

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE SECRETARY

\_\_\_\_\_)  
In the Matter of )  
) Docket No. 52-040 and 52-041  
)  
Florida Power & Light Company )  
)  
Combined License Application for )  
Turkey Point Units 6 & 7 )  
\_\_\_\_\_)

**DECLARATION OF HAROLD R. WANLESS**

I, Harold R. Wanless, do hereby declare as follows:

1. My name is Harold R. Wanless. I am a Professor, Department Chair of the Department of Geological Sciences, and Cooper Fellow of the College of Arts and Sciences at the University of Miami. My office is located in Coral Gables, Florida. My professional and educational experience is summarized in the curriculum vitae attached to this declaration.

Statement of Qualifications

2. I received an A.B. degree in Geology from Princeton University in 1964; a M.S. degree in Marine Geology and Geophysics from the University of Miami in 1967; and a Ph.D. degree in Earth and Planetary Sciences from the John Hopkins University in 1973. My Master's Thesis was on the Holocene sediments that have accumulated in the Biscayne Bay region over the past 7,000 years and the role of sea level rise and storm and biological processes in defining the nature of these sediments. During my time as a Master's student I worked for my Advisor, Dr. A. Conrad Neumann on developing a sea level curve for south Florida, the Bahamas and Bermuda using core boring samples from freshwater peat deposits which formed close to sea

level elevation. My Ph.D. dissertation was on the Cambrian strata in Grand Canyon where small-scale sedimentary cyclic sequences were deposited in response to sea level cycles.

3. Since 1971, I have 39 years of experience as a geologist and marine geologist at the University of Miami. My research specialty is coastal and shallow marine sedimentology, modern and ancient with a focus on documenting and understanding the role of sea level dynamics and storm processes creating and modifying coastal and shallow marine environments. Much of the research of my students and I have done focuses on determining the fine-scale sea level history over the past 7,000 years and the associated response of coastal and shallow marine environments. This work has been funded by a variety of sources including, the National Park Service and NOAA.

4. Since 1981 I have been using our knowledge of past environments to look to the future. My students and I have been documenting the changes in South Florida coastal environments in response to our accelerated sea level rise since 1930 and major (category 4 and 5) hurricanes. This research has studied the low wetland and coastal environments bordering Biscayne Bay, Florida Bay, southwest Florida from Cape Sable to Everglades City and the 10,000 islands. Environments focused on are coastal mangrove wetlands, sandy beaches and barrier islands, low-lying freshwater wetlands near the coast, the Everglades, and low-lying upland. As polar Ice Sheet melt has significantly accelerated on both Greenland and Antarctica since about 2,000, I have been active in working with other scientists, communities, the State of Florida and Federal agencies in using new research data to project future sea level rise both globally and regionally and to determine the impact it will have on low-lying coastal environments, coastal communities, agriculture and industry. This includes an evaluation of the changing anthropogenic effects on coastal and shallow marine environments with rising sea level.

### Local Agency Recognition & Reliance

5. In July, 2006, the Board of County Commissioners for Miami-Dade County established the Miami-Dade County Climate Change Advisory Task Force (CCATF), through the adoption of Ordinance 06-113 sponsored by Commissioner Natacha Seijas. The CCATF serves as an advisory board to the Board of County Commissioners and is charged with identifying potential future climate change impacts to Miami-Dade County, while providing recommendations regarding mitigation and adaptation measures to respond to climate change.

6. I am an active member of the Miami-Dade County Climate Change Advisory Task Force (CCATF), which is comprised of 25 members, appointed by the Commissioners, Mayor and County Manager. CCATF is a diverse, multidisciplinary and highly knowledgeable group of individuals representing various sectors of the community of Miami-Dade County. I currently serve as the Chair of CCATF's Science Committee.

7. Miami-Dade County has officially recognized and relied upon my peer-reviewed research on climate change and sea level rise as evidenced through County review and adoption of CCATF recommendations based in-part upon my peer-reviewed research, as well my current position as the Chair of CCATF's Science Committee. (See *Annual Report and Supplemental Recommendations: Presented to The Miami-Dade Board of County Commissioners*, April 2010 (Wanless Affidavit Exhibit 5.2); *Second Report and Initial Recommendations: Presented to The Miami-Dade Board of County Commissioners*, April 2008 (Wanless Affidavit Exhibit 5.3); *Presentation – Statement On Sea Level in the Coming Century*, Science Committee, Miami-Dade CCATF, April 22, 2008)(Wanless Affidavit Exhibit 5.4).

### State and Federal Agency Recognition & Reliance

8. The South Florida Water Management District (“SFWMD”) has previously relied upon and cited to my peer-reviewed research in assessing sea level rise implications for South Florida. (SFWMD, “*Preliminary Estimate Of Impacts of Sea Level Rise on The Regional Water Resources of Southeastern Florida*” (Wanless Affidavit Exhibit 5.5); SFWMD, “*Estimated Impacts of Sea Level Rise on Florida’s East Coast*” (Wanless Affidavit Exhibit 5.6)).

9. SFWMD has previously relied upon and cited to the scientific findings of the CCATF in assessing sea level rise implications in its review of Turkey Point Units 6 & 7. (See South Florida Water Management District, FPL Turkey Point Units 6 & 7, Site Certification Application, First Completeness Review at 34-35 (July 30, 2009) (“SFWMD First Completeness Review”) (Petition Exhibit 11)). Specifically, SFWMD has acknowledged my prediction, as adopted through CCATF, that sea level rise could be in the range of 1.5 to 5 feet by 2050. (SFWMD First Completeness Review at 34) (Petition Exhibit 11); (Petition at 52).

10. U.S. Army Corps of Engineers personnel acknowledged and cited to my research regarding sea level rise in a presentation entitled “CLIMATE CHANGE concerns for EVERGLADES RESTORATION PLANNING,” which was presented at the Planning Community of Practice Conference 2008. (Wanless Affidavit Exhibit 5.7)

11. It is my understanding that the U.S. Army Corps of Engineers will participate with the NRC as a cooperating agency in most new reactor license applications. (Supplemental Staff Guidance to NUREG 1555, Environmental Standard Review Plan (ESRP) for Consideration of the Effects of Greenhouse Gases and of Climate Change (April 8, 2010) ADAMS Accession Number ML ML100990185, at 2) (“Supplemental Staff Guidance to NUREG 1555”).

12. Circular No. 1165-2-211 of the United States Army Corps of Engineers (“USACE”), issued July 1, 2009, specifically directs incorporation of “the direct and indirect physical effects of projected future sea-level change in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects (Wanless Affidavit Exhibit 5.8). Impacts to coastal and estuarine zones caused by sea-level change must be considered in all phases of Civil Works programs” (USACOE, 2009). Surely, a major addition to a nuclear power plant facility should fall under similar scrutiny. This includes considering sea level rises of 0.7-1.1 meters (2.3-3.6 feet) rise in sea level by 2080 using the Modified NRC-II and –III sea-level rise projection scenarios as required (this NRC = National Research Council).

13. I am familiar with the application of Florida Power and Light Company (“FPL”) for a combined license (“COL”) to construct and operate two new nuclear reactors (“Units 6 & 7”) on the site of the Turkey Point Nuclear Facility located in Homestead, Florida (“Turkey Point”). I have reviewed excerpts of FPL’s Environmental Report (“ER) and Final Safety Analysis Report (“FSAR”) for a COL to construct Units 6 & 7 as they relate to seal level rise.

14. I am providing this declaration in support of the contentions in Intervenors’ Petition in Opposition to FPL’s COL to construct Units 6 & 7 at the Turkey Point site.

U.S. Global Climate Change Research Program

15. It is my understanding that the NRC views assessments such as the June 2009 “State of Knowledge” report from the U.S. Global Climate Change Research Program (“USGCRP”) on impacts of climate change in the United States as representative of appropriate source material to be used for framing resource issues associated with climate change. (Supplemental Staff Guidance to NUREG 1555, Environmental Standard Review Plan (ESRP) for Consideration of the Effects of Greenhouse Gases and of Climate Change (April 8, 2010) ADAMS Accession

Number ML ML100990185, at 5, 11) (“Supplemental Guidance”) (Wanless Affidavit Exhibit 5.18); *see generally* Global Climate Change Impacts in the United States, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press, 2009.) (“USGCRP Report”) (Wanless Affidavit Exhibit 5.9).

16. I am familiar with the findings of the U.S. Global Change Research Program (“USGCRP”) and the 2009 Report entitled “Global Climate Change Impacts in the United States: A State of Knowledge Report from the U.S. Global Change Research Program” (“USGCRP Report”). I share the NRC viewpoint that “the information in the USGCRP report is of high quality and that the report is a reliable source for information regarding climate change in the U.S.” (Supplemental Staff Guidance to NUREG 1555 at 5, 11).

17. Miami, as a coastal city, is particularly at risk to the environmental impacts of sea level rise as acknowledged in the USGCRP Report:

In addition, coastal cities are also vulnerable to sea-level rise, storm surge, and increased hurricane intensity. Cities such as New Orleans, **Miami**, and New York are particularly at risk, and would have difficulty coping with the sea-level rise projected by the end of the century under a higher emissions scenario.<sup>91,164</sup>

(USGCRP Report at 102).

18. Sea level has been rising at an accelerated rate since about 1930. This has resulted in a about a 9-inch rise of sea level in south east Florida. This rise is about the global rate of sea level rise. Presently, global and south Florida sea level is rising at just greater than one foot (30 cm) per century, but sea level rise is now accelerating at 0.17 millimeters per year because of dramatically accelerated ice melt in both Greenland and Antarctica (Velicogna, 2009)(Wanless Affidavit Exhibit 5.11).

19. The Science Committee (of which I am Chair) of the CCATF issued a projection of future sea level rise for south Florida in January, 2008, stating that:

“With what is happening in the Arctic and Greenland, many respected scientists now see a likely sea level rise of **at least** 1.5 feet in the coming 50 years and a total of **at least** 3-5 feet by the end of the century, possibly significantly more. Spring high tides would be at +6 to +8 feet. This does not take into account the possibility of a catastrophically rapid melt of land-bound ice from Greenland, and it makes no assumptions about Antarctica” (MDC-CCATF, 2008)(Wanless Affidavit Exhibit 5.12).

Since issuing this statement, Ice Sheet melting has dramatically increased on both Greenland and Antarctica (Van den Broeke et al., 2009 (Wanless Affidavit Exhibit 5.13); Velicogna, 2009; Kerr, 2009 (Wanless Affidavit Exhibit 5.14)). This has accelerated the rate of global sea level rise. More recent projections of sea level rise through the century are at or above the levels of our 2008 statement (Rahmstorf, 2010) (Wanless Affidavit Exhibit 5.15).

20. All climate and sea level assessments agree that ice melt, and sea level rise will be accelerating into the next century. This means that we will not be adjusting living with a fixed sea level at a new plus three- five-feet, but one that is continues rising at an accelerating rate. If we have reached plus five feet by the end of the century, sea level will be rising at a foot per decade.

#### FPL’s Environmental Report

21. The National Environmental Policy Act (“NEPA”) requires analysis of all reasonably foreseeable environmental impacts associated with the construction and operation of a new nuclear power generating facility at the Turkey Point site. The NEPA analysis for new reactors includes aspects of climate change. (Supplemental Staff Guidance to NUREG 1555 at 10).

22. FPL’s ER is entirely silent on the issue of climate change and sea level rise. In failing to address sea level rise to any extent, the ER does not account for any changes in significant resource areas that may occur during the lifetime of Units 6 & 7. (See Supplemental Staff Guidance to NUREG 1555 at 10).

23. Although wholly unaccounted for in FPL's ER, I agree fully with the following conclusions and acknowledgements of the USGCRP Report regarding the environmental impacts of sea level rise due to climate change:

recent estimates of global sea-level rise substantially exceed the IPCC estimates, suggesting sea-level rise between 3 and 4 feet in this century. Even a 2-foot rise in relative sea level over a century would result in the loss of a large portion of the nation's remaining coastal wetlands, as they are not able to build new soil at a fast enough rate.<sup>164</sup> Accelerated sea-level rise would affect seagrasses, coral reefs, and other important habitats. **It would also fragment barrier islands, and place into jeopardy existing homes, businesses, and infrastructure, including roads, ports, and water and sewage systems.** Portions of major cities, including Boston and New York, would be subject to inundation by ocean water during storm surges or even during regular high tides.<sup>234</sup>

(USGCRP Report at 150).

24. There is strong evidence that global sea level is currently rising at an increased rate.

(USGCRP Report at 37). FPL's ER does not account for global sea level rise at all. FPL's FSAR accounts only for a potential rise in sea level of one foot over the design life of Units 6 &

7. FPL's FSAR accounts for sea level rise as follows:

The long-term sea level rise trend at Miami Beach, Florida, as estimated based on data from 1931 to 1981, is 0.78 foot per century (Reference 206). Accordingly, a nominal long-term sea level adjustment of 1 foot is applied to the 10 percent high tide level resulting in an antecedent water level of 3.6 feet NAVD 88 (2.6 feet NAVD 88 + 1 foot), which represents the initial water level condition in the SLOSH model simulations.

(FSAR at 2.4.5-6). Recent climate research by the Intergovernmental Panel on Climate Change (IPCC) predicts continued or accelerated global warming for the 21st Century and possibly beyond, which will cause a continued or accelerated rise in global mean sea-level. (*See* USGCRP Report at 150). FPL's sea level rise calculation in the FSAR is wholly inadequate and does not conform to the science that is acknowledged in the 2009 USGCRP Report. (*See* USGCRP Report at 150).

25. It is critical that a realistic projected sea level rise for the construction and lifespan of Units 6 & 7 be carefully considered and incorporated into the environmental impacts analysis of the ER. Rising sea level will have significantly changed the coastal environments, interactions of land and water (including salinity), base-level elevations, tidal current patterns and strengths, storm surge patterns and strengths, and population and demographics of southeast Florida by the time the proposed units come on line in 2018 and 2020 and through the proposed reactor's planned lifetime – and rising sea level will dramatically diminish southeast Florida and its population by the end of the century.

A. Incorporating future sea level changes will change the potential environmental impacts of Units 6 & 7, as the transmission line facilities, reclaimed water pipelines, industrial wastewater facilities, access roads, and associated facilities for Units 6 & 7 are currently planned to be built at sea level (ER 3.9-15-16). These non-elevated facilities, structures, and roads will already have been impacted by a 5 to 7 inches of further sea level rise at the time Units 6 & 7 becomes active in 2018 and 2020. (ER Table 3.9-1). These non-elevated facilities, structures, and roads will likely be affected by 1-1.5 feet of sea level rise by 2050, which is within the 40 year lifespan of Units 6 & 7 if the proposed schedule of Table 3.9-1 is followed. (ER Table 3.9-1). By 2080, the anticipated design life of the proposed reactors, there will have been at least 2.1 to 3.4 feet of further sea level rise. The environmental impacts of a power plant attempting to operate in the middle of a combined Biscayne/Florida Bay would surely warrant serious environmental review.

B. Incorporating future sea level changes will affect the population trends for the south Florida area and as such the future power needs. By 2050 sea level is projected to

have risen by at least 1 to 1.5 feet, inundating remaining coastal wetlands, causing major saline intrusion, and forcing relocation from low-lying areas of western southeast Florida proximal to the Everglades, of southeast Florida east of Homestead, and of the barrier islands north from Key Biscayne. Diminishing population will greatly decreasing the energy needs of this region. By 2070, 50 years into the design life for the reactors, sea level will have risen by at least 1.7 to 2.7 feet. By 2080, the anticipated design life of proposed reactor #7, there will have been at least 2.1 to 3.4 feet of further sea level rise. This will severely diminish the habitability of southeast Florida. The ER does not address climate change or sea level rise as it will affect the population trends for the south Florida area and as such the future power needs.

C. Incorporating future sea level changes will change the viability of a nuclear power complex that is increasingly isolated from the mainland and sitting in the middle of a combined Biscayne/Florida Bay. Units 6 & 7 will be an island by 2050, which is within the proposed 40 year lifespan for these new reactors. The ER does not address how future sea level changes due to climate change will change the viability of a nuclear complex that is increasingly isolated from the mainland and sitting in the middle of a combined Biscayne/Florida Bay.

D. Incorporating future sea level changes will change the safety and structural integrity of the complex during major storms and terrorist threats, leading to direct and cumulative environmental impacts that are unaccounted for in the ER. Units 6 & 7 will be significantly more susceptible to hurricane events when no-longer connected to the mainland of Florida. FPL's FSAR states:

The Units 6 & 7 plant area is built up to higher elevations from the adjacent grade and is surrounded by a retaining wall structure with

the top of the wall elevation varying from 20 feet to 21.5 feet NAVD 88. The safety-related structures of Unit 6 and Unit 7 are at least 750 feet and 690 feet away from the nearest retaining wall, PTN COL 2.4-2 PTN COL 2.4-6 respectively. In addition, the retaining wall is a mechanically stabilized earth wall and is inherently robust to resist storm surges as well as other hydrodynamic effects and lateral soil loads.

(FSAR 2.4.10-1-2). Neither the FSAR nor the ER take into account the long-term lateral hydrologic loads that will occur from a sea level rise of at least 1-1.5 feet that will occur by 2050, 1.7 to 2.7 feet that will occur by 2070, or 2.1 to 3.4 feet that will occur by 2080, within the lifespan of proposed Unit 7 (as indicated by FPL PowerPoint slide) (Wanless Affidavit Exhibit 5.16). The ER does not take into account the environmental impacts that result from the increased vulnerability of the retaining wall structure and the complex itself in withstanding a hurricane in the middle of a combined Biscayne/Florida Bay. It is unknown how and whether the complex (including submerged infrastructure and the retaining wall structure itself) would react to continuous and long-term saltwater exposure, changing tides and currents, changing storm surge patterns and intensities due to sea level rise (as such is wholly unaccounted for in the ER). The environmental impacts of a power plant failing to withstand the changing patterns and forces of hurricane surges currents in the middle of a combined Biscayne/Florida Bay would surely warrant environmental review in the ER. The ER does not address how future sea level changes due to climate change will change both the safety and structural integrity of the complex during major storms and terrorist threats, and how such risks pose significant negative environmental concerns.

E. Incorporating future sea level changes will dramatically change the ability of the associated cooling complex and radial wells to function and to remain isolated from and prevent harm to the adjacent marine environment. The ER provides no analysis of the



## References

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[http://www.miamidade.gov/derm/library/08-10-04\\_CCATF\\_BCC\\_Package.pdf](http://www.miamidade.gov/derm/library/08-10-04_CCATF_BCC_Package.pdf) ).

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## Wanless Affidavit Exhibit List

<u>Exhibit</u>	<u>Document Summary</u>
5.1	Wanless Curriculum Vitae
5.2	Annual Report and Supplemental Recommendations: Presented to The Miami-Dade Board of County Commissioners, April 2010
5.3	Second Report and Initial Recommendations: Presented to The Miami-Dade Board of County Commissioners, April 2008
5.4	Presentation – Statement On Sea Level in the Coming Century, Science Committee, Miami-Dade CCATF, April 22, 2008,
5.5	SFWMD, “ <i>Preliminary Estimate Of Impacts of Sea Level Rise on The Regional Water Resources of Southeastern Florida;</i> ”
5.6	SFWMD, “ <i>Estimated Impacts of Sea Level Rise on Florida’s East Coast</i> ”
5.7	U.S. Army Corps of Engineers Presentation, “Climate Change Concerns for Everglades Restoration Planning”
5.8	U.S. Army Corps of Engineers, 2009. Water Resource Policies and Authorities Incorporating Sea-Level Change Considerations in Civil Works Programs. USACE Circular No. 1165-2-211. Washington, DC, 1 July 2009. 23 p.
5.9	Global Climate Change Impacts in the United States, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press, 2009.
5.10	Intentionally Omitted
5.11	Velicogna, I., 2009. Increasing rates of ice mass loss from the Greenland and Antarctic ice Sheets revealed by GRACE. <i>Geophysical Research Letters</i> , v. 36, L19503, doi: 10.1029/2009GL040222, 4 p.
5.12	Science Committee, 2008. Statement on Anticipated Sea Level Rise in the Coming Century. Science Committee, Miami-Dade County Climate change Advisory Task Force, Miami, Fl, 9 p.
5.13	Van den Broeke, M., Bamber, J., Ettema, J., Rignot, E., Schrama, E., van den Berg, W., van Meijgaard, E., Velicogna, I, Wouters, B., 2009. Partitioning recent Greenland mass loss. <i>Science</i> , v. 326, p. 984-986 and supporting on-line material.
5.14	Kerr, RA., 2009. Both of the world’s ice sheets may be shrinking faster and faster. <i>Science</i> , V. 326, p. 217.

- 5.15 Rahmstorf, S., 2010. A new view on sea level rise. Nature Reports Climate Change Published online: 6 April 2010 | doi:10.1038/climate.2010.29
- 5.16 Steve Scroggs & Ken Kosky, Powerpoint Presentation – Turkey Point Units 6 & 7 Nuclear Project (FPL & Golder Associates Aug. 13, 2010)
- 5.17 Jevrejeva, S., Moore, J.C., and Grinsted, A. 2010. How will sea level respond to changes in natural and anthropogenic forcings by 2100?, Geophysical Research Letters, v.37, L07703, doi:10.1029/2010GL042947.
- 5.18 Supplemental Staff Guidance to NUREG 1555, Environmental Standard Review Plan (ESRP) for Consideration of the Effects of Greenhouse Gases and of Climate Change (April 8, 2010) ADAMS Accession Number ML ML100990185.