

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 DR. CHRISTOPHER M. TEAF

Introduction

Please state your name and business address.

1. My name is Dr. Christopher M. Teaf. My business address is 2976 Wellington Circle West, Tallahassee, FL.

Have you previously submitted testimony in this proceeding?

2. Yes. I previously provided sworn direct testimony in this proceeding, identified as Pre-Filed Direct Testimony of Dr. Christopher M. Teaf (FPL-004).

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

3. I have reviewed the Joint Intervenors' Initial Written Statement of Position Regarding Contention 2.1 and the Prefiled Initial Testimony of Mark A. Quarles (Quarles Prefiled Initial Testimony). I have reviewed the Nuclear Regulatory Commission (NRC) Staff Initial Statement of Position and the NRC Staff Testimony. I also reviewed the Pre-Filed Direct Testimony of Mr. David McNabb (FPL-002), as well as the Pre-Filed Direct

Testimony of Mr. Paul Jacobs (FPL-001) and the Pre-Filed Direct Testimony of Dr. Robert Maliva (FPL-003).

What is the purpose of your Rebuttal Testimony?

4. The purpose of my Rebuttal Testimony is to respond to certain portions of the Quarles Prefiled Initial Testimony.

Discussion

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

5. No.

According to Mr. Quarles, the FEIS's determination that impacts from the four constituents will be small is based on the "incorrect conclusion that there is a safe concentration of" the four constituents. Quarles Prefiled Initial Testimony at A19. Is there a safe concentration for the four constituents?

6. Yes, there is. The U.S. Environmental Protection Agency (USEPA) has developed Maximum Contaminant Levels (MCLs) for the four constituents at issue in this case (and numerous other substances) in drinking water. Those drinking water standards were developed under the Safe Drinking Water Act and National Primary Drinking Water Regulations applicable to public water systems. Primary standards protect public health by limiting levels of contaminants in public drinking water. *See* FPL-057 at 003. Concentrations of the four constituents equal to or less than MCL standards are considered safe for consumption in drinking water.

Do you agree with Mr. Quarles that “the constituents could cause potential adverse harms to the groundwater in the Upper Floridan Aquifer?” Quarles Prefiled Initial Testimony A20.

7. No, though I am not professionally familiar with his phrase “adverse harm.” As stated in my Pre-Filed Direct Testimony (FPL-004 at ¶ 59), the constituents of interest are all conservatively assumed to be present at concentrations listed in FEIS Table 3-5 that are less than federal drinking water standards and, as such, do not pose a public health risk from a drinking water perspective.

Do you agree with Mr. Quarles that “[a]ny concentration of the [four] constituents above zero could cause adverse impacts?” Quarles Prefiled Initial Testimony at A21?

8. No. As I stated in my Pre-Filed Initial Testimony (FPL-004 at ¶¶ 55, 56), Mr. Quarles evidently does not understand a basic principle of toxicology, which is that the simple *presence* of an agent, including these four constituents, in an environmental medium such as water, is not sufficient to assess exposure or significance of exposure. In order to determine whether any actual health risk may exist from a potential exposure, it is critical to determine a potential dose based on measured or calculated chemical concentrations and intake rates that may then be compared to health-based risk guidelines.
9. In response to Mr. Quarles’ position that any concentration “above zero” is unacceptable, it is also worth reviewing data for the 2013-2014 period of sampling, following implementation of advanced disinfection processes by the South District Wastewater Treatment Plant. Those 2013-2014 data do not show even a *single* detection of any of the four chemicals of interest, illustrating the qualitative change in water quality that is achieved by the new treatment processes. The new data, based on that treatment, represent a quantity of essentially “zero.” *See generally* FPL-041 to 046.

Mr. Quarles' testimony references the EPA's Maximum Contaminant Level Goal or MCLG. Quarles Prefiled Initial Testimony at A21. What is an MCLG?

10. An MCLG is a health-based goal set at a level at which no adverse health effects may arise, with a significant margin of safety. MCLGs are the starting point from which legally enforceable MCL standards are set. For potential carcinogens such as heptachlor and tetrachloroethylene, MCLGs are very conservatively set at zero, which clearly represents zero risk. USEPA uses MCLGs to represent a non-enforceable public health goal. The agency recognizes that it is not technically possible to detect whether a true zero concentration has ever been attained and treatment systems may not be able to effectively remove chemicals in their entirety from public water supplies due to technology limitations. *See e.g.*, FPL-057 at 004; FPL-059 at 109-110. The USEPA considers an increased cancer risk range of 10^{-6} to 10^{-4} to be acceptable in applications of risk-based criteria, and concludes that MCLs for carcinogens protect human health because they fall within that acceptable risk range. FPL-059 at 075.

What are the EPA MCLGs for toluene and ethylbenzene?

11. The MCLG for ethylbenzene is 0.7 mg/L. The MCLG for toluene is 1 mg/L. The MCLs and MCLGs for these chemicals are the same. Ethylbenzene and toluene concentrations in the injectate water at issue in this case are far less than the MCL and MCLG for each chemical.

Is Mr. Quarles correct when he says that “[t]he MCLG is the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety?” Quarles Prefiled Initial Testimony at A21.

12. Although the definition of MCLG is correct as presented, Mr. Quarles failed to include an important qualifying statement by the USEPA regarding the application of MCLGs. That

qualifying statement reads “MCLGs are non-enforceable public health goals. MCLGs consider only public health and not the limits of detection and treatment technology effectiveness. Therefore, they sometimes are set at levels which water systems cannot meet because of technological limitations.” FPL-057 at 004. Primary standards (MCLs) are sufficient to protect the public health by limiting levels of contaminants in public drinking water (FPL-057 at 003), while MCLGs are much more conservative.

Do you agree with Mr. Quarles that the MCLG “should have been used to determine whether the environmental impact of the constituents would be ‘SMALL?’” Quarles Prefiled Initial Testimony at A21?

13. No. In my professional opinion, using MCLGs alone to determine the environmental impact of the constituents is completely inconsistent with how qualified professionals in the human health risk assessment field make such determinations. To suggest otherwise discloses a fundamental unfamiliarity with how the process is conducted. The MCLG is a highly conservative value and, because of the large margin of safety, detection of a chemical above the MCLG but below the MCL does not indicate a meaningful human health risk. The simple existence of an MCLG is not an indicator that such a number must, or even should, be used as a unique benchmark for environmental impact. On the contrary, the fact that the four constituents exist at concentrations below their respective federal drinking water standards, and thus would be permitted in any federally regulated drinking water supply, represents the functional definition of a “small” impact.

Since you disagree with Mr. Quarles' claim that environmental impacts should be determined using the MCLG, what should be used?

14. The applicable standards that should be used in this instance, and that would be used by qualified professionals in the field, are the MCLs. Those primary standards are

regulations that the USEPA sets to control the level of contaminants in public drinking water systems. MCLs are legally enforceable standards that are designed to protect the quality of public drinking water supplies. FPL-057 at 003. They are protective of human health and fall within the USEPA's defined risk range for carcinogens. FPL-059 at 110.

Do you agree with Mr. Quarles that “[e]ven at minute concentrations, tetrachloroethylene can cause nausea, liver damage, impaired heart function, and death?” Quarles Prefiled Initial Testimony at A21.

15. No. As I stated in my Pre-Filed Direct Testimony (FPL-004 at ¶¶ 52, 53, and 54), Mr. Quarles apparently does not understand the information regarding tetrachloroethylene that he cites. According to the ATSDR document that forms the basis for the ToxFAQ for tetrachloroethylene that Mr. Quarles referenced (FPL-031), impaired heart function was not indicated as a potential health effect, and liver effects were only reported in animal studies. A single case of obstructive jaundice and hepatomegaly was reported in an infant exposed to tetrachloroethylene in breast milk at a concentration approximately *2,800 times* greater than the concentration set forth in FEIS Table 3-5, and nausea was not reported as a potential health effect by any exposure route. Also, it is nonsense for Mr. Quarles to list “death” as a potential health effect that is relevant to a drinking water discussion, since death would be of interest only from a highly unusual, massive acute exposure that would clearly not be related to “minute concentrations.”

Do you agree with Mr. Quarles that “even at minute concentrations,” heptachlor can negatively affect the immune and nervous systems? Quarles Prefiled Initial Testimony at A21.

16. No. As stated in my Pre-Filed Direct Testimony (FPL-004 at ¶ 43), Mr. Quarles seems to not understand the information regarding heptachlor that he cites. According to the ATSDR ToxFAQ for heptachlor that Mr. Quarles referenced, and the ATSDR document

(FPL-038) that forms the basis for that ToxFAQ, there is no reliable information on the health effects of heptachlor in humans. FPL-038 at 025. The immune and nervous system effects listed by Mr. Quarles were reported in animals only at doses that are tens of thousands of times above those that would be associated with potential concentrations in the injectate water, in the unlikely event that water would be actually consumed. Mr. Quarles' statement that these effects are the potential result of exposure to "minute concentrations" is an inaccurate, dramatic, and irresponsible exaggeration.

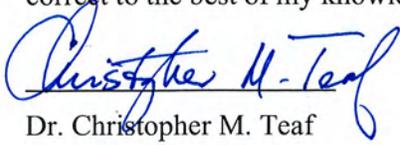
Now that you have read Mr. Quarles' Initial Testimony and Exhibits, have you formed an opinion regarding the credibility of his testimony in toxicology and human health risk assessment?

17. Yes. Mr. Quarles' stated expertise is in the field of geology, not toxicology or human health risk assessment. Mr. Quarles' curriculum vitae lacks any evidence of professional training or education in the fields of toxicology or human health impacts. Accordingly, as I describe above, his opinions are inconsistent with those that would be held by a trained toxicologist. As a result, I believe that his testimony regarding toxicological issues is not credible.

Does this conclude your rebuttal testimony?

18. Yes.

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



Dr. Christopher M. Teaf

23 March 2017

Date