UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)		
	)	Docket Nos.	52-029-COL
Progress Energy Florida, Inc.	)		52-030-COL
	)		
(Combined License Application for	)		
Levy County Nuclear Plant, Units 1 and 2)	)	ASLBP No.	09-879-04-COL

PRE-FILED DIRECT TESTIMONY OF
Dr. George C. Howroyd
Regarding Salt Emissions and Salt Deposition from Cooling Towers

I. BACKGROUND AND PROFESSIONAL QUALIFICATIONS

Q1. Please state your name and business address.

A1. My name is Dr. George Howroyd. My address is 1000 Abernathy Rd., Suite 1600, Atlanta, Georgia 30328.

Q2. Please state your employer and position.

A2. I am employed by CH2M HILL, a Denver, Colorado based engineering firm. I currently hold the positions of Vice President, and CH2M HILL Technology Fellow.

Q3. Please describe your professional qualifications and experience.

A3. I hold a Doctorate degree in Mechanical Engineering, a Master of Science degree in Mechanical Engineering, and a Bachelor of Science degree in Mechanical Engineering, all from the University of Waterloo, in Ontario, Canada. I have been licensed as a Professional Engineer in Georgia since 1984, licensed as a Professional Engineer in Mississippi since 1993, and I have been certified by the American Meteorological Society as a Certified Consulting Meteorologist since 1983. In 2010, I was appointed by the Governor of Georgia to the Georgia State Board of Registration for Professional Engineers and Land Surveyors. A more detailed statement of my professional qualifications is provided in my Curriculum Vitae. PEF502. In addition, I have over 30 years experience as an environmental and engineering consultant performing air quality and environmental evaluations and assessments of industrial facilities, including nuclear and fossil fueled power plants. These evaluations include numerous and extensive air quality modeling studies of air emissions from a variety of sources, including natural draft and mechanical draft cooling towers used for process cooling. For example, I have calculated the emissions of liq-

uids, vapors, and particulate matter (including salt) from cooling towers at industrial and power generating facilities. I have modeled or supervised the modeling of those emissions to quantify the maximum potential impacts of cooling tower operation on the environment in terms of cooling tower plume length and height, cooling tower plume visibility, fogging, icing, ambient concentrations of particulates, and the amount of deposition of particulates, including salts, to the ground surface.

Q4. What is the purpose of your testimony?

A4. The purpose of my testimony is to address, at the request of Progress Energy Florida, Inc. ("PEF")[1], certain aspects of Contention 4A, Part B as admitted by the Nuclear Regulatory Commission's ("NRC") Atomic Safety and Licensing Board ("ASLB") in the Levy County Nuclear Plant, Units 1 and 2 ("LNP") Combined Construction Permit and Operating License ("COL") proceeding. As admitted by the ASLB, Part B of Contention 4A asserts that "[t]he Draft Environmental Impact Statement (DEIS) fails to comply with 10 C.F.R. Part 51 and the National Environmental Policy Act because it fails to specifically and adequately address, and inappropriately characterizes as SMALL, certain direct, indirect, and cumulative impacts, onsite and offsite, of constructing and operating the proposed LNP facility [including] … Impacts to wetlands, floodplains, special aquatic sites, and other waters, associated with salt drift and salt deposition resulting from cooling towers (that use salt water) being situated in an inland, freshwater wetland area of the LNP site."

Q5. What aspects of Part B of Contention 4A will you address in your testimony?

A5. My testimony focuses on quantifying the cooling tower salt drift emissions that will result from operation of the LNP and the deposition of those emissions. The testimony of Dr. Eldon C. Blancher (PEF600) addresses the potential for environmental impacts from those salt drift depositions.

Q6. Are you knowledgeable of matters regarding Contention 4A, Part B?

A6. Yes. I am knowledgeable regarding matters relating to the magnitude of salt that will be present in what is referred to as "cooling tower drift" emitted from the proposed LNP's mechanical draft cooling towers. (Cooling tower drift is characterized by water droplets and suspended or dissolved particulate matter, including salts, that are emitted in the ex-

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1 For the convenience of the reader, PEF501 lists selected acronyms used in this testimony and their meanings.

haust stream from mechanical draft cooling towers similar to those that will be used at the LNP.) I also am knowledgeable regarding the predicted rate of deposition of salts to the ground surface in areas on, and surrounding, the LNP site that would result from cooling tower drift emissions.

Q7. What has been your role in the LNP project relevant to Contention 4A, Part B?

A7. As the lead for air quality and meteorology, I have spent over 5 years assisting PEF in preparing the Environmental Report ("ER") and supporting documentation that was included in PEF's COL Application ("COLA") for the LNP. I also assisted PEF in responding to questions and requests for additional information from the NRC. Specifically, I was the Subject Matter Expert responsible for evaluating and documenting potential impacts on ambient air quality that could result from constructing and operating the LNP, including, but not limited to, evaluating air emissions (including salts contained in cooling tower drift emissions) from the facility's two banks of mechanical draft cooling towers. These evaluations included performing extensive air quality dispersion modeling studies of water vapor, particulate matter, and salt emissions from the LNP mechanical draft cooling towers. I also have reviewed the pleadings filed by the intervenors in this proceeding with respect to cooling tower salt drift and the affidavits on the subject submitted earlier in this proceeding by Dr. Sydney Bacchus.

II. OVERVIEW

Q8. Please summarize your testimony.

A8. My testimony describes the comprehensive dispersion modeling analysis of the deposition of salts resulting from cooling tower operation at the LNP. This analysis was performed under my direction at CH2M HILL and was designed to facilitate an assessment of the potential for environmental impacts attributable to salt deposition resulting from cooling tower operation. The dispersion modeling analysis was performed to calculate the maximum potential onsite and offsite deposition of salt emissions in the area surrounding the LNP. When performing that analysis, we used an Environmental Protection Agency ("EPA") developed dispersion model (as described in my testimony below) to conservatively predict the maximum rate of particulate matter deposition to the ground surface resulting from the operation of the LNP cooling towers. The results of this analysis show: (1) a maximum offsite salt deposition rate of 6.81 kilograms/hectare/month ("kg/ha/mo") (6.13 pounds/acre/month [lb/ac/mo]); and (2) a maximum onsite salt deposition rate of 10.75 kg/ha/mo (9.68 lb/ac/mo). In his direct testimony, Dr. Blancher uses

these maximum predicted deposition rates to evaluate the impacts of salt deposition on the aquatic resources at and surrounding the proposed LNP. The NRC Staff accepted and included these maximum predicted deposition rates in the FEIS. See, e.g., NRC001, Section 5.3.1.1, at pp. 5-20 through 5-21, 5-24; NRC001, Section 5.4.1.1, at p. 5-63; NRC001, Section 5.7.2, at p. 5-86.

III. DESCRIPTION OF COOLING TOWER AND SOURCE OF SALT DRIFT

Q9. Describe the basic design of the LNP as it relates to Contention 4A, Part B.

A9. The LNP will be a two-unit AP1000 nuclear-fueled, power-generating facility, with steam condensers that will be water cooled using a non-contact, closed-loop, cooling system. NRC001, Section 3.4.2.1, at p. 3-25. Heat rejection will be to the atmosphere, and will be accomplished using two banks of mechanical-draft, evaporative cooling towers. PEF503 at p. 5-37.

Q10. Please describe the LNP cooling towers and how they will work.

A10. The LNP will utilize two banks of low-profile mechanical-draft, evaporative cooling towers, one for each reactor, to cool the steam condensers in each reactor's power generation cycle. Each cooling tower bank will consist of 44 individual "cells" that will each include a forced-draft fan to move air across a heat exchanger. PEF503 at p. 5-37. Hot water from the steam condensers will be circulated through the cooling tower heat exchangers in a "closed loop," "closed cycle," or "non contact" system, while cooling water will be simultaneously circulated through the towers and across the heat exchangers to cool the heat exchangers. NRC001, Section 3.4.2.1, at p. 3-25. The closed cycle system will prevent any contact between the process water being circulated for cooling (steam condenser water) and the cooling water being circulated in the cooling towers. During the condenser water cooling process, the temperature of the cooling water will increase, resulting in the evaporation of cooling water and the release of a substantial quantity of pure-water vapor to the atmosphere, some of which may be visible for a short distance from the cooling towers. In addition to the pure-water vapor emitted from the cooling towers, a relatively small amount of liquid water is entrained (as small droplets) in the fan-induced, high-velocity air stream through the cooling tower cells. The water droplets in the cooling tower exhaust are referred to as "cooling tower drift." Cooling tower drift droplets will contain, in addition to pure water, solids consisting of inert material and naturally occurring salts and minerals. PEF503 at pp. 5-36 through 5-39.

Q11. What will be the source of water for the LNP cooling towers?

A11. Water for the LNP cooling towers will be pumped from the Cross Florida Barge Canal ("CFBC"), which is directly connected to the Gulf of Mexico, the ultimate source of cooling water for the plant. PEF503 at pp. 2-8, 2-81 and 2-100. Because of the infiltration of groundwater into the canal and the leakage of water into the canal through the upstream locks that lead to Lake Rousseau, a freshwater lake, the salinity of the water in the CFBC at the point where the LNP cooling water will be withdrawn can be expected to be less than the salinity of the water in the Gulf of Mexico. (The extent of the deviation from the characteristics of water from the Gulf would depend on the rate of infiltration of fresh water into the CFBC and the rate of pumping and the corresponding flow of salt water into the CFBC from the Gulf.)

Q12. What is the source of salt drift from the LNP cooling towers?

A12. The source of salt drift from the LNP cooling towers will be naturally occurring salts that are contained in the water pumped from the CFBC and used as cooling water in the cooling towers. As the water is circulated through the cooling towers, the concentration of solids (including salts) in the water tends to increase due to the constant evaporation and the release of water vapor from the cooling towers.

Q13. Will PEF control the concentration of salts in the drift?

A13. Yes. PEF will control suspended and dissolved solids (including salts) in the cooling tower basins by maintaining a constant "blowdown" of water from the basin through removing a portion of the water from the cooling tower basins and adding makeup water from the CFBC. The LNP cooling towers are designed to operate with a maximum total dissolved solids ("TDS") concentration of 25,000 parts per million ("ppm") in the makeup water, consistent with the TDS of the water that will be pumped from the CFBC. PEF503 at p. 5-38. The concentration of TDS in the cooling tower circulating water will be monitored and controlled by the plant operators to normally operate at 1.5 times the incoming TDS concentration, with potential short term excursions up to 2.0 times the incoming TDS concentration. PEF503 at p. 5-37. The concentration of TDS in the circulating water will be controlled by the LNP's plant operators through balancing makeup water and blowdown water flow rates to ensure that the circulating water is maintained at the design TDS level in the cooling tower basins. PEF503 at p. 5-38.

Q14. What amount of "cooling tower drift" is expected from the LNP cooling towers?

A14. The amount of "cooling tower drift" from the LNP cooling towers will be limited under conditions imposed by the State of Florida when it certified the LNP site. On August 26, 2009, in accordance with the Florida Power Plant Siting Act, the Florida Governor and Cabinet (as the Florida Siting Board), approved the *Final Order on Certification for the Progress Energy Levy Nuclear Power Plant Units 1 & 2* ("Final Order"). PEF004. The Final Order included various Conditions of Certification ("COC"). These COC, in conjunction with the state-issued permit for the Prevention of Significant Deterioration ("PSD"), Federal Air Permit No. PSD-FL-403 (issued February 18, 2009), specifically limit the amount of cooling tower drift that can be emitted from the LNP cooling towers to a maximum of 0.0005 percent of the circulating water flow rate. PEF504 at p. 4 of 5. Cooling tower drift will be kept at or below that limit by using high efficiency drift eliminators on the towers. The limit established by the LNP PSD Air Permit is based on the Florida Department of Environmental Protection's ("FDEP") official determination of what constituted the Best Available Control Technology for mechanical draft cooling towers. PEF504 at p. D-1. As described in the COLA, the two banks of cooling towers will each circulate up to 531,100 gallons per minute (gpm) during normal maximum operation. PEF503 at p. 5-37. Short-term excursions of the cooling tower circulating water flow rate can range up to 600,000 gpm. PEF505 at p. 3 of 75 and p. 4 of 75. Accordingly, based on the maximum normal operating water flow rate of 531,100 gpm in each cooling tower, and the 0.0005 percent circulating water flow rate drift limit, up to 2.66 gpm of entrained water droplets or "drift" could be emitted by each cooling tower during normal maximum operation. During maximum potential short-term operation, up to 3.0 gpm of "drift" could be emitted from each cooling tower, based on a maximum short term water flow rate of 600,000 gpm in each cooling tower.

IV. ASSESSMENT METHODOLOGY FOR EVALUATING DRIFT EMISSIONS AND DRIFT DEPOSITION

Q15. What assessment methodology did you use to evaluate drift emissions and drift deposition?

A15. Under my direction, a CH2M HILL team performed dispersion modeling of the LNP cooling tower drift emissions to predict the maximum potential deposition rate of salts to the ground surface in the area on and surrounding the LNP site. The modeling was performed using an EPA dispersion model and EPA-recommended modeling procedures. The dispersion model is known as the American Meteorological Society/Environmental Protection Agency Regulatory Model ("AERMOD"). The AERMOD model was devel-

oped by the EPA for performing air quality impact evaluations of the emissions from industrial facilities, including the rate of deposition of solid particulate matter, such as salts, to the ground surface, and is a widely used tool for predicting ambient air concentrations and deposition rates from sources of air emissions.

Q16. How did you and your team utilize the AERMOD dispersion model?

A16. We used the AERMOD dispersion model to conservatively predict the onsite and offsite rate of deposition to the ground surface of total particulate matter (including inert solids and dissolved salts) associated with cooling tower drift from the LNP's proposed mechanical draft cooling towers during maximum potential power generation and cooling tower operation. A detailed account of this assessment is included in a Technical Memorandum, entitled *LNP Cooling Tower Plume Deposition Analysis*, ("Technical Memorandum"), which was prepared under my supervision. PEF505.

Q17. Please describe how you performed the analysis.

A17. The assessment of cooling tower drift emissions and the assessment of drift deposition involved a series of sequential steps. First, the AERMOD dispersion model requires as input the design parameters for the cooling towers, including the physical dimensions of the towers and the number of cooling tower cells. That information was obtained from design information supplied by the project's design engineers, using as a basis the size of the cooling system that would be required to support the amount of power that will be generated by the plant. Once that information was known, we calculated the maximum short term liquid emissions (3.0 gpm, as described in my answer to Question 14) and particulate (including salt) emissions from the cooling towers using: (1) cooling tower vendor specifications (which were consistent with current regulatory requirements) for mist eliminator efficiency; (2) the maximum cooling tower circulating water flow rate; (3) the TDS design objectives for water in the LNP cooling tower basins; and (4) the maximum short term water flow rate in each cooling tower of 600,000 gpm. This information was loaded as input into the AERMOD model. The model also requires a long-term period of recorded meteorological data to use as a basis for its simulation of the dispersion of emissions from the cooling towers. Once these data were processed for model use by using standard EPA procedures, they were loaded as input into the AERMOD model. We also specified the locations where the AERMOD model would calculate the rate of deposition to the ground surface using the physical cooling tower characteristics, the cooling tower emissions, and the five years of hourly meteorological data. We followed EPA-

developed procedures for the modeling, and the results were documented in the Technical Memorandum. PEF505 at p. 2 of 75 through p. 9 of 75.

Q18. What specific meteorological data did you use and why?

A18. We used five years of hourly meteorological data (43,800 hours) from Gainesville, Florida (not Tampa, Florida, which, it is my understanding, the Intervenors have claimed earlier in this proceeding) for the period 2001 through 2005 that were obtained from the National Oceanic and Atmospheric Administration's National Climatic Data Center. PEF505 at p. 2 of 75. The data from Gainesville were used because that is the location of the nearest and most representative first-order National Weather Service weather station to the LNP site, at approximately 76 km (47 mi) north-northeast of the LNP. PEF503 at p. 2-623. Less than one year of data from the LNP site itself were available, which, if used, could have resulted in seasonally biased modeling results. In response to questions from the NRC, we compared the available onsite meteorological data with regional meteorological data, including the Gainesville, Florida data that was used in our assessment, and the Gainesville data were found to be generally consistent with the limited onsite data in terms of wind speed and direction characteristics. PEF503 at p. 2-636.

Q19. Did you make any assumptions regarding wind direction in your analysis?

A19. No assumptions were made with regard to wind direction. As I describe above, the modeling analysis was based on the use of actual hourly meteorological observations (including wind direction) that were recorded over a five year period, from 2001 through 2005, which contained more than 43,800 hours of observations. The dispersion model systematically utilizes the meteorological data, in conjunction with maximum projected emission rates and the physical characteristics of the cooling towers, to calculate the rate of deposition for each hour of meteorological data at the locations specified.

Q20. How were the deposition locations for the modeling selected?

A20. The deposition locations specified for the modeling included locations in all directions surrounding the cooling towers. They were based on a "polar receptor grid" that consisted of a series of concentric circles that were centered on the midpoint of the cooling towers, with receptors located on each circle every 10 degrees (i.e., 10º, 20º, 30º, etc.). The closest circle of receptors was 1000 meters (3,280 feet) from the center of the cooling towers, which corresponds to the distance to the nearest property line, due west of the cooling towers. Additional circles were located at distances of 1100, 1200, 1300, 1400, 1500, 2000, 2500, 3000, 4000, and 5000 meters from the cooling towers. PEF505 at p. 3

of 75. The receptors located to the north of the cooling towers are all onsite within approximately 2000 meters of the cooling towers. To the northeast of the cooling towers, the receptors are all onsite within approximately 3000 meters of the cooling towers. To the east and southeast of the cooling towers, the receptors are all onsite within approximately 1800 meters of the cooling towers. To the south of the cooling towers, the receptors are all onsite within approximately 2000 meters of the cooling towers. The model mathematically sorted the resulting deposition rates to determine the maximum monthly deposition rates for each location being evaluated by the model, with the highest predicted deposition rate at each location being associated with worst case meteorological conditions.

Q21. Describe the assumption for salinity used in your analysis.

A21. For purposes of the salt deposition analysis, all cooling water withdrawn from the CFBC was conservatively assumed to be saltwater, as a worst case scenario, with a TDS concentration of 25,000 ppm, consistent with the maximum expected TDS concentration in the CFBC when the LNP is operational. PEF503 at p. 5-38 and p. 5-40.

Q22. What circulating flow rate and cycles per concentration were used in your analysis?

A22. The salt drift emissions used in the drift deposition modeling analysis were conservatively based on the maximum short-term, circulating-water flow rate of 600,000 gpm. It was also assumed that the water would be recirculated in the cooling towers such that the TDS in the cooling tower basins will increase by a factor of 1.5 during normal operation, consistent with the design basis for the cooling towers. PEF505 at p. 3 of 75 and p. 4 of 75.

Q23. Describe any other assumptions used in your analysis relating to salt drift.

A23. The cooling tower drift will contain both suspended and dissolved solids, including salts. For the purpose of the analysis, we conservatively assumed that all suspended and dissolved solids (including inert material) in the cooling tower drift would be salts. PEF503 at p. 5-40. The actual emissions of dissolved salts from the cooling towers would, therefore, be less than what was assumed as an emission rate in the analysis.

V. PREDICTION OF MAXIMUM OFFSITE SALT DRIFT DEPOSITION RATE

Q24. What did your analysis predict for the maximum offsite deposition rate?

A24. As shown in the first line of Table 3 on page 7 of 75 in PEF505, the dispersion modeling analysis resulted in a maximum predicted offsite (outside of the LNP property line) depo-

sition rate of 0.4024 g/m^2/mo of total solids (including salts) at a location 1000 meters (m) (3280 ft) due west of the midpoint of the cooling towers at the nearest site boundary. While there are higher predicted deposition rates than 0.4024 g/m^2/mo in Table 3 of PEF505, the configuration of the LNP property boundary is such that all of the higher predicted values are at onsite locations. This maximum predicted offsite deposition rate is calculated assuming only one cycle of concentration of the circulating water through the cooling towers and a circulating water flow rate of 531,100 gpm; the result is expressed in units of g/m^2/mo. To account for 1.5 cycles of concentration (maximum normal operation) and a maximum potential circulating water flow rate of 600,000 gpm (short-term excursions), and converting the deposition rate to units of kg/ha/mo, we used the following calculation:

Max. off-site Conc. = 0.4024 g/m^2/mo x 1.5/1.0 x 600,000/531,100 x 10,000 m^2/ha / 1000 g/kg
= 6.81 kg/ha/mo

The maximum predicted offsite deposition rate of 6.81 kg/ha/mo was accepted by the NRC Staff and is relied upon in the FEIS. NRC001, Section 5.7.2, at p. 5-86. (Note that the FEIS mistakenly reports the result as 6.83 kg/ha/mo in one section. See NRC001, Section 5.3.1.1, at p. 5-21. This appears to be a typographical error that is corrected in other sections of the FEIS. See, e.g., NRC001, Section 5.4.1.1, at p. 5-63; NRC001, Section 5.7.2, at p. 5-86.) The results of our analysis represent a maximum predicted rate of salt deposition to the ground surface since we have conservatively assumed that: (1) the LNP will be continuously operated at maximum power generation capacity; (2) the cooling towers will be operated continuously at the maximum, short-term circulating water flow rate; (3) all solid emissions from the cooling towers are salts; (4) the water will have the maximum expected salinity from the CFBC; and (5) all of these operating characteristics would simultaneously occur in conjunction with the occurrence of worst case meteorological conditions.

Q25. Is 6.81 kg/ha/mo the expected actual rate of salt deposition offsite?

A25. No. The *actual* rate of deposition rate of salts offsite would be expected to be less than the maximum predicted rate of 6.81 kg/ha/mo. This maximum predicted offsite deposition rate is representative of the “worst case” because it is based on the simultaneous occurrence of maximum salt drift emissions (during normal maximum power generation and cooling tower operation), maximum possible saline content of cooling water from the CFBC, and the worst-case meteorological conditions as selected by the model from a five-year period of data. In my professional opinion, and based on my experience, it is

unlikely that these events would actually occur simultaneously, particularly due to the low frequency of occurrence of worst case meteorological conditions.

Q26. Does the predicted offsite deposition rate change based on distance from the LNP?

A26. Yes. The dispersion modeling analysis that we performed demonstrates that the maximum offsite deposition rate of 0.4024 g/m^2/mo would decrease significantly with increasing distance from the LNP. More specifically, the analysis predicts that the maximum offsite deposition rate decreases to about one-third of the maximum predicted offsite deposition (i.e., 0.1498 g/m^2/mo) rate at a distance of 2000 m (6560 feet) from the cooling towers (PEF505 at p. 7 of 75), which is approximately 3280 feet from the LNP site boundary. This decrease in the maximum predicted offsite deposition rate was accepted by the NRC Staff and is included in the FEIS. NRC001, Section 5.3.1.1, at pp. 5-20 through 5-21.

VI. PREDICTION OF MAXIMUM ONSITE SALT DRIFT DEPOSITION RATE

Q27. What did your analysis predict for the maximum onsite salt deposition rate?

A27. As shown in Table 3 on page 8 of 75 in PEF505, the dispersion modeling analysis resulted in a maximum predicted onsite (inside the LNP property line) deposition rate is 0.6353 g/m^2/mo at a location approximately 1000 meters northeast of the cooling towers. PEF505 at p. 8 of 75. This maximum predicted onsite deposition rate is calculated assuming one cycle of concentration of the circulating water through the cooling towers and a circulating water flow rate of 531,100 gpm; the result is expressed in units of g/m^2/mo. To account for 1.5 cycles of concentration (maximum normal operation), a maximum potential circulating water flow rate of 600,000 gpm (maximum short-term excursions), and converting the deposition rate to units of kg/ha/mo, we used the following calculation:

Max. on-site Conc. = 0.6353 g/m^2/mo x 1.5/1.0 x 600,000/531,100 x 10,000 m^2/ha / 1000 g/kg
= 10.75 kg/ha/mo

The maximum predicted onsite deposition rate of 10.75 kg/ha/mo was also accepted by the NRC Staff and is reflected in the FEIS. NRC001, Section 5.3.1.1, at pp. 5-20, 5-21, 5-24; NRC001, Section 5.3.2.1, at p. 5-55. The results of this analysis represent a maximum predicted rate of salt deposition to the ground surface onsite because we have conservatively assumed that: (1) the LNP will be continuously operated at maximum power generation capacity; (2) the cooling towers will be operated at the maximum circulating water flow rate; (3) all solid emissions from the cooling towers are salts; (4) the water

will have the maximum expected salinity from the CFBC; and (5) all of these operating characteristics would simultaneously occur in conjunction with the occurrence of worst case meteorological conditions.

Q28. Is 10.75 kg/ha/mo the expected actual rate of salt deposition onsite?

A28. No. The *actual* rate of deposition rate of salts onsite would be expected to be less than 10.75 kg/ha/mo. This maximum predicted onsite deposition rate is representative of the "worst case" because it is based on the maximum salt drift emissions (during maximum power generation and cooling tower operation), maximum possible saline content of the cooling water from the CFBC, and the worst-case meteorological conditions selected by the model from a five-year period of data. In my professional opinion, and based on my experience, it is unlikely that these events would actually occur simultaneously, particularly due to the low frequency of occurrence of worst case meteorological conditions.

VII. CONCLUSIONS

Q29. What are your conclusions regarding the cooling tower salt drift emissions that will result from operation of the LNP and the deposition of those emissions on the ground surface?

A29. I conclude that the worst case or maximum potential rate of deposition of salt at an offsite location resulting from cooling tower drift emissions from the LNP's mechanical draft cooling towers would be 6.81 kg/ha/mo. I also conclude that the worst case or maximum potential rate of deposition of salt at an onsite location resulting from cooling tower drift emissions from the LNP's mechanical draft cooling towers would be 10.75 kg/ha/mo. I consider these to be the worst case or maximum potential onsite and offsite deposition rates because they are based on the simultaneous occurrence of maximum salt drift emissions, maximum possible saline content of cooling water from the CFBC, and the worst case meteorological conditions selected by the model from a five-year period of meteorological data. In my professional opinion, and based on my experience, it is unlikely that these events would actually occur simultaneously.

Q30. Does that conclude your testimony?

A30. Yes.

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

George C. Howroyd Signature

6/19/2012 Date