup>

Moreover, as the DEIS recognizes, additional disinfection of the reclaimed water at the SDWWTP began in early 2013, as part of the Miami-Dade County High-Level Disinfection (HLD) Project. See DEIS at 5-87. This consists of upgraded filtration and chlorination systems to comply with FDEP requirements. The SDWWTP's enhanced filtration system reduces the suspended solids in the treated wastewater in order to enhance the effect of chlorination on bacteria and viruses. When the suspended solids are removed, constituents, including all four Constituents, that are adsorbed onto the wastewater treatment solids are also removed, and a higher level of disinfection is achieved.

## **B. The Constituents, if any, will be Removed by Further Treatment at the Turkey Point Plant and Through Operation of the Plant's Circulating Water System**

### **1. Reclaimed Water Treatment at Turkey Point**

In addition to treatment by industrial users and the SDWWTP as described above, the reclaimed water will be further treated at Turkey Point's own reclaimed water treatment facility before it enters the plant's storage and circulating water systems. As described in the DEIS, this will involve an integrated treatment train consisting of flow equalization, continuous water quality monitoring, flow metering, dechlorination, nitrification, possibly chemical phosphorous removal, clarification, pH adjustment, deep filter bed denitrification, chlorination, and water quality monitoring. This reclaimed water treatment system is designed to remove the nutrients of nitrogen and phosphorous from the reclaimed water and in doing so provide redundant

<sup>9</sup> FDEP Permit No. FLA 042137-020-DW1P at pp. 3-5.

<sup>10</sup> FDEP Permit No. FLA 042137-0200-DW1P, I.B.8., at 11 *citing* F.A.C. 62-550.

<sup>11</sup> F.A.C. 62-550 at Table 4 and Table 5.



treatment to that provided by the SDWWTP.<sup>12</sup> Accordingly, this process will further remove any of the remaining Constituents should they be present.

As a conservatism, the concentrations for these Constituents that appear in the ER and the DEIS did not take these treatment processes and their capabilities into account.<sup>13</sup>

## **2. Turkey Point's Circulating Water System**

In addition, the Turkey Point plant will have a "circulating cooling water system" that provides a heat sink for waste heat exhausted from the steam turbines to the main condenser and dissipates this heat to the atmosphere using cooling towers. The design of the circulating water system cooling towers at Turkey Point will act to further remove or "strip" any toluene, ethylbenzene, and tetrachloroethylene that remains in the reclaimed water after it is processed through the SDWWTP's and Turkey Point's reclaimed water treatment facilities.

The circulating water system for each Turkey Point unit consists of three circulating water pumps; three mechanical draft cooling towers; and associated piping, valves, and instrumentation. The mechanical draft cooling towers remove the heat from the cooling water by the counter current flow of water and air through the cooling tower. During each pass through the cooling tower, a significant portion of the reclaimed water flow will be lost to evaporation in the countercurrent air stream and the water is cooled from approximately 115 degrees Fahrenheit (°F) to approximately 91°F.<sup>14</sup>

The warmer water of the circulating water system tends to expel or volatilize the more volatile constituents (i.e. toluene, ethylbenzene, and tetrachloroethylene) from the water, similar to what one would experience if the water were to be boiled.

In this process, the circulating water system cooling towers act to remove volatile constituents, stripping them from the water. Although the cooling towers are not designed specifically to be air strippers, the evaporation of water and the loss of heat energy expose the water that remains to the airflow, which transfers the more volatile constituents to the air from the water. Air stripping is a recognized method of removing volatile organic compounds (VOCs) such as toluene, ethylbenzene and tetrachloroethylene from water streams, and air

---

<sup>12</sup> See DEIS at 5-87 citing Letter from W. Maher re: "Florida Power & Light Company Proposed Turkey Point Units 6 and 7, Docket Nos. 52-040 and 52-041, Response to Request for Additional Information Letter 120403 (RAI 6350 Rev. 1) Related to ESRP Section 5.8.1 – Etiological Agents", dated May 21, 2012 (Available at ADAMS Accession No MLML12143A356); See also FDEP Permit No. FLA 042137-0200-DW1P, I.B.8., page 11.

<sup>13</sup> Wagner Decl. at ¶9.

<sup>14</sup> See Turkey Point Final Safety Analysis Report ("FSAR"), Rev. 6 at 10.4-15.

strippers are designed using the same principles that are used in the circulating cooling water towers.<sup>15</sup>

#### **IV. Conclusions**

For the reasons set forth above, in my opinion the concentrations of the Constituents that appear in Table 3-5 of the DEIS (and FPL's ER) are so extremely conservative as to be unrealistic. The probability of detectable concentrations of toluene, ethylbenzene, tetrachloroethylene, and heptachlor in the reclaimed water used by Turkey Point and ultimately discharged into the Boulder Zone is so remote as to not warrant further environmental consideration.

My conclusions are based on the results of sampling and testing of SDWWTP reclaimed water performed in 2013-2014 by PACE, and the facts that, prior to deep well injection into the Florida Boulder Zone the water at issue will be: (1) subject to the Miami-Dade Industrial Wastewater Pretreatment Program; (2) treated at the SDWWTP, which now includes high level disinfection; (3) treated at Turkey Point's reclaimed water treatment facility; and (4) cycled through Turkey Point's circulating water system.

---

<sup>15</sup> See e.g. "Meet the Cousin of the Cooling Tower .... The Air Stripper" available at <http://deltacooling.com/meet-the-cousin-of-the-cooling-tower-the-air-stripper/>