

In the Matter of: Progress Energy Florida, Inc.
(Levy County Nuclear Power Plant, Units 1 and 2)



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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 REBUTTAL TESTIMONY OF
Dr. Eldon C. Blancher II, PhD
Regarding Impact of Cooling Tower Salt Emissions

I. BACKGROUND

- Q1. Please state your name and business address.
A1. My name is Dr. Eldon C. Blancher II. My business address is 775 N. University Boulevard, Suite 200, Mobile, Alabama.
- Q2. Have you previously prepared testimony in this proceeding?
A2. Yes. I submitted pre-filed direct testimony in this proceeding regarding the potential impacts of salt deposition from salt drift emitted by the cooling towers at Progress Energy Florida, Inc.'s ("PEF")¹ proposed Levy County Nuclear Plant, Units 1 and 2 ("LNP"). PEF600.
- Q3. What is the purpose of your testimony?
A3. The purpose of my testimony is to respond to the pre-filed direct testimony of Dr. Sydney Bacchus (INT301R) regarding the environmental impacts of salt deposition from the LNP's cooling towers, including alleged cumulative impacts. I also will discuss how the NRC Staff's ("Staff") testimony demonstrates that the NRC carefully analyzed and properly characterized such impacts in its Final Environmental Impact Statement ("FEIS") for the LNP.

II. SALT DRIFT IMPACTS

- Q4. On page 42 of her pre-filed direct testimony (INT301R), Dr. Bacchus asserts that exposed areas of the aquifer system and other exposed waters on and in the vicinity of the LNP site

¹ PEF609 is a list of acronyms used in my rebuttal testimony.

would suffer contamination directly from deposition of salt particles and from infiltration of the deposited salt following rainfall events. Do you have any concerns regarding contamination of the aquifer through exposed areas?

A4. I am not concerned about salt contamination of the aquifer or other waters through exposed areas. The main point of my direct testimony is that the projected maximum amount of salt deposition onsite and offsite at the LNP is minimal and that rainfall in the area will dilute the salt deposits to such an extent that there will be no impact to surface waters or groundwater. This analysis applies equally to exposed areas of the underlying aquifer system, if any, in the vicinity of the LNP. The quantity of salt deposited in the aquifer would be low relative to the volume of water from rain and will be further diluted by water in the aquifer. Dr. Bacchus seems to discount, without any valid reason, the dilution of salt by rainfall and water bodies that must be taken into account.

Q5. On page 43 of her pre-filed direct testimony (INT301R), Dr. Bacchus asserts that the FEIS failed to quantify the combined and cumulative impacts of salt drift from the LNP's cooling towers and naturally occurring airborne salt deposition from the coast in the vicinity of the LNP. Should the FEIS have considered this combined impact?

A5. As pointed out by the Staff in its direct testimony, the amount of background salt deposited in the vicinity of the LNP from the coastal areas is negligible. NRCTEST at p. 157. I agree with the Staff's premise (except perhaps during hurricanes or tropical storms, which obviously are of limited duration) that the contribution of naturally occurring salt is so minor as to be negligible and can be excluded from the analysis of LNP salt drift impacts. Furthermore, Dr. Bacchus provides conflicting testimony regarding the naturally occurring aerial salt deposition resulting from the location of the LNP with respect to the coast. In some parts of her testimony, she implies that the habitats in the area are highly sensitive freshwater systems, i.e., "LNP is an inland site that is forested by tree species not commonly exposed to salt spray" (INT301R at p. 46), suggesting that there is minimal naturally occurring aerial salt deposition at the LNP. That testimony directly conflicts with her implication elsewhere that there is appreciable natural aerial salt deposition at the LNP. INT301R at p. 43. If there were appreciable coastal salt deposition, then the flora and fauna in the areas under investigation would not be highly sensitive freshwater systems. Rather, they would be adapted to this background salt deposition, and therefore more tolerant.

Q6. On pages 43-44 of her pre-filed direct testimony (INT301R), Dr. Bacchus states that the FEIS uses corn as an "indicator species" regarding harm from salt drift, but that corn is not a proper

indicator because there is no scientific documentation supporting the presumption that corn is not as sensitive as native species in the area, such as wetlands cypress. Do you agree?

- A6. Dr. Bacchus's claim that the FEIS improperly uses corn as an indicator species is without merit for three reasons. First, the FEIS uses NRC guidance for leaf damage to plants of 10-20 kg/ha/mo (NRC001 at p. 5-21) of salt, which is based on information contained in the NRC's NUREG-1555 (NRC013) and NUREG-1437 (NRC057). As described by Dr. Howroyd's rebuttal testimony (PEF506 at p. 5), that threshold relies on data from a range of plant species. The FEIS highlights three agricultural species and three sensitive native species amongst a list of species used to develop the guidance. NRC001 at p. 5-21. Corn is just one of them. Second, corn is a commonly used indicator species for a variety of reasons, primarily because its response to stressors is typical for broad-leaved plants, especially those not adapted to certain stressors such as salt. Third, Dr. Bacchus does not cite any valid references supporting her claim that cypress is more sensitive than corn. In fact, cypress is commonly known to have a moderate tolerance to salinity. PEF610 at p. 3; PEF611 at p. 309. In addition, the analysis set forth in my direct testimony and in the FEIS both conclude that projected salt concentrations from LNP drift (even considering the maximum projected salt deposition and severe drought conditions) would be insufficient to impact even the most sensitive species onsite and offsite at the plant. Finally, since the key factor in evaluating the impacts of salt drift is rainfall, which is abundant in subtropical Florida and not in other parts of the country, applying the NRC guidance threshold of 10-20 kg/ha/mo in Florida is conservative to begin with.
- Q7. On page 44 of her pre-filed direct testimony (INT301R), Dr. Bacchus states that, in analyzing salt drift impacts, the FEIS failed to take into account normal dry seasons and drought conditions. Do you have a response to that claim?
- A7. I disagree with Dr. Bacchus's assertion. The FEIS's analysis of salt drift impacts included normal dry seasons and drought conditions. NRC001 at p. 5-22. In particular, the FEIS discusses the range for mean monthly rainfall for the region, which varies from 1.6 inches to 9.8 inches, as well as projected changes in rainfall over the next 70 to 80 years. Id. The FEIS uses the lowest mean monthly precipitation rate (1.62 inches) to estimate a conservative runoff salinity concentration of 0.026 parts per thousand ("ppt") (NRC001 at p. 5-24), which is far below the concentration level of 1 ppt where the most conservative models show habitat stress beginning. PEF600 at p. 7; NRC001 at p. 5-24. Additionally, my review of the Staff's direct testimony shows that the Staff considered worst case rainfall conditions. For example, the Staff estimated the con-

centration of salt during a 2 month period with no rainfall, followed by a third month where the rainfall was 0.4 inches, which was the driest period in the meteorological records that they examined. NRCTEST at p. 160. Using that worst case rainfall data, the Staff calculated a salt concentration of 0.34 ppt, still well below levels where there could be environmental impacts. Id. In addition, the analysis set forth in my direct testimony – which used a slightly different approach to confirm that salinity concentrations from LNP salt deposition will not result in environmental impacts – explicitly estimated salinities during nearly 100-year worst drought conditions. PEF600 at pp. 6-8. Dr. Bacchus’s testimony ignores *all* dilution and washout of salt, and assumes, mistakenly, that the salt will accumulate over many years.

Q8. On page 44 of her pre-filed direct testimony (INT301R), Dr. Bacchus asserts that the Crystal River Energy Complex (“CREC”) salt drift study shows that the impact from salt drift alone is illustrated by the “extensive death and destruction” of native vegetation that has occurred in the vicinity of the CREC. Do you agree with that assertion?

A8. Dr. Bacchus erroneously states that the CREC salt drift study found “extensive death and destruction” from salt drift. In fact, the CREC study attributes the stressed conditions of certain species at the CREC to sea level rise and inland saltwater advancement, and not to cooling tower salt deposition. PEF607 at pp. 22-23; NRC001 at p. 5-23. This is a phenomenon that is noted across the Gulf of Mexico shorelines. I agree with the Staff’s testimony that the CREC study noted some minor damage to individual plants attributable to salt drift, but the study certainly does not describe anywhere near the “extensive” impacts alleged by Dr. Bacchus that could be attributable to cooling tower operation. NRCTEST at p. 168.

Q9. On page 44 of her pre-filed direct testimony (INT301R), Dr. Bacchus asserts that the CREC salt drift monitoring reports are flawed. Do you agree?

A9. I disagree with Dr. Bacchus’s inference that the CREC study is invalid as a result of the changes in sampling sites or because certain cooling towers were off-line during part of the study. Changing the sampling sites would have no impact on the results of the study; it merely provided data in different areas over the lengthy duration of the study. The fact that cooling tower operation changed over time also does not invalidate the data collected over the duration of the study. The information and data presented in the CREC study are the result of a long-term effort to understand the impacts of salt drift on habitats in the vicinity of the closest cooling towers to the LNP site. Accordingly, in my professional opinion, it was appropriate and reasonable for the Staff to consider the CREC study, because it provides some useful regional in-

formation regarding salt drift impacts, particularly to habitats similar to those found onsite and offsite at the LNP. In any event, the Staff expressly states that the CREC report was not the “primary basis” for its conclusions (NRCTEST at p. 162); it merely provided some “support” (NRCTEST at p. 169).

Q10. On page 46 of her pre-filed direct testimony (INT301R), Dr. Bacchus asserts that salt drift from cooling towers located in forested areas will result in interception of a significant portion of the salt by the tree canopy, including pond-cypress, and that these trees are not adapted to such salt deposition. Will trees, including pond cypress, be adversely impacted by salt deposition from the LNP’s cooling towers?

A10. Dr. Bacchus’s assertion is speculative, with no evidence to support her claims. As I pointed out previously in my response to Q6, cypress, including pond cypress, are moderately tolerant to salinity. I refer to my analysis (PEF600 at pp. 5-9) which shows that salt drift from LNP will not result in salt concentrations injurious to fauna or flora, onsite or offsite, even during extreme drought conditions. That includes pond-cypress.

Q11. On pages 45-46 of her pre-filed testimony (INT301R), Dr. Bacchus makes various arguments regarding the potential harm to pond-cypress and other trees from root exposure to salt. Is that testimony relevant here?

A11. As pointed out above, pond-cypress is moderately tolerant to salt drift. In addition, Dr. Bacchus provides photographs of various trees and then asserts, without any basis, that the photographs illustrate the “death and premature decline” of the trees due to salt exposure. Her implication is that salt drift was the cause. She has provided no data showing the source of salt, the amount of salt deposition that these trees were supposedly exposed to, or any basis for her statement that their “death and premature decline” is due to salinity from salt drift. Finally, even if we accept that these trees have been impacted by salinity, Dr. Bacchus has not shown that the projected amount of salt deposition from the LNP would cause similar damage. In my opinion, these photos again show salt intrusion impacts from rising sea level and not from any local phenomena. Seawater can have salinities of up to 35 ppt, well in excess of the salinity levels of LNP salt deposition that I calculated (PEF600 at p. 7) and that the Staff calculated (NRC001 at p. 5-24; NRCTEST at pp. 159-160) under various conservative scenarios.

Q12. On page 46 of her pre-filed testimony (INT301R), Dr. Bacchus states that the results of a National Academies Study show that soil-salt and spray-salt caused damage to pines in an area of vegetation not adapted to salt exposure.

- A12. Dr. Bacchus did not provide a copy of the study, to which she only generally refers. Thus, it is not possible for me to comment on its relevance in this proceeding.
- Q13. On page 4 of her pre-filed direct testimony (INT301R), Dr. Bacchus asserts that salt drift will have LARGE impacts on water quality and the terrestrial and aquatic ecosystems, which provide habitat for endangered and threatened species and other wildlife. She makes a similar claim on pages 46-47 of her testimony. Do you agree with this conclusion?
- A13. For the reasons set forth in my direct testimony, I do not agree that there will be LARGE impacts on water quality and terrestrial biota, including endangered and threatened species as alleged by Dr. Bacchus. Dr. Bacchus's testimony is based purely on conjecture regarding salt deposition impact, with no scientific support or site-specific analysis based on the actual amount of salt deposition predicted at the LNP. Her testimony also completely disregards the mitigating effects of precipitation, which is fatal to her testimony given the precipitation levels in Florida.
- Q14. On page 43 of her pre-filed direct testimony (INT301R), Dr. Bacchus claims that the FEIS failed to take measures necessary to perform an adequate evaluation of salt drift impacts. Do you have any views regarding whether the Staff undertook an adequate evaluation?
- A14. As I stated in my direct testimony, the FEIS contains a substantial and accurate evaluation of the impacts of salt drift from the LNP's cooling towers. The Staff's direct testimony, which describes the detailed analysis it undertook to prepare the FEIS, confirms my view. NRCTEST at pp. 160-176. The Staff, unlike Dr. Bacchus, used site-specific projected salt deposition rates, and considered historical and projected rainfall data in its analysis. The Staff analyzed the various scenarios for worst case salt drift conditions, and arrived at the conclusion that the impacts would be minor, infrequent, and limited to the LNP site. NRC001 at p. 5-22. Contrary to Dr. Bacchus's testimony, the Staff provided analyses which demonstrated that, under worst case drought conditions, the maximum salinity would be well below harmful levels. These results are similar to my own analysis, which looked at the impacts of salt deposition over an extended dry period. The Staff also looked at impacts to various habitats, flora and fauna; predicted impacts to adjacent wetlands; and evaluated impacts to aquatic biota. NRCTEST at p. 60 and p. 172. In my opinion, the Staff performed an exhaustive analysis, and Dr. Bacchus's assertion is totally without merit.

III. CUMULATIVE IMPACTS

- Q15. On page 15 of her pre-filed direct testimony (INT301R), Dr. Bacchus asserts that the wetlands and other ecosystems affected by salt drift could be destroyed from the combined, cu-

mulative impacts of salt drift and hydroperiod alterations, while the long-term average rainfall theoretically remained adequate. How do you respond to this?

A15. Given the low level of salinities calculated even under extreme drought conditions, the onsite and offsite impacts from salt drift will be so low as to contribute negligibly to cumulative impacts, even if there were significant hydroperiod alterations. Since Dr. Bacchus overestimates the impacts from LNP salt drift, she incorrectly presumes that salt drift will combine with other phenomena to result in significant cumulative impacts.

Q16. On pages 41-42 of her pre-filed direct testimony (INT301R), Dr. Bacchus asserts that the cumulative impact of salt drift with the induced recharge resulting from the LNP supply wells would have a LARGE adverse impact. How do you respond?

A16. Again, as demonstrated by the analysis in my direct testimony and in the FEIS, the salinities that would accumulate due to salt drift are so low that they would not contribute to a measurable cumulative impact, even when combined with induced recharge, if any, from the LNP supply wells.

Q17. On pages 46-47 of her pre-filed testimony (INT301R), Dr. Bacchus states that salt drift, considered cumulatively with dewatering, could affect wildlife. Do you have a response?

A17. As the FEIS describes (NRC001 at p. 5-21), and as the analysis in my direct testimony shows (PEF600 at p. 9), there will be little impact, if any, on wildlife from LNP salt drift. The assertions regarding cumulative impacts presented by Dr. Bacchus are purely speculative and without foundation. As I previously stated, because Dr. Bacchus overestimates the impacts of LNP salt drift to begin with, she incorrectly presumes that salt drift will combine with dewatering to result in cumulative impacts that could significantly affect wildlife.

Q18. On pages 48-49 of her pre-filed direct testimony (INT301R), Dr. Bacchus asserts that the FEIS failed to evaluate the cumulative impacts on the habitat of existing endangered species of aerial deposition of salt from the LNP resulting in increased salinity of both surface water discharges and groundwater discharges to the Withlacoochee Canal² and exacerbating the increased salinity from proposed withdrawals. How do you respond?

A18. My answer is the same. The projected amount of salt deposition is low, and rainfall levels are sufficient to dilute the salt deposited to levels which will not measurably change the salt content of surface waters or groundwater. Thus, there will not be a

² Dr. Bacchus refers to the Cross Florida Barge Canal as the "Withlacoochee Canal".

measureable change in salt concentration in the Withlacoochee Canal due to LNP salt drift, and any projected impact to endangered species by this pathway is not credible.

Q19. On pages 49-50 of her pre-filed direct testimony (INT301R), Dr. Bacchus asserts that the cumulative impacts from salt drift from the proposed LNP cooling towers, proposed groundwater withdrawals, excavated stormwater ponds and the proposed sand mine would result in irreversible destruction of significant stands of natural pine that could be used by red cockaded woodpeckers. How do you respond to this?

A19. Dr. Bacchus's assertion that these cumulative impacts, including salt drift, will result in destruction of stands of natural pine that could be used by red cockaded woodpeckers is without merit. The LNP site has been used for silviculture for over 100 years (NRC001 at pp. 3-1 through 3-2), and does not have suitable stands of natural pine for the red cockaded woodpecker. NRC001 at p. 2-79. In any event, instead of providing site-specific data or analysis, Dr. Bacchus supports her position with photos, which she identifies by the following numbers: 0847 (INT310, not provided), 1010 (INT321), 1011 (INT399), 1035 (INT322), 1193 (INT327), 1231 (INT400). None of those photos show pine tree damage caused by cooling tower drift. Although I cannot be certain because Dr. Bacchus does not identify the precise locations that she photographed, the photos she identifies appear to be taken from within a tidally influenced area of the Withlacoochee Preserve. At least three of her cited photos of dead trees (INT321, INT322, and INT327) appear to be from tidal areas and show tree damage similar to what can be seen all along the Florida Gulf coast as a result of advancing sea level. In fact, INT303 describes those photos as "former freshwater pond[s] contaminated with salt water" (INT303 at p. 2). (INT303 does not provide a description of INT399 and INT400). Indeed, the dead trees in INT322 are surrounded by the fully estuarine (tidal) species *Spartina* and *Juncus*. All of these photos show similar impacts to those observed in the CREC studies, which, as I previously explained, noted that seawater levels (which can have salinities of up to 35 ppt) were the most influential factor driving this phenomenon. Thus, these photos have no relevance to an analysis of salt drift impacts from the LNP. The amount of salt deposition from the LNP will not result in increased surface or groundwater salinities to anywhere near seawater levels. The contribution of LNP salt drift to any cumulative impacts will be so minor as to be negligible.

Q20. Does that conclude your testimony?

A20. Yes.

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



Signature



Date