UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

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

PRE-FILED REBUTTAL TESTIMONY OF MR. DAVID MCNABB

Introduction

Please state your name and business address.

1. My name is David McNabb. My business address is 4600 Military Trail, Suite 116, Jupiter, Florida 33458.

Please describe your employer and position.

2. I am president of McNabb Hydrogeologic Consulting, Inc.

Have you previously submitted testimony in this proceeding?

3. I previously provided sworn direct testimony in this proceeding: the Pre-Filed Direct Testimony of Mr. David McNabb (FPL-002).

In addition to your work described in your Pre-Filed Direct Testimony, what have you done to prepare this Pre-Filed Rebuttal Testimony?

4. I have reviewed the Intervenors' Initial Written Statement of Position Regarding Contention 2.1, as well as the Prefiled Initial Testimony of Mr. Quarles (hereinafter "Quarles Prefiled Initial Testimony"). I have also reviewed the Nuclear Regulatory

Commission (NRC) Staff Initial Statement of Position and the NRC Staff Testimony Concerning Contention 2.1. Lastly, I have reviewed the Pre-Filed Direct Testimony of Dr. Robert Maliva (FPL-003), as well as the Pre-Filed Direct Testimonies of Mr. Paul Jacobs (FPL-001) and Dr. Christopher Teaf (FPL-004).

What is the purpose of your Rebuttal Testimony?

5. The purpose of my Rebuttal Testimony is to address portions of the Quarles Prefiled Initial Testimony regarding the interpretation of data from EW-1 and the ability of monitoring to detect any leak or upward migration of wastewater at Turkey Point.

Discussion

Has anything in Mr. Quarles' Prefiled Initial Testimony caused you to doubt the conclusions stated in your direct testimony?

6. No. Mr. Quarles' Prefiled Initial Testimony misinterprets the relevant data. The core laboratory data, combined with the geophysical log data and straddle packer testing results that I describe in my Direct Testimony (*see, e.g.*, FPL-002 at ¶¶ 21-38) clearly demonstrate the presence of a 1,465-foot thick confining unit at the site. Turkey Point's wastewater injection wells will be constructed in accordance with current rules and regulations in a manner that will not allow leakage from injection wells. Mr. Quarles also misrepresents the frequency of monitoring at Turkey Point. The monitoring system that will be installed as part of the injection well system will effectively monitor the injection wells for leaks and upward migration of injected fluid.

Do you still believe that the data from EW-1 supports the existence of an adequate confining layer at Turkey Point?

7. Yes. As I explained in my Direct Testimony (FPL-002 at ¶¶ 17, 31-38), laboratory analysis of core samples collected within the Middle Confining Unit demonstrate low vertical hydraulic conductivity. The core sample data, combined with the geophysical logging data (showing the absence of fracturing or faulting within the Middle Confining Unit) and the straddle packer testing results (showing that the tested intervals have very low fluid productivity), demonstrate the confining characteristics of the Middle Confining Unit at the site.

Well EW-1

Mr. Quarles testified that the use of one exploratory well is not sufficient to support a determination as to the likelihood of confinement. Quarles Prefiled Initial Testimony at A14. Do you agree?

8. No. The hydrogeology of the Floridan Aquifer System does not vary significantly over short distances, i.e. within a few miles. Each of the proposed injection wells will be located within a 1-mile radius of EW-1. The presence of vertically extensive confinement at EW-1 provides assurance that vertically extensive confinement will be present at each of the proposed injection wells.

Mr. Quarles claims that the EW-1 Analysis contains methodological flaws. Quarles Prefiled Initial Testimony at A14. Do you agree?

9. No. First, Mr. Quarles' contention that the EW-1 data evaluation is methodologically flawed because drill cuttings were used in the confinement evaluation is incorrect. One of the standard data sources used in the industry to conclude the presence of confinement at a site is drill cuttings produced during the drilling process.

10. Second, Mr. Quarles' contends that an insufficient amount of rock cores were collected. According to Mr. Quarles, cores should have been collected for the "entire 3,230-foot deep well." Quarles Prefiled Initial Testimony at A14. The coring program for EW-1, however, was properly limited consistent with industry standards to evaluating the confining unit, not the entire depth of the well. A total of 10 rock cores were collected in the relevant area, providing a sufficient sampling of the anticipated confining unit to allow evaluation of its confining characteristics. Samples of the cores were sent to a laboratory for analysis, and those samples clearly demonstrated confining characteristics.

11. Finally, these two analyses did not stand alone. The drill cuttings and rock core samples were combined with additional data sources, including geophysical logs and the results of inflatable straddle packer testing, to reach a conclusion. These data sources are the primary tools used in the industry to identify the adequacy of confinement. Each data source independently suggests the presence of a 1,465-foot thick confining unit at the site, and when the data sources are combined it leaves no doubt that confinement is present over the interval from 1,450 to 2,915 feet.

Mr. Quarles testified that low percent bedrock recoveries indicate an ineffective confining unit. Quarles Prefiled Initial Testimony at A10 - A11. How, if at all, do the low percent bedrock recoveries from EW-1 impact a finding of confinement?

12. Not at all. There is no correlation between core recovery percentage and the presence or absence of vertical confinement. Percent recovery is a measure of the amount of rock core recovered versus the amount of cored interval, not "how much of the bedrock core sample from a specified sample interval actually contains bedrock rather than voids," as Mr. Quarles incorrectly asserts in paragraph A11. Laboratory measurements of core

samples for vertical hydraulic conductivity ranged from 5.4 x 10^{-4} cm/second to 1.1 x 10^{-6} cm/second, demonstrating that each of the core samples are confining in nature. Paragraphs 35 and 36 of my Direct Testimony (FPL-002) explain this in greater detail.

Mr. Quarles testified that high percent porosity of bedrock intervals indicates ineffective confinement. Quarles Prefiled Initial Testimony at A10, A12. How, if at all, does the high percent porosity of bedrock intervals from EW-1 impact a finding of confinement?

13. Not at all. Porosity is not a measure of the confining characteristics of the rocks. Rock with a relatively high porosity can have a low permeability if the individual pores within the rock are not interconnected. As I noted above, laboratory analysis of core samples collected in the Middle Confining Unit during construction of EW-1 demonstrated low vertical hydraulic conductivity ranging from 5.4 x 10^{-4} cm/second to 1.1 x 10^{-6} cm/second. This range is indicative of confinement. Paragraphs 35 and 36 of my Direct Testimony (FPL-002) explain this is greater detail.

Mr. Quarles testifies that inconclusive straddle packer testing indicates ineffective confinement. Quarles Prefiled Initial Testimony at A10, A13. How, if at all, does the inconclusive straddle packer testing from EW-1 impact a finding of confinement?

14. Straddle packer testing conclusively demonstrated the presence of the confining unit. When the packers were able to isolate the test interval by sealing against the borehole wall, confinement was clearly demonstrated. Paragraphs 37 and 38 of my Direct Testimony (FPL-002) explain this in greater detail.

Mr. Quarles claims that there is highly weathered bedrock at Turkey Point that might lead to upward migration. Quarles Prefiled Initial Testimony at A29. Please respond.

15. Highly weathered rock is located in the Boulder Zone, which is below the confining unit. It is *not* present in the confining unit, overlying the Boulder Zone, and the confining unit is what matters when determining the likelihood of upward migration.

Mr. Quarles states that FPL's "failure to use [seismic-reflection analysis] is unjustifiable." Quarles Prefiled Initial Testimony at A14. Is a seismic-reflection analysis required before the use of a Class I injection well? Why or why not?

16. A seismic-reflection analysis is not required under the Florida Department of Environmental Protection's (FDEP) regulations, nor is it necessary, for permitting a Class I injection well. This is because such an analysis only identifies structures in the subsurface; it does not provide data related to the confining characteristics of the rock or groundwater flow, which is the relevant information one needs to determine whether to permit a well.

Mr. Quarles also claims that recent studies have shown that the Middle Confining Unit is "now characterized as consisting of two 'semi-confining' units *because of their tendency to leak*." Quarles Prefiled Initial Testimony at A15 (emphasis added). Do you agree?

17. I do not agree. Laboratory analysis of site-specific core samples collected within the Middle Confining Unit clearly demonstrates low vertical hydraulic conductivity. That analysis, combined with the geophysical logging data and straddle packer testing results described above and in my Direct Testimony (FPL-002 at ¶ 31), clearly demonstrate the confining characteristics of the Middle Confining Unit.

Well Adequacy

Mr. Quarles claims that the design and testing of the wells at Turkey Point will not prevent leaks. Quarles Prefiled Initial Testimony at A19, A27. What is your opinion on that topic?

18. The injection wells were designed to prevent upward migration of injected fluids in accordance with Florida Administrative Code (FAC) Section 62-528. Fluid would need to pass through numerous barriers (fiberglass reinforced plastic, steel, and cement) to leak from the injection well. If a leak in the well were to develop, there would be an immediate loss of pressure in the annular monitoring system, which would serve to notify FPL of the leak. Cement bond logging performed on the final casing of EW-1 demonstrated that the cement holding the casing in place was fully bonded to the casing, removing the possibility of fluid movement along the casing. Paragraphs 39 through 43 of my Direct Testimony (FPL-002) address these issues in greater detail.

Mr. Quarles also claims that FPL's groundwater monitoring system will not be able to detect leaks before they enter the Upper Floridan Aquifer. Quarles Prefiled Initial Testimony at A19, A28. What is your opinion?

19. In my professional opinion, the groundwater monitoring system will be able to detect leaks before they enter the Upper Floridan Aquifer. The dual-zone monitoring wells and their proximity to the injection wells are designed to detect leaks. As required under FDEP regulations (FAC 62-528.425), and consistent with industry standards, the monitoring wells will be constructed within 150 feet of the injection well with a lower monitor zone located below the base of the Underground Source of Drinking Water (USDW). This allows detection of migrating fluids before they can reach the Upper Floridan Aquifer.

20. Also, while Mr. Quarles only acknowledges "quarterly or semi-annual sampling frequencies" (Quarles Prefiled Initial Testimony at A28), there were will be much more frequent, and in some cases continuous, monitoring. As required under FDEP regulations, both monitor zones of the dual-zone monitor well will be sampled on a weekly basis for the first six months to two years of operation, after which the sampling frequency will be reduced to monthly. *See also* McNabb Direct Testimony (FPL-002) at ¶ 44. The frequent sampling, proximity of the monitor well to the injection well, along with continuous monitoring of the water level of both monitor zones will allow leaks to be detected by the monitoring wells. Paragraphs 44 through 49 of my Direct Testimony (FPL-002), address these issues in greater detail.

Mr. Quarles claims that properly installed wells may create vertical conduits because the "process is risky." Quarles Prefiled Initial Testimony at A29. Do you agree?

21. No. Properly constructed injection wells do not create vertical conduits for fluid migration. To the contrary, current construction techniques remove all risk of creating a vertical conduit during construction by backplugging all pilot holes that go through the confining unit with cement and careful cementing of casings in place. The few injection well systems that have leaked, such as those at the South District Plant, were constructed more than 25 years ago. At that time, pilot holes remained open, sometimes acting as a direct conduit for injected fluid to move upwards. Currently, pilot holes going through the confining unit are backplugged with cement, removing that risk. Paragraphs 40 and 41 of my Direct Testimony (FPL-002) address these issues in greater detail.

General

Is there anything else that you would like to address in Mr. Quarles' testimony?

22. As was the case in the affidavits he submitted earlier in this proceeding, in his Prefiled Initial Testimony Mr. Quarles continues to misinterpret the data collected during construction of EW-1. For example, relatively low core recovery percentage in exploratory well testing is related to difficulty in obtaining core samples, not the presence of voids as Mr. Quarles contends. Quarles Prefiled Initial Testimony at A11. Laboratory analysis of core samples (collected in the Middle Confining Unit) from EW-1 demonstrated low vertical hydraulic conductivity of each of the core samples. In addition, the "failed" straddle packer tests referenced by Mr. Quarles (Quarles Prefiled Initial Testimony at A13) are related to the inability of the packers at certain times to create a seal with the borehole wall, rather than a demonstration of a lack of confinement. The straddle packer test data that were obtained demonstrate the confining unit at the site is highly confining. The geophysical logging data demonstrate an absence of cavities or vertical fractures in the confining unit.

23. Mr. Quarles also relies purely on speculation, unsupported by any scientific fact, study, or analysis, when he claims that the wells will leak and that the monitoring system will be unable to detect those leaks. *See* Quarles Prefiled Initial Testimony at A27 and 28. The proposed wells will be constructed in accordance with techniques that have been proven to prevent leaks, and the wells will be monitored in accordance with well-established industry practice and applicable regulations. There is no reason to expect that the well construction or monitoring will be insufficient to prevent or detect leaks.

In your expert opinion will the wastewater contaminate the USDW or a potable water supply?

24. No, in my opinion injected wastewater will not contaminate the USDW or a potable water supply. Tests performed during construction of EW-1 leave no doubt of the presence of an effective 1,465-foot thick confining layer between the injection zone and the base of the USDW. The data give no evidence of faulting and vertical fracturing within the confining unit.

Does this conclude your rebuttal testimony?

25. Yes.

I, David McNabb, swear under penalties of perjury that the foregoing testimony is true and correct to the best of my knowledge and belief.

Signature

3/23/17

Date