NUCLEAR REGULATORY COMMISSION
ATOMIC SAFETY AND LICENSING BOARD
Before Administrative Judges:
Alex S. Karlin, Chairman
Dr. Anthony J. Baratta
Dr. Randall J. Charbeneau

In the Matter of:	)	
PROGRESS ENERGY FLORIDA, INC.	)	
(Levy County Nuclear Power Plant, Units 1 and 2)	)	Docket Nos.
	)	52-029-COL, 52-030-COL
	)	
	)	July 31, 2012

PRE-FILED REBUTTAL TESTIMONY OF DAVID STILL IN SUPPORT OF CONTENTION C-4 REGARDING ENVIRONMENTAL IMPACTS OF LEVY UNITS 1 AND 2 ON WATER RESOURCES AND ECOLOGY

Q. 1. Please state your name.

A.1. I am David Still.

Q. 2. What is your educational background and experience?

A.2. My educational background and experience is described in response to Question 2 of my Prefiled Direct Testimony (Exhibit INT201), which was served on the Atomic Safety and Licensing Board ("ASLB") and the parties on June 26, 2012. In addition, a copy of my curriculum vitae is attached to my Prefiled Direct Testimony as Exhibit INT202.

Q. 3. What is the purpose of your Rebuttal Testimony?

A.3. The purpose of my Rebuttal Testimony is to respond to the Prefiled Direct Testimony submitted by witnesses for Progress Energy Florida ("PEF") and the NRC Staff on June 26, 2012.

Exhibit INT701
July 31, 2012

Q. 4. Does the NRC and PEF's testimony contain any new information that is relevant to your testimony but you had not considered before?

A.4. Yes, there are some additional pieces of information, including an EMP, but nothing in the expert testimony recently filed by PEF and Staff has changed the opinions that I expressed about the FEIS in my initial testimony. The EMP is a significant document that fills out the approach taken in the FEIS, which is to build first and monitor and mitigate after, rather than attempting to accurately predict the impacts caused by the groundwater extraction.

Q.5. Is there anything in the testimony of testimony of Dr. William J. Dunn (Exhibit PEF300) that you find problematic? What are the consequences of any problems that you have found?

A.5. There are two particularly puzzling aspects of the testimony. First Dr. Dunn states in Q17 **(Exhibit PEF300 p. 14)** the following: "In the screening criteria used by the SWFWMD and the SJRWMD, a flow reduction in a river of 10% or less is considered a SMALL impact." I am unaware of any portion of the Saint John's River Water Management ("SJRWMD") or the South West Florida Water Management District ("SWFWMD') in 40C-4 or 40D-4, Florida Administrative Code, or the Applicants' Handbook that indicates the Districts even use the SMALL criteria. As far as I am aware, the Districts use "harm" and "significant harm." I am also unaware of the use of 10% screening criteria, as the districts base their evaluations on adverse impacts. This statement therefore shows a lack of understanding of the regulatory process in Florida.

Second, in Answer 20, Dr. Dunn states (**Exhibit PEF300** p. 16) that "[t]he 0.5 ft drawdown level in wetlands and aquatic ecosystems and their underlying aquifers has been used by the SWFWMD and SJRWMD as a threshold of concern regarding potential risks of adverse

impacts to due to groundwater withdrawals." This statement is incorrect because the 0.5 ft drawdown criterion is simply considered a "rule of thumb" to be used by professionals when more detailed data are not available, but it is not implemented by Florida rules or statute. Wetlands react differently due to water drawdown depending on soil conditions, hydrology, rainfall and other factors. Thus the 0.5 foot drawdown is not considered by the State of Florida to be an acceptable criterion for deciding whether harm to wetlands will occur.

The consequences of these two issues are that the FEIS cannot make useful predictions about wetland impacts. Drawdown estimates are very uncertain. The combination of a harm criterion not recognized by all agencies concerned, along with a high degree of uncertainty about the drawdown predictions, means that the FEIS has failed to provide useful predictions about harm to sensitive areas, such as wetlands.

Q.6. Do you believe that the Water Management Districts have created modeling thresholds that prevent impacts due to water drawdown?

A.6. No. Dr. Dunn, (**Exhibit PEF300**, p.18) incorrectly states: "Since its development, the SRWMD has used the drawdown threshold range as a screening tool for the evaluation of potential for harm for groundwater use permitting." In fact, in my experience as the Director of the SRWMD, I found that even with the best efforts to produce reliable, accurate thresholds for water drawdowns with modeling, our results were less than desired. This drawdown threshold range has obviously not been effective because *all* of the Water Management Districts in the region have still been forced to deal with salt water intrusion in well fields and difficulties in ensuring a safe, reliable water supply to towns and developments in their areas. These

difficulties would not have occurred if the predictions about the effects of groundwater withdrawals were accurate.

Q.7. In your opinion is it reasonable to base the CoC on the original DWRM2 model rather than the recalibrated model? (Staff testimony, p. 48)

A.7. No. The original DWRM2 model was used as the basis of analysis for the CoC, but NRC Staff acknowledge that the original model under-predicts impacts, which is why they required the construction of the recalibrated model. For groundwater modeling to be sufficiently reliable to be the basis of determining environmental harm, a conservative approach is necessary. Therefore, I believe that using a model that predicts the lowest impacts to derive the CoC is inappropriate because NRC Staff required, and received, a more detailed modeling that predicted significantly more greater drawdown due to groundwater withdrawals. For example, the original DWRM2 predicted that no wetlands would exceed a 0.5 foot drawdown, while the recalibrated model predicted 2092 acres of wetlands would exceed that same 0.5 foot drawdown (**Exhibit NRC001** p. 5-27). The initial model predicted a drawdown of only 4.8 to 6 inches immediately adjacent to the well heads, whereas the recalibrated model predicts a surficial aquifer drawdown of up to 2.5 feet near the wellheads and 6 inches extending up to three miles from the wellheads (**Exhibit NRC001** p.5-27). I consider these differences significant. If the recalibrated model (which Dr. Hazlett and Mr. Davies testify is still not accurate for predicting impacts) is the better model, and the NRC Staff are relying on the COC to preclude harm, then the EMP should at the very least be based on the model the NRC believes is more accurate. It is inconsistent and illogical for NRC Staff to accept the CoC when they are based on a model the NRC Staff themselves believe is faulty.

Q.8. Do you see problems with basing the CoC on the recalibrated model?

A.8. Yes. Each of the models, as with all modeling efforts (as Dr. Hazlett pointed out (**Exhibit INT101**, A.4 and A.8), has a high degree of uncertainty. In my experience, not only as Director of the Suwanee River Water Management District, but also in the various other water-management positions I've held, too many decisions that relied heavily on modeling resulted in environmental harm. Models are important, and must be as accurate as possible. But these models should be only one tool in a toolbox. Other data and information not included in the model such as long-term climate change, saltwater intrusion, soils, and the unique site karst geology, must also be taken into account, because all of these factors are important in predicting harm and potential adverse impacts.

Regarding the recalibrated model, Staff, in their rebuttal testimony (Staff testimony, p. 44) say: "[T]he Staff determined that the groundwater model alone was not sufficient for supporting a definitive assessment of the impacts on wetlands." (**Exhibit NRC001A** p. 2-29). The testimony goes on to state that "SWFWMD staff indicated that they do not provide explicit limits on usage impacts, but instead rely on the monitoring program required by the conditions of certification to account for uncertainty in model parameters and implementation" (Staff testimony, p. 46). This means that, other than groundwater modeling, the only constraint used by SWFWMD to prevent harm is reliance on the CoC, which, as stated in my initial testimony, except for the limits on pumping rates, only *identify* impacts, rather than limit them. It also means that, without meaningful limits on impacts, SWFWMD and the NRC Staff are unable to provide meaningful protection to the environment, and instead rely on detecting damage through

monitoring *after* LNP begins operation. This is particularly problematic for irreversible impacts, such as saltwater intrusion.

Q. 9. Do you believe that the Conditions of Certification (CoC) can substitute for high quality predictions of impact at the Levy site?

A.9. No. The Conditions of Certification only aid in identifying environmental damage, and, once damage is detected, rely on mitigation for that damage. The CoC are not designed to prevent impacts. For example, Dr. Dunn, in his testimony p. 8 states (emphasis added in italics): "If that testing or monitoring were to *identify* unacceptable adverse impacts, the COC require PEF to implement mitigation measures."

Such a plan to make a plan is not reasonable for a project of this size. The implicit assumption in the FEIS is that LNP must be built using groundwater withdrawal and that therefore the only alternative is mitigation of impacts through the CoC. However, there are other alternatives. For example, the FEIS fails to address whether a better mitigation alternative would be to require the development of an alternative water supply *before* the plant is built, perhaps with groundwater withdrawal providing a short-term back-up. An alternative supply would eliminate the need for harvesting groundwater, inducing saltwater intrusion, and impacting the water resources in the area. Design after the fact, a remedy referred to as "retrofits," are always more expensive than when built into projects at the front end. Moreover, building mitigation into the front-end of the project precludes attempts to avoid the expense of mitigation at a later date.

Finally, as a water resource professional, I do not believe the assertion that the FEIS reliance on the CoC will prevent LARGE impacts. There are too many uncertain situations that

can and will occur in a karst environment, especially when considering cumulative impacts, variable precipitation, and drought. For example, the salt drift modeling assumes the use of brackish cooling water from the CFBC (Staff testimony p. 164). The water is assumed to be brackish because of the fresh water that currently flows into the CFBC through the Inglis Lock, and from springs along the canal. But if the springs disappear due to dewatering, as may occur in a karst environment, the actual salinity of the cooling water may be more close to the salinity of Gulf ocean water, which makes the salt drift modeling underpredict the impact. The CoC do not anticipate or require determination of these cumulative impacts. It only outlines methods to identify impacts, and then requires mitigation.

Q.10. Have you reviewed the Environmental Monitoring Plan (EMP) attached as an exhibit to PEF's Statement of Position? If so, are there any parts of the EMP you find troublesome?"

A.10. Yes, I have reviewed the EMP. There are many issues that concern me but the most critical failing is that, as stated in my initial testimony, the CoC states that PEF can request the termination of the monitoring program after five years (**Exhibit PEF005** p.42) and it is my belief that in today's difficult economic times, even the most well-intentioned government agencies will be hard-pressed to require the continuation of the program. Therefore, there is a strong possibility that an EMP could be terminated before the environmental damage is discovered. The basis for the five-year period is unclear, because the NRC and PEF predict that the impacts could take more than five years to be significant. For example, PEF's expert, Dr. Dunn (**Exhibit PEF300** p. 21) states: "Even if the magnitude of the drawdown is sufficient to induce long-term unacceptable changes, those changes typically take five to ten or more years to manifest," and Dr. Bacchus agrees with Dr. Dunn on this time line **(Exhibit INT301**, A.9). Therefore, in my

opinion, the strong possibility that PEF will be released after only five years is a fatal loophole in the CoC. Only through continuous monitoring can the data reveal impacts on resources. Environmental conditions change and impacts are likely to happen; for example, effects from sinkholes, droughts, floods, and climate change dictate that a monitoring plan should be kept in place for the duration of the plant operation. Many times, long-term data are needed to discover and evaluate changes. Therefore, I believe it is crucial that continuing monitoring is required for the life of the LNP project.

Q.11. Besides the strong possibility that PEF will be released from the EMP, are there other aspects of relying on the EMP that concern you?

A.11. Yes. I am concerned that an EMP will be based on an inappropriate, artificially-lowered baseline. On page 11, the EMP states: "Baseline monitoring of these assessment areas will begin a minimum of 2 years before operational production wells are installed." This time period overlaps with the construction phase of the project, which also requires significant dewatering. For example, the CoC, on page 41, lists well number 5, a construction well permitted to extract up to 90,000 gallons of groundwater per day (average) for a number of years. Because the baseline will be determined after the construction well has been operating, the baseline will obviously have been lowered. Baseline conditions, if they are to mean anything, should be determined before *any* dewatering begins at the site.

Furthermore, there is no daily pumping limit for that number 5 construction well pump so it is impossible to determine what volume of water that pump could conceivably extract per day, and for how long, yet still remain within the one year average of 90,000. The average could be maintained while the well dewatered the area by a tremendously larger rate for short periods of

time. If this larger dewatering occurred during a drought or dry period, even a fairly short duration could cause irreparable damage to the wetlands.

Q.12. Do you believe the EMP will be able to detect far-field adverse impacts?

A.12. No. The EMP "will focus on the near vicinity of the production wells where potential drawdown impacts, if any, are likely to be detected first" (**Exhibit PEF305** p.11). As Dr. Hazlett, Mr. Davies, Dr. Bacchus, and I have previously explained, this conclusion is faulty because of the karst geology that does not act as a porous medium. Because of conduits, fractures, and other preferential pathways, it is highly unlikely that impacts will occur in a radial pattern emanating from the production wells. If this EMP, based on the lesser impacts the original DWRM2 model predicted, is followed, impacts outside the near vicinity of the wells could be missed or ignored because they could erroneously be assumed to be "the result of regional factors (such as precipitation patterns, cumulative groundwater pumping in the area, or disruption in surface water hydrology)," (**Exhibit PEF305** p.11) and not a result of the groundwater pumping.

Not only will the focus of the EMP be the near vicinity of the production wells (and it specifically does not include well number 5, the construction well) but also, the EMP is only concerned with detecting groundwater-pumping effects and not effects from other dewatering caused by construction and operation of the LNP. Page 11 of the EMP states (emphasis added in italics) "[t]he purpose of this EMP is to describe the field data collection process that will be used to identify potential effects on wetlands within the vicinity of the LNP well field *from the proposed groundwater withdrawals.*" Mr. Davies has explained that groundwater pumping is not the only potential cause of water-flow disruption at the proposed LNP. There also is the potential

for conduits or other karstic preferential flow paths to be intercepted by the nuclear islands and to cause spring dry-up. Dr. Bacchus has explained the importance of historic sheet-flow to wetland communities and that the plant will disrupt this flow not only by the obstruction caused by buildings, but also by way of capturing the overland flow in the stormwater ponds. As a result, I am very concerned about the following language from the EMP (emphasis added in italics):

> This EMP provides a process by which the monitoring and data collection efforts are linked to the implementation of management strategies to prevent wetland functional losses, if any, *resulting from groundwater withdrawals*"**(Exhibit PEF305 p.24**)

It is clear then, that the EMP is only concerned with identifying impacts caused by groundwater withdrawals from the wells at LNP. It appears to me, therefore, that if the wells cannot be proven as the *sole* source of the impacts, pumping will continue in spite of damage to the wetlands. This will be allowed because even if the proposed LNP is a major contributing factor to the "cumulative groundwater pumping" or "disruption in surface water hydrology," these factors will not be considered by monitoring required by the CoC to be a cause of environmental damage and the damage will be ignored. In fact it may *never* be possible to prove that groundwater-pumping is the sole reason the wetlands are dying, springs are running dry and saltwater intrusion is occurring. The heart of Contention C4A is cumulative impacts from many aspects of the proposed LNP, not solely dewatering from groundwater-pumping.

Q.13. Do you agree with the Staff that it is possible that an EMP will fail to detect localized wetland impacts? (Staff testimony, p. 95)

A.13. Yes. Considering the karst environment at LNP, as I stated above, it is possible that the EMP will miss impacts that occur along the lines of conduits due to disruption to conduit flow

and other pathways of regional water flow caused by the construction and operation of the LNP. Therefore, if monitoring points are not placed along the lines of the preferential flow pathways, the monitoring could miss impacts. In addition, springs located beyond the geographic area of interest established in the FEIS may well be permanently impacted by the pumping done at LNP. I am aware of the total loss of Kissingen Springs, in Bartow, Florida, White Springs, Hamilton County, and Worthington Springs, Union County. These springs and their flow have ceased or been drastically reduced due to changes in the conduit flow and the over-pumping from regional groundwater resources.

Q. 14. NRC witnesses have stated the USACE is evaluating wetland impacts. Should the NRC Staff have received and analyzed the USACE evaluation prior to issuing the FEIS?

A.14. Yes. Dr. Dunn has explained that the USACE is also evaluating PEF's proposed groundwater withdrawal and its impact on wetlands (**Exhibit PEF300** p.24). USACE has significant resources to aid in evaluating potential environmental harm, and their input should have been required prior to issuing the DEIS and the FEIS.

Q.15. Have you, in your years working for the various WMDs, seen any examples of wetland sites that were still destroyed despite monitoring and mitigation being required?

A.15. Yes, there are many examples of failed mitigation, especially with attempted wetland creation. It is almost impossible to replicate the natural hydrology, soils, and wetland plant communities of a natural wetland with success. I have personally witnessed sites that have failed despite monitoring and mitigation. Yelvington Distribution Center (ERP00-0322), and Cannon Creek Basin Improvements / Home Depot (ERP00-0608) are two examples that failed during the monitoring period. Despite the monitoring requirements, irreversible changes were missed before harm occurred and 80% to 100% of the plants died. Each of these sites then had to

modify the mitigation plans, but that was obviously too late. The SRWMD is currently evaluating the monitoring of the modified permits.

Q.16. What is the purpose of the aquifer performance testing plan (APT)?

A.16. The APT is an integral part of the EMP and is required by the CoC. The CoC, p. 30 states the APT is "for the purpose of confirming Upper Floridan transmissivity and leakance values." The APT provides data regarding the degree of drawdown caused by pumping a well over a long period of time. The APT gives a "snap shot" of the current conditions in the immediate surroundings of a well. Normally, tracer tests are not performed, but in my professional opinion, that tracer tests should be required at LNP due to the unknown karst environment and the magnitude of activity proposed. Because tracer tests are not proposed for the APT, it will not reliably find karst conduits. In the absence of an accurate APT it is not possible to predict localized impacts because the regional data are insufficient for this purpose.

Q.17. Is it necessary for the NRC to review this plan before relying on it to mitigate impact?

A.17. Yes. A review of an APT is required to determine accurate modeling parameters, calibration, and other information. It would also allow NRC Staff to determine the types of environmental impacts that may occur given the known or possible water withdrawals. One critical decision that would be informed by predictions derived from the APT would be whether to require the development of an alternative water supply to groundwater withdrawal prior to the commencement of operation of the plant.

Q.18. Is it reasonable to rely on the adaptive management strategy described by Dr Dunn for PEF? (Exhibit PEF300, p. 32)

A.18. No**.** An adaptive management strategy is effectively a way to make the best of a given situation. Although it is good practice to have a strategy to deal with unanticipated events, this does not mean that there is no need to make accurate predictions of impacts. It seems the approach taken in the FEIS is to neglect accurate predictions of impacts. The adaptive management at LNP should be based instead on good predictions of impacts. This would first enable an informed decision about whether groundwater withdrawal is even a viable source of water for the LNP. If further modeling appropriate for a karst environment shows that it is possible to extract groundwater, an effective monitoring plan with no release provision and appropriate trigger and action levels can be developed. Moreover, active management approaches have to be very carefully implemented because the induced changes are irreversible. For example, salinity changes due to sea level rise and climate change have not been modeled here, but could occur. In the absence of good predictions of these changes, how can the EMP be well-designed to catch such impacts before they become unacceptable?

Furthermore, the strategies given (**Exhibit PEF305**, p. 25) are, in my opinion, problematic. Strategy 3, "Manage water use in the facility to increased efficiency" should not be deferred until after problems have occurred. I cannot stress strongly enough that Strategy 6, "Transition to alternative water supply strategies," should be implemented immediately, before operation, instead of using valuable groundwater. Of course, any alternative water supply would have environmental consequences to be considered.

Finally, despite the fact that state law specifies that any permit granted cannot contribute to water quality violations, no matter whether from a discharge or other reason, the EMP does not monitor for water quality. In short, the purpose of adaptive management is intended to deal

with unforeseen difficulties, and is not intended to replace careful analysis of expected impacts before a project is begun. As the adage says, this is shutting the barn door after the horse has gone.

Q.19. Did the FEIS or expert testimony adequately consider variations in weather when predicting the potential impacts of the groundwater withdrawal?

A.19. No. Both the FEIS and expert testimony rely too heavily on averages, such as average precipitation, when considering impacts caused by groundwater extraction. Dr. Dunn's testimony, Answer 25, deals extensively with identifying the cyclic rainfall of Florida, but does not then address how the modeling might have better reflected this variation in precipitation. Dr. Rumbaugh, in his testimony on Page 15, specifically states that the precipitation used for his DWRM modeling used "rainfall approximately equal to the long-term average for the area." Due to drought and possible climate change, impacts based on a range of multi-year deviations from past weather averages should have been modeled. Relying on a long-term rainfall average of 53" is not using the most accurate data for modeling. A rolling average would be more useful, as well as factoring in foreseeable changes to weather patterns.

Q. 20. Is it reasonable for the staff to consider the effect of stormwater changes on the hydroperiod, but not make a similar assessment for dewatering?

A.20. No. It is totally inconsistent to consider how the changes in the stormwater regime could affect the hydroperiod of the wetlands, but then claim that such an analysis is not necessary for the groundwater withdrawals. Although the groundwater withdrawals are relatively constant, their impacts are cumulative with the stormwater impacts, and the other changes in flow, such as the construction of the nuclear island. Therefore, an analysis of how all these changes affect the wetland hydroperiod is required, but has not been done.

Q.21. Do you swear in accordance with 28 U.S.C. § 1746, under penalty of perjury, that this testimony is true and correct?

A.21. Yes I do.

Executed in accord with 10 C.F.R. § 2.304(d) by:

Electronically signed by
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