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October 20, 2017

-VIA ELECTRONIC FILING-

Ms. Carlotta S. Stauffer
Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0850

Re: Docket No. 2017______-EI
In re: Florida Power & Light Company's Petition for Determination of Need for Dania Beach Clean Energy Center

Dear Ms. Stauffer:

Enclosed for filing on behalf of Florida Power & Light Company ("FPL") is FPL's Petition for Determination of Need for Dania Beach Clean Energy Center, along with testimony and exhibits of Dr. Steven R. Sim, Richard Feldman, Jacquelyn K. Kingston, and Heather C. Stubblefield, which support the petition.

Please contact me should you or your Staff have any questions regarding this filing.

Sincerely,

s/ William P. Cox
William P. Cox
Senior Attorney

WPC/msw
Enclosures

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Florida Power & Light Company's	)	
Petition for Determination of Need for	)	Docket No.2017____-EI
<u>Dania Beach Clean Energy Center Unit No. 7</u>	)	

<u>PETITION</u>

Pursuant to Sections 366.04 and 403.519, Florida Statutes, and Rules 25-22.080, 25-22.081, 25-22.082, and 28-106.201, Florida Administrative Code ("F.A.C."), Florida Power & Light Company ("FPL" or "the Company"), hereby petitions the Florida Public Service Commission ("Commission") for an affirmative determination need for the construction of a combined cycle ("CC") generating unit at the site of FPL's existing Lauderdale power plant in Broward County, Florida, which will utilize existing facilities, including transmission line, substation facilities, and gas infrastructure, to integrate, interconnect, and transmit energy from this site to FPL's transmission network for delivery to customers. The unit and the existing facilities is referred to herein collectively as the Dania Beach Clean Energy Center Unit 7 ("DBEC Unit 7" or the "Project").

FPL proposes to build a new 2-on-1 ("2x1") CC unit sited at FPL's existing Lauderdale plant site in Broward County, Florida. The new CC unit, DBEC Unit 7, will replace the older, less efficient existing Lauderdale Units 4 & 5 currently at the site. These older CC units will be retired prior to beginning construction of the new CC unit. This modernization of the Lauderdale site is projected to be completed by June 2022.

The Project is projected to provide $337 million cumulative present value of revenue requirements ("CPVRR") in savings to FPL's customers compared to keeping the existing Lauderdale Units 4 & 5 operating with their higher operational and fuel costs. It will also enhance FPL's system reliability by increasing two reserve margin criteria and enhancing the load-generation balance in the Southeastern Florida region of FPL's service territory. In addition, the Project would defer the need for future capacity additions, and the unit's high fuel efficiency will result in less natural gas burned on the FPL system than would be the case if the existing Lauderdale Units 4 & 5 remained in operation. Beyond the fuel savings, system reliability improvements, and air emission reductions, DBEC Unit 7 is estimated to generate significant economic benefits, including millions of dollars in tax revenues for local governments and school districts, and a number of temporary and permanent jobs.

Thus, the proposed modernization of the existing Lauderdale plant site with a new 2x1 CC unit, DBEC Unit 7, is projected to result in economic, reliability, and fuel usage benefits for FPL's customers. Consequently, FPL is respectfully requesting that the FPSC grant a determination of need for DBEC Unit 7 with an in-service date of June 1, 2022.

I. Introduction and Overview

1. FPL's request for an affirmative determination of need for DBEC Unit 7 results from the culmination of extensive investigation and analyses which ultimately identified the modernization of the existing Lauderdale plant as the most cost-effective alternative to address FPL system resource needs, including the need in FPL's Southeastern Florida region to maintain and enhance the load-generation balance for that region of FPL's service territory. This evaluation included FPL's assessment of various generation, transmission, and efficiency options to select the most cost-effective option for FPL customers to meet that need in Southeastern Florida, including CC generation, combustion turbine (CT) generation, solar generation, and energy storage options. Consistent with previous modernization projects, FPL sought and obtained an exemption from the Commission's Bid Rule (Rule 25-17.082, F.A.C.) and its requirement to conduct a Request for Proposals ("RFP") for supply-side generation alternatives, based on findings that the Dania Beach Project is likely to result in lower cost supply of

electricity, more reliable supply of electricity, and public welfare benefits. See Order No. PSC-2017-0287-PAA-EI.

2. Specifically, the modernization involves replacing the existing Lauderdale plant Units 4 & 5 having a summer peak capacity rating of about 884 megawatts ("MW") with the construction of the new highly efficient DBEC Unit No. 7, a CC power plant, with a summer peak capacity rating of about 1,163 MW commencing commercial operation by June 1, 2022. DBEC Unit 7 will provide an incremental 279 MW to serve FPL's customers in FPL's Southeastern Florida region. The modernized plant's primary fuel will be natural gas, and it will have the dual fuel capability to burn light fuel oil as a back-up fuel.

3. Adding DBEC Unit 7 by 2022 is an integral part of FPL's resource plan to meet the growing resource needs of its customers and continue to deliver electricity at a reasonable cost, while complying with both existing and anticipated environmental requirements. An affirmative determination of need for DBEC Unit 7 beginning in 2022 is projected to provide several important benefits to customers and Florida residents that will be reflected in lower electric rate and bill impacts and greater service reliability for all of FPL customers:

- First, FPL customers are projected to receive substantial electricity cost savings.
    - FPL's customers are projected to save $337 million CPVRR with the DBEC Unit 7 as compared to an alternative that would consist of keeping the existing Lauderdale Units 4 & 5 operating.
    - In addition, DBEC Unit 7 is projected to be $1,288 million CPVRR less expensive than with an equivalent amount of firm capacity (1,163 MW) in Southeastern Florida supplied by solar and batteries sited in that region.

- Second, DBEC Unit 7 will enhance FPL's system reliability and integrity to serve its customers.
    - The additional 279 MW from DBEC Unit 7 will increase FPL's reserve margin values and also defer the need for future capacity additions.
    - The new CC unit will also maintain and enhance the balance between generation and load in the Southeastern Florida region.
- Third, DBEC Unit 7 is also projected to provide public welfare benefits.
    - DBEC Unit 7 is projected to create an estimated $297 million in new tax revenue to local governments and school districts over the life of the project.
    - DBEC Unit 7 will create an estimated 650 direct jobs at its peak during construction.
- Fourth, DBEC Unit 7 will significantly improve FPL's air emission profile compared to continuing the operation of Lauderdale Units 4 & 5.
    - The new unit will decrease the NO_x emissions rate by an expected 95%.
    - The new unit will provide significant reductions in CO_2 and other air emissions.

II. The Utility Primarily Affected (Rule 25-22.081(a)(1))

In support of its Petition, FPL states:

4. The Petitioner's name and address are:

Florida Power & Light Company
700 Universe Boulevard

Juno Beach, Florida 33408

5. FPL's representatives who should receive communications regarding this docket:

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6. FPL is a Florida corporation with headquarters at 700 Universe Boulevard, Juno Beach, Florida, 33408. FPL is a utility as defined in Section 366.82(1), Florida Statutes, and is an applicant as defined in Section 403.503(4), for purposes of Section 403.519, Florida Statutes. FPL is the primarily affected utility within the meaning of Rule 25-22.081, F.A.C.

7. FPL currently serves approximately 4.9 million retail customer accounts throughout Florida. Its service area covers about 27,650 square miles in 35 Florida counties. Approximately ten million people live within the area FPL serves, which spans from St. Johns County in the north to Miami-Dade County in the south, and westward to Manatee County. FPL's largest concentration of electric sales is in the Southeastern Florida region (Miami-Dade and Broward counties). Miami-Dade and Broward counties account for 44 percent of the Company's summer peak load.

8. FPL has one of the cleanest generating fleets in the country. FPL meets its customers' energy needs through a mix of gas-fired and nuclear generating units, renewable generation, purchased power, and Demand Side Management ("DSM") programs. FPL's existing generation resources are located at 17 sites distributed geographically throughout its service territory (3 of which are located within the Southeastern Florida region) and also includes

partial ownership of one unit located in Georgia and two units in Jacksonville, Florida.[1] At the time of filing this Petition, FPL's active generation fleet totals approximately 26,139 MW (summer) of firm capacity and 26,267 MW (summer) of total system capacity, and its generating units consist of four nuclear steam units, four coal steam units in which it holds partial ownership interests, 16 CC units, four fossil steam units, four combustion gas turbines, nine simple cycle combustion turbines ("CT"), five oil/gas steam units, 48 CT units, and five solar photovoltaic ("PV") units.

9. At the end of 2016, FPL had contracted to purchase firm capacity and energy from cogeneration and small power production facilities totaling 334 MW. FPL currently projects that about 114 MW of these third-party renewable contracts will be available to FPL in 2022. FPL has also fostered the expansion of renewable energy sources through development of its own renewable generation projects. FPL operates six commercial-scale solar generation facilities in Florida. FPL's five solar PV facilities (Manatee [74.5 MW], Citrus [74.5 MW], Babcock [74.5MW], DeSoto [25 MW], and Space Coast [10 MW]) represent a combined 258.5 MW (nameplate, AC). In addition, a Martin solar facility represents 75 MW of solar thermal (nameplate) capacity.

III. The Proposed Electrical Power Plant (Rule 25-22.081(1)(b))

10. FPL plans to build a state-of-the-art, highly-efficient, low-emission 2x1 advanced CC generation unit at FPL's existing Lauderdale plant site (392 acres), which is located on parts of the Cities of Dania Beach and Hollywood in Broward County, Florida. With this Project, FPL would propose to retire in 2018 two 1990s-era natural gas-fueled 2x1 CC electric generating units located at the existing Lauderdale power plant site, totaling 884 MW of generating

[1] The two units located in Jacksonville, Florida are part of the St. John's River Power Park, and on September 25, 2017, the Commission approved FPL's early shutdown of these units in Docket No. 20170123-EI, with anticipated shutdown in January 2018.

capacity, and to replace them with the planned unit with up to 1,163 MW of generating capacity by June 2022.

11. The Lauderdale plant has been repowered three previous times since its initial construction in 1925 as FPL's first power plant. Its current steam turbine generators and associated equipment were placed in service in 1957. In 1993, the steam units were repowered to combined cycle generation technology with the addition of the current combustion turbine generators ("CTGs").[2] The proposed replacement of what would be a nearly thirty-year-old CC unit (four CTGs, four heat recovery steam generators ("HRSGs"), and two steam turbine generators ("STGs") with this proposed CC modernization (two CTGs, two HRSGs, and one STG) will continue a trend to bring the most efficient and cost-effective generation to serve FPL customers by replacing a CC unit that is currently at the bottom of the FPL combined cycle fleet dispatch order. The current CTG steam injection for emissions control requires significant water use and incremental operations & maintenance ("O&M") expense. In addition, the current STGs, CTGs, and HRSGs all require significant maintenance at a considerable expense in the near term to keep the existing plant running in proper order.

12. FPL has attained a great deal of experience in building and operating CC plants to achieve the best possible efficiencies. FPL has also proven its ability to implement CC plant projects on budget and on time.

13. DBEC Unit 7 will be configured as a CC unit, which will use two of the latest generation CTs, two HRSGs, and one STG. Each CT is connected to an electric generator that produces electricity to meet the needs of FPL's customers. The exhaust gas produced by each CT then passes through an HRSG and produces steam, which, in turn, is used to drive an STG and produce additional electricity for FPL's customers. This waste heat recovery feature of the

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[2] In addition in 2016, the original peaking units from 1970, also on the site, were replaced with modern CTGs.

CC system improves overall plant efficiency beyond that of simple-cycle CTs or simple-cycle steam plants.

14. The DBEC Unit 7 2x1 CC unit is expected to have a summer peak capacity of about 1,163 MW. DBEC Unit 7 will be a 2x1 CC unit consisting of two nominally 400-MW advanced CTs, with dry low-NOx combustors, peak-firing, inlet cooling, and wet compression, and two HRSGs, which will use the waste heat from the CTs to produce steam to be utilized in a new steam turbine generator.

15. Generally, new CC plants can be expected to achieve an energy conversion rate ("heat rate") of less than 7,000 British thermal units ("Btu") per kilowatt hour ("kWh"). FPL anticipates that DBEC Unit 7 will have an average base heat rate as low as approximately 6,119 Btu/kWh, based on an average ambient air temperature of 75°F. The new unit's heat rate represents 22% improvement over the approximate 7,800 Btu/kWh heat rate of the existing Lauderdale Units 4 & 5 and will result in fuel savings for FPL customers.

16. The CTs will use the same types of fuel that are currently being used at the site. Natural gas will be used as the primary fuel. DBEC Unit 7 will utilize the existing gas pipeline to the site for necessary fuel transportation. FPL has sufficient gas transportation capacity to serve DBEC Unit 7. To provide a backup fuel to the unit in the event of an extended disruption of natural gas supply, DBEC Unit 7 will also be designed to burn light fuel oil, more specifically light fuel oil with an ultra-low sulfur content (maximum of 0.0015 percent), as a back-up fuel.

17. DBEC Unit 7 will connect into the existing onsite Lauderdale Plant 230kV/138kV transmission switchyard. No new offsite transmission lines or network upgrades are required as a result of the Project.

18. The cooling water source for the Project will continue to be the existing Dania Cutoff Canal with an auxiliary cooling system to help limit the temperature rise of the water.

Process and potable water will continue to be obtained from existing county and city supplies. The use of natural gas as a primary fuel source with light fuel oil as a backup fuel, combined with combustion control technologies, will minimize air emissions from the unit and ensure compliance with applicable emission limiting standards. By using natural gas as the primary fuel for DBEC Unit 7 and technology that is recognized by the Florida Department of Environmental Protection as the Best Available Control Technology for minimizing air emissions, DBEC Unit 7 is projected to be among the cleanest and most efficient natural gas-fired, electric-power generating units of its kind in the world.

19. FPL expects that DBEC Unit 7 will be a highly reliable source of energy for FPL's customers. The new CC unit is estimated to have an equivalent availability factor of up to 95.5 percent based on an estimated average forced outage factor of approximately 1.0 percent and a planned outage factor of 3.5 percent. Adding this highly reliable unit will help maintain and enhance the system and regional reliability of FPL.

20. The projected total construction cost of DBEC Unit 7 will be $888.0 million. Principal components include the power block and generator transformers at $764.0 million, transmission interconnection and integration at $21.0 million, and allowance for funds used during construction ("AFUDC") at $103.0 million. FPL will annually report to the Commission's Director of Economic Regulation the budgeted and actual cost of DBEC Unit 7, compared to the estimated total in-service cost presented in this Petition.

IV. The Need for DBEC Unit 7 (Rule 25-22.081(1)(c))

21. Under the need determination criteria in Section 403.519, Fla. Stat., the need for DBEC Unit 7 is based on a combination of a need for adequate electricity at a reasonable cost, a need for electric system reliability and integrity, and a need for fuel diversity and supply reliability, all for the benefit of FPL's customers.

22. ***Need for Adequate Electricity at a Reasonable Cost.*** The Lauderdale modernization project, which results in DBEC Unit 7, is projected to be approximately $337 million CPVRR less expensive than continuing to operate the existing Lauderdale Units 4 & 5 in their present form. Further, the new CC unit is projected to result in the lowest system CPVRR cost of all of the numerous resource options and resource plans evaluated by FPL, including CC, CT, solar PV, and energy storage technologies. As such, the unit is also projected to result in the lowest electric rates for FPL's customers when compared to these alternatives, which is driven in part by the fact that the new unit will not require any new gas pipeline, transmission line, or water supply.

23. ***Need for Electric System Reliability and Integrity.*** DBEC Unit 7 will also enhance FPL's system reliability and integrity as measured by FPL's two reserve margin criteria. The additional 279 MW that will result from retiring the 884 MW from existing Lauderdale Units 4 & 5, and adding 1,163 MW from DBEC Unit 7, will increase FPL's reserve margin values and also defer the need for future capacity additions. The new CC unit will also maintain and enhance the balance between generation and load in the Southeastern Florida region because this increased generation capacity amount will be sited in that region.

24. The Southeastern Florida region is important for several reasons. First, the electrical load in this region constitutes 44% of FPL's total load and continues to grow. Second, the region is already highly developed and development continues. As a result, areas suitable for electric generation facilities are limited. Third, the region is geographically constrained near the end of the Florida peninsula. Thus, the potential to build new transmission lines to transport power from outside the region is limited. Fourth, a balance between the region's electrical load, generation sited in the region, and transmission import capability into the region is important in order to maintain regional reliability and to avoid having to run generators in the region out of

economic dispatch.

25. ***Need for Fuel Diversity and Supply Reliability.*** Because of DBEC Unit 7's high level of fuel efficiency, the unit is projected to lower the total amount of natural gas used by FPL's generating fleet compared to continuing to operate the existing Lauderdale Units 4 & 5 in a status quo scenario. With the start of operations earlier this year of the new Sabal Trail/Florida Southeast Connection pipeline system, the diversity and reliability of natural gas supply to FPL's system has been significantly enhanced.

V. FPL's Analysis of Generating Alternatives (Rule 25-22.081(1)(d))

26. Beginning in 2016 and through early 2017, FPL conducted extensive analyses to examine FPL's projected resource needs for the entire FPL system and the need to maintain a state of balance between generation and load in the Southeastern Florida region, which is needed to maintain system reliability in this very high load area. The 2016 analyses examined a variety of resource options and resource plans that could potentially address both the system need and the regional need. In the 2016 analyses, FPL examined: (i) new generation potentially located inside the Southeastern Florida region, (ii) new generation potentially located outside of this region, and (iii) transmission options for increasing electricity import capability into the Southeastern Florida region from generation located outside of the region.

27. FPL analyzed a variety of types of generation (including CCs, CTs, and PV), multiple potential generation sites, energy storage batteries, and DSM, as well as new natural gas pipelines that would be needed if generation was added at specific sites, and transmission facilities that would be needed to interconnect new generation options to the FPL system The PV facilities analyzed included both universal (utility-scale) PV and distributed generation (commercial rooftop) PV sited in the Southeastern Florida region. A Lauderdale modernization option emerged as one of the most promising options in the 2016 analyses. That option, and

several other promising resource plans and resource options from the 2016 analyses, were carried into 2017 for additional analyses that used updated forecasts and projections for load, fuel costs, environmental compliance costs, and resource option costs.

28. The result of the 2017 analyses was that retiring the existing Lauderdale Units 4 & 5 in late 2018, followed by a modernization of the site by June 1, 2022 with a 2x1 CC unit (DBEC Unit 7), was projected to be the most economic option for FPL's customers. It is projected to be approximately $337 million CPVRR less expensive than continuing to operate the existing Lauderdale Units 4 & 5 in a status quo scenario, and $1,288 million CPVRR less expensive than a resource plan in which DBEC Unit 7 is not built and an equivalent amount of firm capacity (approximately 1,163 MW) in Southeastern Florida is assumed to be supplied by solar and batteries sited in that region. FPL's analyses also showed that a delay from the planned 2022 in-service date by one year results in a projected $12 million CPVRR increase and a $38 million CPVRR increase for a two year delay.

VI. FPL's Analysis of Non-Generating Alternatives (Rule 25-22.081(1)(e))

29. FPL employs comprehensive and cost-effective DSM programs to reduce peak load requirements and reduce energy consumption. Without its DSM achievements, FPL would require more additional capacity to meet its present and projected needs. Since the inception of its DSM programs through 2016, FPL has eliminated the need for the equivalent of 15 new 400 MW generating units. FPL has achieved this level of demand reduction through DSM programs designed to reduce electric rates for all customers, DSM participants and non-participants alike.

30. FPL's forecast of resource needs takes into account all projected DSM from cost-effective programs approved by the Commission, including all cost-effective energy efficiency ("EE") programs that might be implemented in the Southeastern Florida region. FPL's analyses supporting the need for DBEC Unit 7 accounted for all achievable, cost-effective DSM approved

by the FPSC in the DSM Goals set for FPL through the year 2024, plus an assumed continuation of that same level of annual DSM implementation through the year 2030. FPL's summer MW Goals for the 2015 – 2024 time period were set at 526 MW or about 53 MW of DSM per year on average. FPL has not identified additional cost-effective DSM beyond that already reflected in FPL's analyses. There is no evidence to suggest that additional DSM could provide economic benefits to FPL's customers that could in any way diminish the unquestionable benefits projected to be provided by DBEC Unit 7 beginning in 2022. Taking these benefits into consideration, the interests of FPL's customers are best served by placing DBEC Unit 7 in commercial operation in June of 2022.

VII. Adverse Consequences (Rule 25-22.081(f))

31. If an affirmative determination of need for DBEC Unit 7 in 2022 is not granted, FPL's customers would face adverse consequences in terms of increased costs, potentially diminished system and regional service reliability, and increased fossil fuel usage. Foremost, without placing DBEC Unit 7 in service in 2022, FPL customers would lose significant cost savings and would feel the impact on their electric bills as early as 2022. The estimated incremental cost to FPL's customers ranges from $337 million up to $1,288 million CPVRR when comparing DBEC Unit 7 to all other alternatives analyzed.

32. In addition, the 1,163 MW of capacity that is projected from DBEC Unit 7 will enhance system reliability and defer the need to add resources in future years. Denying the need determination will result in lower system reliability for FPL's customers and in FPL having to acquire new resources earlier than if this need determination is approved, likely at a higher cost. Moreover, the additional 279 MW of capacity that would be added in the Southeastern Florida region will enhance regional reliability for service to FPL's customers. Thus, denying a need determination for DBEC Unit 7 will forego this opportunity to enhance regional reliability.

33. Finally, DBEC Unit 7 will be a very fuel efficient generating unit with a projected heat rate of approximately 6,119 BTU/kWh. Once DBEC Unit 7 is in-service, it is projected that FPL's total usage of natural gas will decrease on a system-wide basis compared to the status quo scenario in which the existing Lauderdale Units 4 & 5 continue to operate. If the need determination is denied, FPL is projected to burn more natural gas for its generation needs than would be the case if the need determination for DBEC Unit 7 is approved compared to keeping the status quo. In summary, a decision to not grant a need determination for DBEC Unit 7 is projected to result in higher costs, lower system reliability, lower regional reliability, and higher fossil fuel usage, all to the detriment of FPL and its customers.

VIII. Disputed Issues of Material Fact

34. FPL is presently unaware of any disputed issues of material fact affecting this proceeding. FPL will demonstrate that approving a need determination for DBEC Unit 7 in 2022 will best serve FPL's customers by providing substantial economic, system and regional reliability, and fuel usage benefits. FPL also will demonstrate that there are no reasonably available renewable resources, DSM, or other non-generation alternatives that would significantly mitigate the need for, and economic benefits of, DBEC Unit 7.

CONCLUSION

As proposed, DBEC Unit 7 is a highly cost-effective choice for serving FPL's customers. DBEC Unit 7 is projected to deliver major cost savings to benefit FPL's customers, enhance system and regional reliability to serve FPL's customers, and reduce FPL's usage of natural gas a as a fuel source for generation.

Based upon the foregoing and the more detailed information in the pre-filed testimony and exhibits submitted contemporaneously with this Petition, FPL requests that the Commission grant FPL an affirmative determination of need for DBEC Unit 7 in June of 2022. FPL will annually report to the Commission's Director of Economic Regulation updates to the budgeted and actual cost of DBEC Unit 7, compared to the estimated total in-service cost presented in this Petition.

FPL also requests that, as part of the Commission's order granting an affirmative determination of need for DBEC Unit 7, the Commission provide that its determination is not predicated on FPL's selection of a particular design or model of CT, HRSG, STG (the "Power Train Components") or other related equipment necessary for operation of the unit, thus providing FPL the flexibility through its negotiations and analyses to select the technology that best meets FPL customers' needs in terms of reliability and cost-effectiveness.

FPL would select an enhanced design or model only if the enhanced design or model results in lower projected system CPVRR cost to FPL's customers. In the event that FPL selects an enhanced design or model other than the analyzed technology subsequent to the Commission having granted a determination of need for DBEC Unit 7, FPL proposes to make an informational filing to the Commission that documents the projected comparative CPVRR cost advantage of the alternate technology chosen.

WHEREFORE, FPL respectfully requests that the Commission grant an affirmative determination of need for DBEC Unit 7 with an in-service date of June 1, 2022 that is not limited to a particular design or model of Power Train Components or other related equipment necessary for operation of the unit, but rather would allow FPL to select an enhanced design or model other than the analyzed technology if the Company documents through an informational filing that the projected CPVRR to FPL's customers would be lower.

Respectfully submitted this 20th day of October, 2017.

R. Wade Litchfield
Vice President and General Counsel
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Senior Attorney
Kevin I.C. Donaldson
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Attorneys for Florida Power & Light Company
By: *s/ William P. Cox*________
William P. Cox
Florida Bar No. 0093531

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

FLORIDA POWER & LIGHT COMPANY

PETITION FOR DETERMINATION OF NEED

REGARDING THE DANIA BEACH CLEAN ENERGY CENTER UNIT 7

DIRECT TESTIMONY OF DR. STEVEN R. SIM

DOCKET NO. 2017_______-EI

OCTOBER 20, 2017

TABLE OF CONTENTS

I. INTRODUCTION AND CREDENTIALS

Q. Please state your name and business address.

A. My name is Steven R. Sim. My business address is 700 Universe Boulevard, Juno Beach, Florida 33408.

Q. By whom are you employed and what is your position?

A. I am employed by Florida Power & Light Company (FPL) as Director of Integrated Resource Planning.

Q. Please describe your duties and responsibilities in that position.

A. I direct and perform analyses that are designed to determine the magnitude and timing of FPL's resource needs and then develop the integrated resource plan with which FPL will meet those resource needs. I also direct and perform analyses that are designed to otherwise improve system economics and/or enhance system reliability for FPL's customers.

Q. Please describe your educational background and business experience.

A. I graduated from the University of Miami (Florida) with a Bachelor's degree in Mathematics in 1973. I subsequently earned a Master's Degree in Mathematics from the University of Miami (Florida) in 1975 and a Doctorate in Environmental Science and Engineering from the University of California at Los Angeles (UCLA) in 1979. While completing my degree program at UCLA, I was also employed full-time as a Research Associate at the Florida Solar Energy Center (FSEC) during 1977-1979 where I analyzed potential renewable resources in the Southeastern United States.

In 1979, I joined FPL. From 1979 until 1991, I worked in various departments including Marketing, Energy Management Research, and Load Management, where my responsibilities concerned the development, monitoring, and cost-effectiveness analyses of demand side management (DSM) programs. In 1991, I joined the System Planning Department, later named the Resource Assessment & Planning department, where I held different supervisory and management positions dealing with integrated resource planning. I assumed my current position earlier this year.

Q. Have you previously testified on resource planning issues before the Florida Public Service Commission?

A. Yes. I have testified before the Florida Public Service Commission (FPSC) in numerous dockets. These dockets have dealt with various resource planning issues such as system reliability and economic analyses of resource options. The specific subjects of these dockets have included: (i) need determination filings for combined cycle (CC) units, advanced coal units, and nuclear units, (ii) nuclear feasibility analyses, and (iii) DSM goal-setting.

Q. Are you sponsoring any exhibits in this case?

A. Yes. I am sponsoring four exhibits which are attached to my direct testimony:

Exhibit SRS-1	2017 Projection of Environmental Compliance Costs for CO_2;
Exhibit SRS-2	2017 Projection of FPL's Resource Needs Utilizing FPL's Two Reserve Margin Criteria;
Exhibit SRS-3	The Three Resource Plans Analyzed in 2017; and,

Exhibit SRS-4 The Economic Results for the Three Resource Plans Analyzed in 2017.

II. PURPOSE AND SCOPE

Q. What is the purpose and scope of your testimony?

A. The primary purpose of my testimony is to support FPL's request that the FPSC grant an affirmative determination of need for the construction of a new 2-on-1 (2x1) advanced CC unit sited at FPL's existing Lauderdale plant site in Broward County, Florida. The new CC unit, which will be named the Dania Beach Clean Energy Center (DBEC) Unit 7, will replace the older, less efficient existing Lauderdale Units 4 & 5 currently at the site. These older units will be retired prior to beginning construction of the new CC. This modernization of the Lauderdale site is projected to be completed by June 2022.

My testimony addresses six main points. First, I summarize what FPL is requesting from the FPSC and how the proposed DBEC Unit 7 meets the criteria the FPSC considers in a need determination filing. Second, I introduce the FPL witnesses who are providing direct testimony in this docket and, for convenience, briefly describe the information each FPL witness is providing in his/her direct testimony. Third, I provide an overview of analyses performed in the second half of 2016 in which FPL examined projected resource needs for both the FPL system and the Southeastern Florida region (Miami-Dade and Broward counties), plus resource options that could potentially meet those projected needs.

Fourth, I discuss additional analyses conducted in 2017 using current forecasts and assumptions. The 2017 analyses resulted in a conclusion that the modernization of the Lauderdale site, with DBEC Unit 7 being placed in service in mid-2022, was the best option for FPL's customers. I summarize and discuss the benefits for FPL's customers of adding DBEC Unit 7. Fifth, I discuss the adverse consequences FPL and its customers would face if a determination of need for DBEC Unit 7 is not granted. Sixth, based on the analyses performed, I discuss my conclusion that the addition of DBEC Unit 7 will benefit FPL's customers from the perspectives of both economics and reliability.

Q. Please summarize your testimony.

A. In mid-2016, FPL began to perform an extensive set of analyses that examined FPL's projected resource needs for the entire FPL system and, importantly, the need to maintain a state of balance between generation and load in the Southeastern Florida region, which is needed to maintain system reliability in this very high load area. The 2016 analyses examined a variety of resource options and resource plans that could potentially address both the system need and the regional need. In the 2016 analyses, FPL examined: (i) new generation potentially located inside the Southeastern Florida region, (ii) new generation potentially located outside of this region, and (iii) transmission options for increasing electricity import capability into the Southeastern Florida region from generation located outside of the region. The specific types of generation resources that were examined included: CC units, combustion turbine (CT) units, and solar photovoltaic (PV) options. In addition, FPL evaluated energy storage batteries, DSM, new natural gas pipelines (needed if generation was added at specific sites), and transmission facilities that would be needed to interconnect new generation options to the FPL system, and/or to integrate the transmission system as a whole.

Several conclusions were drawn from the results of the 2016 analyses. First, a new transmission line into Southeastern Florida was needed in virtually all resource plans analyzed and, once this transmission line was in place, it could address the regional needs through the decade of the 2020s. Second, the installation of this new transmission line can open a window of opportunity in which the old, low fuel efficiency existing Lauderdale Units 4 & 5 can be retired and their capacity replaced within the region. Third, continued operation of FPL's existing Lauderdale Units 4 & 5 is projected to incur significant costs in both the near and long term. Thus, a Lauderdale modernization option emerged as one of the most promising options in the 2016 analyses. That option, and several other promising resource plans and resource options[1] from the 2016 analyses, were carried into 2017 for additional analyses that used updated forecasts and projections for load, fuel costs, environmental compliance costs, and resource option costs.

The result of the 2017 analyses was that retiring existing Lauderdale Units 4 & 5 in late 2018, followed by a modernization of the site by June 1, 2022 with a 2x1 CC unit (DBEC Unit 7), was projected to be the most economic option for FPL's customers. No new gas pipeline, transmission line, or water supply will be needed for the new CC unit. The resource plan based on this modernization is projected to be $337 million cumulative present value of revenue requirements (CPVRR) less expensive compared to keeping the existing Lauderdale Units 4 & 5 operating. In addition, this resource plan is projected to be $1,288 million CPVRR less expensive than a resource plan in which DBEC Unit 7 is not built and an equivalent amount of firm capacity (approximately 1,163 MW) in Southeastern Florida is assumed to be supplied by solar and storage batteries sited in that region.

With the addition of a new 2x1 CC unit of 1,163 MW (Summer peak capacity), FPL's customers would also benefit from increased reliability. This capacity addition, which would result in an increase in Southeastern Florida generating capacity of 279 MW (1,163 – 884 = 279) beyond the 884 MW

[1] The term "promising" refers to resource options and resource plans that emerged from the 2016 analyses as being among the lowest in terms of their cumulative present value of revenue requirements (CPVRR) costs.

currently supplied by existing Lauderdale Units 4 & 5, would enhance FPL's system reliability by increasing reserve margins. This additional capacity would also defer the need for future capacity additions. Also, because this new capacity is sited inside the Southeastern Florida region, the additional MW from DBEC Unit 7 will also assist in maintaining/enhancing regional balance. Furthermore, the new CC unit's high fuel efficiency will result in less natural gas burned on the FPL system than would be the case if the existing Lauderdale Units 4 & 5 remained in operation in a "status quo" scenario.

Thus, the proposed modernization of the existing Lauderdale plant site with a new 2x1 CC unit, DBEC Unit 7, is projected to result in economic, reliability, and fuel usage benefits to FPL's customers. Consequently, FPL is respectfully requesting that the FPSC grant a determination of need for DBEC Unit 7 with an in-service date of June 1, 2022.

III. FPL'S REQUEST FOR FPSC APPROVAL

Q. What regulatory approval is FPL seeking from the FPSC in this proceeding?

A. FPL seeks an affirmative determination of need for DBEC Unit 7 with an in-service date of June 1, 2022 from the FPSC.

Q. Is FPL's request for a need determination order based on economic savings for FPL's customers, on meeting future reliability needs, or both?

A. Both. The request is based on a combination of enhanced economics and enhanced system and regional reliability. Each of these factors will benefit FPL's customers. The remainder of my testimony will address these considerations.

Q. From a resource planning perspective, please address how the DBEC Unit 7 meets the need determination criteria set forth in Section 403.519, Florida Statutes.

A. Under Section 403.519(3), Florida Statutes, there are specific criteria that the FPSC is to consider in a determination of need proceeding. This relevant text reads as follows:

> *"In making its determination, the commission shall take into account the need for electric system reliability and integrity, the need for adequate electricity at a reasonable cost, the need for fuel diversity and supply reliability, whether the proposed plant is the most cost-effective alternative available, and whether renewable energy sources and technologies, as well as conservation measures, are utilized to the extent reasonably available. The commission shall also expressly consider the conservation measures taken by or reasonably available to the applicant or its members which might mitigate the need for the proposed plant and other matters within its jurisdiction which it deems relevant."*

I address the application of each of these criteria to the proposed Lauderdale modernization with DBEC Unit 7:

- *Need for Electric System Reliability and Integrity:* FPL's request for a need determination of DBEC Unit 7 is driven in large part by significant projected economic benefits for FPL's customers. In addition, the new unit will enhance FPL's system reliability and integrity as measured by FPL's two reserve margin criteria. The additional 279 MW that will result from retiring the 884 MW from existing Lauderdale Units 4 & 5, and adding 1,163 MW from DBEC Unit 7, will increase FPL's system reserve margin values and also defer the need for future capacity additions. DBEC Unit 7 will also assist in maintaining and enhancing the balance between generation and load in the Southeastern Florida region because this increased generation capacity amount will be sited in that region.

- *Need for Adequate Electricity at a Reasonable Cost*: In addition to the reliability benefits for both the system and region described above, DBEC Unit 7 is projected to result in the lowest system CPVRR cost of all of the numerous resource options and resource plans evaluated by FPL. As such, the unit is also projected to result in the lowest electric rates for FPL's customers when compared to these alternatives. This result is driven in part by DBEC Unit 7's projected installed cost, including AFUDC, of $764 per kW, which is projected to be significantly lower that the installed cost/kW of FPL's most recent modernizations.[2] The fact that the new unit will not require any new gas pipeline, transmission line, or water supply contributes to lower the cost of this modernization.

- *Need for Fuel Diversity and Supply Reliability*: Because of DBEC Unit 7's high level of fuel efficiency, the unit is projected to lower the total amount of natural gas used by FPL's generating fleet compared to continuing to operate the existing Lauderdale Units 4 & 5 in a "status quo" scenario. With the start of operations earlier this year of the new Sabal Trail/Florida Southeast Connection pipeline system, the diversity and reliability of natural gas supply to FPL's system has been significantly enhanced. FPL is also pursuing cost-effective solar energy as a means to enhance fuel diversity on its system. For example, approximately 225 MW[3] of PV facilities went into operation at the end of 2016. Additionally, as part of its current Solar Base Rate Adjustment (SoBRA) filing, FPL is requesting approval for cost recovery of an additional 598 MW of cost-effective PV facilities that will be in service by early 2018. FPL's 2017 Ten Year Power Plant Site Plan (TYSP) further describes that FPL projects continued significant cost-effective PV additions through at least the year 2023. In the longer term, FPL is also seeking to enhance fuel diversity for its system by continuing to pursue a Combined Operating License for new

[2] The modernizations at Cape Canaveral, Riviera, and Port Everglades had total installed costs/kW of approximately $921, $1,053, and $928, respectively, using in-service year dollars.
[3] The MW values used for solar resource options represent the nameplate, AC rating of the option. The firm capacity values for these solar options will be lower than the nameplate ratings.

nuclear energy generation. If completed, this would allow the potential to construct and operate two new nuclear units at its Turkey Point site, subject to projected market factors and a full review by the FPSC prior to proceeding. The option to proceed to construct new nuclear generation would then be available to FPL and the FPSC for approximately 20 years.

- *Whether the Proposed Plant is the Most Cost-Effective Alternative Available*: As previously mentioned, FPL analyzed a variety of types of generation (including CCs, CTs, and PV), multiple potential generation sites, batteries, and DSM. The Lauderdale modernization project, which results in DBEC Unit 7, is projected to be approximately $337 million CPVRR less expensive than continuing to operate the existing Lauderdale Units 4 & 5 in a status quo scenario, and $1,288 million CPVRR less expensive than a resource plan in which DBEC Unit 7 is not built and an equivalent amount of firm capacity (approximately 1,163 MW) in Southeastern Florida is assumed to be supplied by solar and batteries sited in that region.

- *Whether Renewable Energy Sources and Technologies, as well as Conservation Measures, Are Utilized to the Extent Reasonably Available*: In addition to FPL's extensive and on-going implementation of cost-effective PV as described above, FPL's analyses of generation options in both its 2016 and 2017 analyses included PV facilities, including both universal (utility-scale) PV and distributed generation (commercial rooftop) PV, sited in the Southeastern Florida region. Further discussion of this is presented later in my testimony. As for conservation measures, FPL's analyses accounted for all achievable, cost-effective DSM approved by the FPSC in the DSM Goals set for FPL through the year 2024, plus an assumed continuation of that same level of annual DSM implementation through the year 2030.

- *Conservation Measures Taken or Reasonably Available to the Applicant or its Members which Might Mitigate the Need for the Proposed Plant*: In the course of its analyses, FPL examined whether incremental cost-effective energy efficiency (EE) programs might be implemented in the Southeastern Florida region. FPL already implements approximately a third of its total EE program annual sign ups within this region. Thus, the opportunity to shift EE program implementation from other areas of its system into the Southeastern Florida region is limited, particularly if FPL is going to continue to offer its EE programs on a cost-effective basis to FPL's customers in the rest of its service territory at annual levels prescribed in FPL's DSM Goals.

  Furthermore, additional EE above FPL's DSM Goals is not considered to be a viable option because the cost-effectiveness of DSM has continued to decline since FPL's DSM Goals were set in late 2014. This decline in

DSM cost-effectiveness is due to several factors that affect DSM's benefits (*i.e.*, costs that are potentially avoidable through DSM) including: lower forecasted fuel costs, enhanced generation efficiency of FPL's system (including cost-effective solar additions), lower costs for new generation options, lower projected environmental compliance costs, and a larger projected impact of energy efficiency codes and standards. This trend of declining DSM cost-effectiveness can be seen by comparing the cost-effectiveness analysis results from the 2014 DSM Goals docket with those from the 2009 DSM Goals docket, and by examining the results of FPL's response earlier this year to Staff's 1st Set of Interrogatories in Docket No. 2017002-EG, Interrogatory No. 1 that requested updated cost-effectiveness analyses of utility DSM programs. Such a comparison and examination will show that utility DSM program cost-effectiveness has been steadily declining for a number of years for the reasons described above. Therefore, levels of EE which are higher than those set in FPL's DSM Goals are not cost-effective and not a viable alternative to DBEC Unit 7.

IV. INTRODUCTION OF FPL WITNESSES

Q. Who are FPL's other witnesses in this docket and what subject(s) will each witness address in his/her direct testimony?

A. Three other FPL witnesses are providing testimony in this docket. A brief description of the witnesses, presented in alphabetical order, and the subject(s) each addresses in his/her direct testimony, follows:

- FPL witness Richard Feldman, of FPL's Load Forecasting group, presents FPL's load forecasting process, discusses the methodologies and assumptions used in the forecasting process, and presents FPL's 2017 TYSP load forecast that was used in the economic analyses that led to the selection of DBEC Unit 7.

- FPL witness Jacquelyn K. Kingston, of FPL's Project Development department, presents the engineering details of FPL's DBEC Unit 7, which involves the construction of a new state-of-the-art 2x1 CC unit at FPL's existing Lauderdale plant site in Broward County. Included in witness Kingston's testimony are the projected capital and operations and maintenance (O&M) costs, as well as the performance characteristics of the technology to be used in DBEC Unit 7 which were accounted for in FPL's economic analyses.

- FPL witness Heather C. Stubblefield, of FPL's Energy Marketing and Trading (EMT) department, describes the fuel transportation plan to deliver natural gas (the primary fuel for the new CC unit) and light oil (the secondary/back-up fuel) to DBEC Unit 7 and testifies to the ready availability of natural gas for this unit. Witness Stubblefield also presents FPL's 2017 TYSP fuel price forecast that was used in the economic analyses.

V. OVERVIEW OF FPL'S 2016 ANALYSES

Q. What was the objective of the analyses that FPL began in 2016?

A. As is described each year in FPL's annual TYSP filings, FPL conducts resource planning analyses designed to determine the timing and magnitude of FPL's next resource needs, and to determine the best resource option(s) with which to meet those needs. Included in this work are evaluations of a number of factors that are important in maintaining a reliable electric system and in keeping electric rates low for FPL's customers. One of these factors is maintaining a balance between generation and load in the Southeastern Florida region that consists of Miami-Dade and Broward counties. The importance of addressing this factor has been highlighted in each of FPL's TYSP filings since 2003.[4]

[4] Most recently, the importance of maintaining a balance between load and generation in Southeastern Florida is discussed on pages 61 and 62 of FPL's 2017 TYSP.

In 2016, FPL projected a need to add new resources to its system by 2024 to meet FPL's system reliability criteria. This was indicated in FPL's 2016 TYSP by the projected addition of an unsited CC unit in 2024 as a placeholder in the resource plan (because no decision regarding how to address this need was required at that time). A concurrent examination of the generation and load balance for Southeastern Florida also showed that an imbalance in the region was projected to occur at approximately the same time. Thus, the objective of the 2016 analyses was to determine the best approach to address both system and regional needs.

Q. Why is the Southeastern Florida region of particular importance?

A. There are several reasons for this. First, as also mentioned in FPL Witness Feldman's testimony, the electrical load in this two county region is very large, constituting 44% of FPL's total load. To put the magnitude of this load in perspective, the electrical load in just these two counties is roughly equivalent to the entire electrical load of the Duke Energy Florida system. Furthermore, this electrical load continues to grow. Second, these two counties are already highly developed and development continues to expand. As a consequence, areas suitable for electric generation facilities are limited. Third, these two counties sit near the end of the Florida peninsula and are surrounded by the Atlantic Ocean to the east, the Florida Keys to the south, the Everglades to the west, and highly developed areas in Palm Beach County to the north. Thus, the two counties are further constrained in regard to the potential to build new transmission lines to transport power from outside the region into the two counties.

In summary, maintaining and enhancing balance between generation and load in Southeastern Florida is a significant factor in FPL's planning effort due to the sheer size of the region's electrical load, its continuing growth, and the constraints inherent in and around the region.

Q. Please explain what are meant by "balance" and "imbalance" and why it is important to avoid an imbalance in this region?

A. Electric load (MW) in Southeastern Florida is greater than the amount of generation (MW) sited in that region. Thus, when considering just load and generation sited in the region, there is an imbalance. As a result, a significant amount of energy required in this region, particularly during peak periods, is provided by importing energy through the transmission system from generating units located outside of the region. By accounting for this transmission "import" capability, a balance of load, generation, and transmission import capability for the region can be reached. However, as previously mentioned, electric load in the two county region is steadily growing.

Evaluations of regional balance are performed using load flow analyses that address both FPL's transmission and generation systems. These load flow analyses address not only the usual MW and MWh characteristics of an electrical system that are utilized in resource planning analyses, but also address transmission system considerations to meet North American Electric Reliability Corporation (NERC) reliability standards.

As FPL approaches/reaches an imbalance condition in Southeastern Florida, at least two negative consequences begin to occur. The first of these, and by far the most important, is that the reliability of the transmission system in Southeastern Florida is placed at risk. Second, generating units in the region are operated out of system economic dispatch in an attempt to maintain regional balance. This increases system energy costs to all of FPL's customers, not just to customers within the region.

When an imbalance condition is projected, resources (generation, transmission, and/or DSM) need to be added either inside the region or, in the case of transmission, both inside and outside the region, to at least maintain, and hopefully enhance, regional balance.

Q. Please describe the approach used in FPL's 2016 analyses.

A. To address both the system need and the regional need, FPL performed an iterative series of analyses using its resource planning and transmission planning models. These models include: a reserve margin calculation spreadsheet, the Siemens PTI Power Transmission System Planning software load flow analysis model, the UPLAN production costing model, and FPL's fixed cost spreadsheet model.

For these analyses that began in mid-2016, FPL used the same forecasts for load, fuel cost, and environmental compliance cost that it had used in developing the 2016 TYSP. A few updates regarding generation assumptions were made. The most significant of these was in regard to the amount of PV that FPL would add throughout its system in future years. In its 2016 TYSP, FPL projected approximately 300 MW of additional PV after the year 2016. For these 2016 analyses, FPL assumed that it would add approximately 1,400 MW of PV beyond those 300 MW of PV presented in FPL's 2016 TYSP, or a total of approximately 1,700 MW of PV after 2016. All 1,700 MW of the additional PV was assumed to be sited outside of the Southeastern Florida region due to concerns about land availability and cost in the region. This additional 1,400 MW of PV, and the assumed locations of the PV, had the effect of moving both the projected system and regional needs back a year from 2024 to 2025.

Four separate analysis iterations were conducted sequentially during the second half of 2016. Various generation and/or transmission options formed the core of a specific resource plan, and each of the resulting resource plans was analyzed. Each of the four iterations also examined the transmission interconnection and integration facilities needed for the new generation and associated sites, as well as transmission facilities needed to import sufficient capacity to maintain balance in the Southeastern Florida region. In addition, the need for, and cost of, new gas pipelines that might be needed for new gas-fired generation were evaluated.

The types of generation options, and the general siting of those options that were contained in the various resource plans analyzed in 2016, are summarized as follows:

- Iteration #1: CCs and CTs sited outside of the Southeastern Florida region;
- Iteration #2: CCs and CTs sited inside the Southeastern Florida region (including potential modernization of the existing Lauderdale plant site);
- Iteration #3: PV and/or batteries sited inside the Southeastern Florida region; and,
- Iteration #4: Another examination of a potential modernization at the existing Lauderdale site, as well as a potential modernization at the existing Martin site.

Q. FPL evaluated a wide range of resource options including CCs, CTs, PV, and batteries. Please discuss the experience that FPL draws upon when considering these resource options.

A. In regard to experience with CC units, FPL has placed 9 new CCs in service since the beginning of 2005, including the recent modernizations at the Cape Canaveral, Riviera, and Port Everglades sites (projects that are very similar to the proposed modernization of the existing Lauderdale site with DBEC Unit 7). In regard to CT experience, FPL has just completed the replacement of old gas turbine peaking units with 7 modern CT peaking units sited at its Fort Myers and Lauderdale plant sites.

In regard to solar experience, in addition to the two PV facilities that FPL installed in 2009/2010, FPL installed three 74.5 MW PV facilities near the end of 2016. Additionally, FPL is currently petitioning the FPSC for approval to recover costs associated with 596 MW of new PV through the SoBRA docket (FPSC Docket No. 20170001-EI). These new PV facilities are under construction at the time this testimony is being prepared and will result in FPL having approximately 860 MW of PV by early 2018. Furthermore, FPL's 2017 TYSP discusses plans to have a total of approximately 2,345 MW by the end of 2023. In regard to storage, FPL is currently evaluating battery performance with its work in its smaller scale storage testing (several MW) and under its larger 50 MW Storage Pilot Program.

In summary, FPL has experience with the generation options examined in these analyses. The 2016 analyses, and the later analyses conducted in 2017, drew upon that experience in developing the performance and cost projections for each of the resource options.

Q. Are the cost projections for the solar and storage options market-based and how are the cost projections developed?

A. The cost projections for the solar and storage options used in FPL's analyses are market-based and are proprietary, internal projections of such costs. Cost and performance projections for generating resources such as these are developed by an internal group shared by both FPL and NextEra Energy Resources (NEER). This group is tasked with developing and maintaining cost projections for a wide variety of generation options based on current and projected market conditions. These cost and performance projections are based in part on experience with prior projects that have been built. The projections are also based on information gained through on-going interaction with suppliers, contractors, and other utilities which helps provide a real-time view of the supply and demand markets and the direction(s) the markets are headed. The projections used in FPL's analyses account for costs of the equipment and construction itself as well for site-specific costs pertaining to local land and permitting.

Q. Please briefly discuss FPL's experience with DSM options.

A. In regard to DSM, FPL has continually offered utility DSM programs since 1979 that have been cost-effective and which have minimized adverse electric rate impacts to all FPL customers. The cumulative total of demand (kW) reduction – the aspect of DSM that actually avoids or defers the need for new power plants – from these programs is equivalent to avoiding the need for 15 new power plants of 400 MW each. Thus, FPL has extensive experience with DSM programs. In addition, FPL performs periodic economic analyses of its existing programs as well as of new DSM measure and/or program concepts.

As previously mentioned, the continuing trend of declining cost-effectiveness of DSM options resulted in FPL concluding that additional cost-effective DSM was not a viable option for addressing FPL's system and regional needs in the analyses. Consequently, the 2016 and 2017 analyses discussed in my testimony focused on CC, CT, solar, and storage options.

Q. What resource options and resource plans appeared economically competitive in the 2016 analyses?

A. The top three resource plans, and their featured resource options, from the 2016 analyses were as follows:

- A new 3x1 CC at either FPL's Okeechobee or Martin site;
- A modernization at the Lauderdale site which consists of retirement of the existing Lauderdale Units 4 & 5, followed by the addition of a new 2x1 CC unit at the same site; and,
- 983 MW of PV, including both universal PV and distributed generation (commercial rooftop) PV, sited in the Southeastern Florida region.

These three resource plans are listed above in the order of their economic ranking in the 2016 analyses. The plan featuring the 3x1 CC at either Okeechobee or Martin was projected at that time to be approximately $146 million CPVRR less expensive than the Lauderdale modernization, and $249 million CPVRR less expensive than the plan featuring almost 1,000 MW of PV located in Southeastern Florida. All other resource plans were projected to be at least $384 million CPVRR more expensive than the best plan.

Q. What conclusions did you draw from the 2016 analyses?

A. Three main conclusions were drawn from the results of the 2016 analyses. First, a specific new transmission line into Southeastern Florida was needed in virtually all resource plans analyzed including the top three plans. This new transmission line is the Corbett-Sugar-Quarry (CSQ) line which is a 500 kV line that runs from near FPL's West County CC units in Palm Beach County into the middle of Miami-Dade County.[5]

The CSQ line is projected to be able to address the regional need once it goes in-service. However, the projected in-service year for the line varied significantly among the three top resource plans based on the timing of the generation options included in the plan. The projected CSQ in-service dates in the top plans ranged from 2018 to 2027. Because this transmission line is an integral component of these plans, additional study regarding the best in-service date for the CSQ line was an early part of the continuing analyses in 2017.

Second, the installation of this new transmission line could open an early window of opportunity in which to consider retiring and replacing the capacity at FPL's existing Lauderdale site. The years in which that window is open depends upon when the CSQ line is placed in-service.

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[5] The CSQ transmission line is part of the Levee-Midway project that is presented in FPL's 2017 TYSP in Table III.E.1 on page 68.

Third, FPL's continued operation of the existing Lauderdale Units 4 & 5 is projected to incur significant costs both in the near-term and in later years. However, the 2016 analyses used what I will refer to as an initial projection of operational costs (*i.e.*, fixed O&M and capital replacement costs) that would be needed to keep the existing Lauderdale Units 4 & 5 operating into the future. In addition, the net book value (NBV) cost impact of retiring the existing Lauderdale Units 4 & 5 had not yet been accounted for in the 2016 analyses. Therefore, additional study to be carried out in 2017 of a potential Lauderdale modernization would seek to use a more detailed look at what the projected on-going operational costs for Lauderdale Units 4 & 5 were and to incorporate the NBV cost impact of retiring those units.

With this view of the results of the 2016 analyses, FPL began new analyses in 2017 of the most promising resource options and resource plans.

VI. FPL'S 2017 ANALYSES

Q. What forecasts and assumptions were utilized in the 2017 analyses?

A. FPL used the same updated forecasts for load, fuel costs, and environmental compliance costs that were used in analyses that led to FPL's TYSP and SoBRA filings in 2017. As previously mentioned, Mr. Feldman's testimony presents FPL's 2017 TYSP load forecast and Ms. Stubblefield's testimony presents FPL's 2017 TYSP fuel cost forecast. Exhibit SRS-1 presents FPL's 2017 projection of environmental compliance costs for CO_2.

In regard to the amount of PV that was assumed in FPL's resource plans, these analyses used the same PV implementation schedule that is presented in FPL's 2017 TYSP. That implementation schedule calls for approximately 2,100 MW of universal PV to be added after 2016 which represents an increased amount of PV compared to the PV assumption used in the 2016 analyses.

Q. Based on the 2017 TYSP load forecast and PV assumptions, what are FPL's projected system resource needs?

A. Exhibit SRS-2 presents projections of FPL's system resource needs based on FPL's two reserve margin criteria. Because one of the most promising resource plans that emerged from the 2016 analyses was a Lauderdale modernization that included the retirement of the existing Lauderdale Units 4 & 5, this exhibit presents a projection of system resource needs both with and without this retirement. The top half of this exhibit provides a projection of FPL's system resource needs assuming the retirement of the Lauderdale units in late 2018 (as shown in Column (3)). The bottom half of this exhibit provides a second projection of FPL's system resource needs assuming the Lauderdale units are not retired (as shown in Column (3)). With either of these projections, the first year of resource need is identical using either of FPL's two reserve margin criteria and the projected magnitudes of the annual system resource needs are very similar.

Q. What was decided regarding the in-service date of CSQ transmission line and what are the impacts of that decision?

A. The decision was made to install the CSQ line by mid-2019 based on considerations of system resiliency and security. There are two impacts from that decision that relate to these analyses. First, the addition of the CSQ line increases the transmission import capability into Southeastern Florida by approximately 1,200 MW which can address the regional need from mid-2019 through the year 2030 (assuming no other changes in projected load, generation, and/or transmission capability). Second, the addition of the CSQ line in mid-2019 allows the retirement of the 884 MW from Lauderdale Units 4 & 5 to occur in late 2018, thus maximizing the cost savings of no longer operating those units. In turn, the retirement of this 884 MW of capacity alters the projection of the regional need. Assuming the retirement of the existing Lauderdale units in late 2018, the Southeastern Florida region is projected to become imbalanced as early as 2025.

Thus, the window of opportunity in which to replace the regional capacity lost by retiring the Lauderdale units is projected to close as early as 2025. This window could close even earlier if either the Summer peak load is higher than is currently projected and/or there are other changes in FPL's generating units that result in less available generation. As a consequence, FPL's 2017 analysis looked at resource options and resource plans that could provide additional capacity at a date earlier than 2025.

Q. You mentioned earlier that the 2016 analyses had used a preliminary projection of the cost to continue to operate Lauderdale Units 4 & 5. Was a more detailed projection of those operational costs developed for the 2017 analyses? If so, please discuss those costs.

A. Yes, a more detailed projection was developed for the 2017 analyses. As mentioned previously, there are two basic types of operational costs. The first type of cost is fixed O&M which consists primarily of plant staff payroll, overhead, and routine maintenance which are projected to escalate annually at a rate of 2.5% per year. The second type of cost is capital replacement which refers to capital costs for the CTs, heat recovery steam generators (HRSGs), and/or steam turbine that must be incurred periodically according to the manufacturer's instructions based on the generator's service hours. Using projections of these existing units' capacity factors and service hours, projections of on-going capital replacement costs were developed.

Replacement of the HRSGs is projected in the 2019 and 2020 time frame to coincide with steam turbine and CT outages and expenditures that are also projected for that time period. Additional major capital expenditures will be incurred in later years to ensure continued reliable and safe operation. The projected CPVRR cost of continuing to operate existing Lauderdale Units 4 & 5 for the duration of the analysis period is approximately $861 million. Based on these more detailed cost projections, the retirement of the existing Lauderdale units looked to be even more promising than was the case in the 2016 analyses.

Q. What resource options and resource plans did FPL evaluate in the 2017 analyses?

A. The 2017 analyses focused on the most promising resource plans and resource options from the 2016 analyses which resulted in three resource plans being analyzed. Two of the resource plans assumed that the existing Lauderdale Units 4 & 5 retire in late 2018. The other resource plan assumed a "status quo" scenario in which these existing units are not retired and continue to operate. The three resource plans are presented in Exhibit SRS-3 and are summarized as follows:

- Plan 1: This is a status quo scenario that assumes no retirement of the existing Lauderdale Units 4 & 5. After a small one-year PPA in 2026, FPL's first generation addition is a 3x1 CC unit in 2027 sited at the Okeechobee site;
- Plan 2: Assumes retirement of the existing Lauderdale Units 4 & 5 in late 2018. A 2x1 CC unit (DBEC Unit 7) with a Summer capacity rating of 1,163 MW is added at the Lauderdale site in mid-2022. This results in an additional 279 MW of firm capacity being added in the Southeastern Florida region; and,
- Plan 3: Assumes retirement of the existing Lauderdale Units 4 & 5 in late 2018 (as in Plan 2). A sufficient amount of PV and batteries is assumed to

be added in the Southeastern Florida region by 2022 to approximate the incremental 1,163 MW of firm capacity that is added in the region in Plan 2 by the new 2x1 CC unit.

With the analyses of these three resource plans, FPL sought to examine the economics of new CC, PV, and battery options, and to look at the economics of the retirement of the existing Lauderdale Units 4 & 5 using the updated forecasts and assumptions.

Q: Please provide more detail regarding the solar and storage resource options that are assumed in Plan 3 including the firm capacity values used for solar and storage.

A. Plan 3 assumes that 1,033 MW of solar, plus 755 MW of storage, are in place by 2022. These resources are all assumed to be sited in Southeastern Florida in order for the resources to at least theoretically address both system and Southeastern Florida regional needs in the same way, and at a comparable level, that DBEC Unit 7 would do. The combined firm capacity from these solar and storage options is assumed to be approximately the same as the Summer MW rating of DBEC Unit 7: 1,163 MW. The solar and storage installations are assumed to be made over a several year period as shown in Exhibit SRS-3.

The 1,033 MW of solar is comprised of two types of solar installations. The first of these is universal solar and these installations are assumed to be similar to FPL's SoBRA solar installations. However, the potential land in Southeastern Florida that is suitable for universal solar sites is both limited and generally more expensive than land costs outside of the Southeastern Florida region. The assumption used in the analyses is that a total of six such sites might be possible in the region, with five sites accommodating 74.5 MW each and one site accommodating 60 MW. Thus the amount of universal solar assumed in the analysis was approximately 433 MW. The second type of solar assumed in the analyses was distributed generation solar. These installations are assumed to be FPL-owned solar facilities that are sited on rooftops of commercial customers (such as on parking garages). The commercial customers would receive a lease payment from FPL in exchange for a 30-or-more year lease for the rooftop space. For purposes of this analysis, it was assumed that there could be a total of 600 MW of such facilities.

In regard to the storage options, it was assumed that batteries would be sited at/near FPL substations or power plants in the Southeastern Florida region to minimize costs. Each of these batteries was assumed to be able to contribute their full rated output continuously for 4 hours.

In regard to the firm capacity values assumed for these options, there were two firm capacity values for solar and one firm capacity value for storage. The first 265 MW of solar was assumed to provide a firm capacity value of 54% of the nameplate AC rating (as is the case with FPL's current SoBRA filing).

However, this amount of additional solar, when combined with projections of solar to be installed outside of Southeastern Florida in each of the resource plans, is projected to result in a shift in the timing of the remaining peak load on FPL's system that is not being served by solar. The projected shift in this "remaining" peak load is from the 4 to 5 p.m. hour to the 5 to 6 p.m. hour.[6] At this later hour of the day, the sun is lower in the sky and the MW output of solar is reduced. As a result, the projected output from any additional solar facilities beyond the first 265 MW decreases from 54% of the nameplate rating to 35% of the nameplate rating. Thus, the remaining 168 MW (433 MW – 265 MW = 168 MW) of universal solar, plus the 600 MW of rooftop solar, was assumed to provide 35% of their nameplate rating as firm capacity.

In regard to storage options, FPL currently assumes that batteries must be able to provide output continuously for at least 4 hours in order for this level of output to be viewed as firm capacity. Because FPL assumed that all of the storage options were continuous 4-hour batteries, the batteries were assumed to provide 100% of their nameplate rating as firm capacity, *i.e.*, 755 MW.

Q. Did FPL update its cost projections for solar and storage for the 2017 analyses?

A. Yes. Update capital and operating cost projections for both solar and storage

[6] Note that this shift in the peak hour for the remaining load to be served is similar to the shift in load and generation patterns seen in the "duck curve" that has been discussed in regard to large scale deployment of solar elsewhere, particularly in California

were developed prior to FPL's filing in this docket which allowed FPL's analysis to use the most current projections of solar and storage costs.

Solar and storage resources are not currently projected to have as long an operating life as a new CC unit. However, for these analyses, an optimistic-for-Plan 3 assumption was made. It was assumed that the operating life of both solar and storage would match the 40-year operating life of DBEC Unit 7. As a result, the additional solar and storage resources in Plan 3 would not have to be replaced with new solar and storage facilities at any point in time over the analysis period, thus avoiding the large capital costs of new replacement resources. In regard to on-going annual operating costs for these resources (fixed O&M, battery replenishment, etc.), it was assumed that these costs would continue through the duration of the analyses.

Q. What were the results of the economic analyses?

A. The results of these analyses are presented in Exhibit SRS-4. Page 1 of this exhibit shows the magnitude of the cost differences between the plans by presenting the projected CPVRR costs for the three plans. Page 2 of this exhibit shows the timing of the cost impacts on FPL's customers by presenting the cumulative CPVRR cost differences by year for Plans 1 and 3 compared to Plan 2. The results of the analyses are summarized as follows:

- Plan 2, featuring the planned retirement of the existing Lauderdale Units 4 & 5 in 2018, and the addition of DBEC Unit 7 in mid-2022, is the most economic plan. It is projected to be approximately $337 million CPVRR less expensive than Plan 1 (the status quo scenario that assumes no retirement of the existing Lauderdale Units 4 & 5). Plan 2 is also projected to be approximately $1,288 million CPVRR less expensive than Plan 3 (which also assumes the retirement of the existing Lauderdale Units 4 & 5 in late 2018 and the addition of 1,033 MW of PV and 755 MW of batteries in Southeastern Florida by mid-2022).

- Plan 2 is projected to result in cost savings for FPL's customers beginning almost immediately versus either Plan 1 or Plan 3 as shown on page 2 of this exhibit.

Based on the results of these analyses, FPL concluded that the most economic choice for its customers is to proceed with the scheduled retirement of the existing Lauderdale Units 4 & 5 in late 2018, then add the 2x1 CC unit, DBEC Unit 7, at the existing Lauderdale site in mid-2022.

Q. Did FPL consider a scenario in which the in-service date for DBEC Unit 7 is delayed?

A. Yes. FPL considered scenarios of both a one-year delay and a two-year delay. In these scenarios, it was assumed that the in-service date of DBEC Unit 7 was delayed from mid-2022 to mid-2023 for the one-year delay scenario, and delayed to mid-2024 for the two-year delay scenario. In both scenarios, the retirement of Lauderdale Units 4 & 5 was also assumed to be delayed by either one year or two years, respectively, to maintain the same roughly 4-year period in which a major Southeastern Florida generation component would be missing as is assumed in Plan 2. Projections for operational costs for Lauderdale Units 4 & 5, and construction costs for DBEC Unit 7, commensurate with the one-year and two-year delay scenarios were developed and used in the analyses of the delay scenarios.

The results of the economic analysis of the delay scenarios were that the delays were projected to increase CPVRR costs to FPL's customers by approximately $12 million for a one-year delay, and by approximately $38 million for a two-year delay. Thus, a delay of the mid-2022 in-service date of DBEC Unit 7 is projected to be uneconomic for FPL's customers.

Q. Assuming a need determination is granted for DBEC Unit 7, will FPL continue to evaluate the new CC unit?

A. Yes. As explained in the testimony of FPL witness Kingston, FPL will competitively procure models for the CTs, the heat recovery steam generator (HRSG), the steam turbine (collectively, the "Power Train Components"), and other related equipment that will comprise DBEC Unit 7, and optimize the design as a part of FPL's continuing efforts to determine which technology will provide the greatest benefits to FPL's customers.

Q. If FPL were to select an enhanced design or model for the DBEC Unit 7 Power Train Components or other related equipment, how does FPL propose to address such selection as it pertains to the determination of need requested by FPL in this proceeding?

A. FPL requests that, as a part of the FPSC's order granting an affirmative determination of need for DBEC Unit 7, the FPSC provide that its determination is not predicated on FPL's selection of a particular design or model for the Power Train Components or other related equipment necessary for operation of the unit, thus providing FPL with the flexibility through its negotiations and analyses to select the Power Train Components and other related equipment that best meet FPL customers' needs in terms of reliability and cost-effectiveness. Of course, FPL would select an enhanced design or model only if the enhanced design or model results in lower projected system CPVRR cost to FPL's customers. In the event that FPL selects an enhanced design or model other than the analyzed technology subsequent to the FPSC having granted a determination of need for DBEC Unit 7, FPL proposes to make an informational filing to the FPSC that documents the projected comparative CPVRR cost advantage of the alternate technology chosen. Such an approach was approved by the FPSC in FPL's most recent need determination docket involving the 2019 Okeechobee CC unit (FPSC Docket No. 150196-EI; Order PSC-16-0032-FOF-EI).

Q. Please summarize the benefits to FPL's customers of adding DBEC Unit 7.

A. DBEC Unit 7 is projected to benefit FPL's customers in a number of ways. First, it is projected to result in at least a $337 million CPVRR cost savings, and FPL's customers are projected to see cost savings almost immediately. Second, the unit's 1,163 MW of capacity will enhance system reliability and defer FPL's next resource need. Third, DBEC Unit 7 will result in an increase of 279 MW of highly reliable generating capacity in FPL's most heavily populated region, Southeastern Florida, which will help to maintain and enhance a balance between load and generation in the region. This also will enhance system reliability and economics. Fourth, DBEC Unit 7 will be highly efficient and is projected to reduce system natural gas usage compared to a status quo scenario in which the existing Lauderdale Units 4 & 5 continue to operate.

VIII. ADVERSE CONSEQUENCES OF NOT BUILDING DBEC UNIT 7

Q. Would there be any adverse consequences to FPL and its customers if the FPSC were not to grant an affirmative determination of need for DBEC Unit 7 in this proceeding?

A. Yes. If a determination of need for DBEC Unit 7 were not granted in this proceeding, FPL's customers will face adverse consequences in at least four ways. First, the results of FPL's economic analyses presented in Exhibit SRS-

4 show that FPL's customers are projected to receive at least $337 million CPVRR in lower costs over the life of the new 2x1 CC unit in comparison to all other alternatives analyzed. Therefore, denying the need determination for the new 2x1 CC unit would result in an adverse economic outcome for FPL's customers. Second, the 1,163 MW of capacity that is projected from DBEC Unit 7 will enhance system reliability and defer the need to add resources in future years. Denying the need determination will result in lower system reliability for FPL's customers and will result in FPL having to acquire new resources earlier than would be the case if the need determination is approved.

Third, the additional 279 MW of capacity that would be added in the Southeastern Florida region will enhance the reliability of electric service in the region. Thus, denying a need determination for DBEC Unit 7 will forego this opportunity to enhance regional reliability.

Fourth, DBEC Unit 7 will be a very fuel efficient generating unit with a projected heat rate of approximately 6,119 BTU/kWh. Once DBEC Unit 7 is in-service, it is projected that FPL's total usage of natural gas will decrease on a system-wide basis compared to the status quo scenario in which the existing Lauderdale Units 4 & 5 continue to operate. If the need determination is denied, FPL is projected to burn more natural gas by continuing to operate the existing Lauderdale units than would be the case if the need determination for DBEC Unit 7 is approved.

In summary, a decision to not grant a need determination for DBEC Unit 7 is projected to result in higher costs, lower system reliability, lower regional reliability, and higher fossil fuel usage.

IX. CONCLUSION

Q. What is your conclusion about the DBEC Unit 7 project?

A. As discussed previously, building DBEC Unit 7 with an in-service date of June 1, 2022 is beneficial for FPL's customers in various ways including economics, system reliability, regional reliability, and reducing fossil fuel usage. For these reasons, I believe the FPSC should grant an affirmative determination of need for DBEC Unit 7 with a target in-service date of June 1, 2022, based on a finding that this new 2x1 CC unit is projected to provide a variety of significant benefits to FPL's customers.

Q. Does this conclude your direct testimony?

A. Yes.

2017 Projection of Environmental Compliance Costs for CO_2

Year	($/ton, Nominal)
2017	$0.00
2018	$0.00
2019	$0.00
2020	$0.00
2021	$0.00
2022	$0.00
2023	$0.00
2024	$0.00
2025	$0.00
2026	$0.00
2027	$0.00
2028	$3.24
2029	$3.83
2030	$6.70
2031	$9.24
2032	$12.12
2033	$15.36
2034	$19.01
2035	$23.10
2036	$25.83
2037	$28.85
2038	$32.20
2039	$35.91
2040	$40.02
2041	$43.07
2042	$46.35
2043	$49.88
2044	$53.68
2045	$57.77
2046	$62.17
2047	$66.91
2048	$72.01
2049	$77.50
2050	$83.41
2051	$85.49
2052	$87.63
2053	$89.82
2054	$92.07
2055	$94.37
2056	$96.73
2057	$99.15
2058	$101.63
2059	$104.17
2060	$106.77
2061	$109.44

2017 Projection of FPL's Resource Needs Utilizing FPL's Two Reserve Margin Criteria
(assumes no non-PV capacity additions from 2020-on)

I. Assumes Lauderdale Units 4 & 5 Are Retired in Late 2018:

	(1)	(2)	(3)	(4) =(1)+(2)-(3)	(5)	(6)	(7) =(5)-(6)	(8) =(4)-(7)	(9) =(8)/(7)	(10) =((7)*1.20)-(4)	(11) =((4)-(5))/(5)	(12) = ((5)*1.10)-(4)
August of the Year	FPL Unit Capability* (MW)	Firm Capacity Purchases* (MW)	Retired Capacity (MW)	Total Capacity (MW)	Peak Load (MW)	Summer DSM Capability** (MW)	Firm Peak Load (MW)	Summer Reserves (MW)	Summer Total Reserve Margin (%)	MW Needed to Meet 20% Total Reserve Margin*** (MW)	Generation-Only Reserve Margin (GRM) (%)	MW Needed to Meet 10% GRM**** (MW)
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2017	26,058	826	0	26,884	24,009	1,851	22,157	4,727	21.3%	(295)	---	---
2018	26,357	826	0	27,182	24,297	1,906	22,391	4,791	21.4%	(313)	---	---
2019	27,895	114	884	27,125	24,496	1,950	22,547	4,578	20.3%	(69)	10.7%	(179)
2020	28,204	114	884	27,433	24,605	1,994	22,612	4,822	21.3%	(299)	11.5%	(367)
2021	28,363	114	884	27,592	24,717	2,038	22,679	4,914	21.7%	(378)	11.6%	(404)
2022	28,610	114	884	27,839	24,967	2,083	22,883	4,956	21.7%	(379)	11.5%	(376)
2023	28,854	114	884	28,083	25,338	2,130	23,209	4,874	21.0%	(233)	10.8%	(211)
2024	29,011	114	884	28,241	25,756	2,177	23,579	4,662	19.8%	**54**	9.6%	**91**
2025	29,007	114	884	28,237	26,137	2,224	23,914	4,323	18.1%	**459**	8.0%	**514**
2026	29,004	114	884	28,233	26,552	2,271	24,281	3,952	16.3%	**904**	6.3%	**974**
2027	29,000	110	884	28,226	26,956	2,318	24,639	3,587	14.6%	**1,341**	4.7%	**1,426**
2028	28,996	110	884	28,222	27,387	2,364	25,023	3,199	12.8%	**1,806**	3.0%	**1,904**
2029	28,992	110	884	28,218	27,916	2,411	25,505	2,714	10.6%	**2,387**	1.1%	**2,489**
2030	28,989	110	884	28,215	28,422	2,457	25,965	2,250	8.7%	**2,943**	-0.7%	**3,049**

II. Assumes a Scenario in Which Lauderdale Units 4 & 5 Are Not Retired:

	(1)	(2)	(3)	(4) =(1)+(2)-(3)	(5)	(6)	(7) =(5)-(6)	(8) =(4)-(7)	(9) =(8)/(7)	(10) =((7)*1.20)-(4)	(11) =((4)-(5))/(5)	(12) = ((5)*1.10)-(4)
August of the Year	FPL Unit Capability* (MW)	Net Firm Capacity Purchases* (MW)	Retired Capacity (MW)	Total Capacity (MW)	Peak Load (MW)	Summer DSM Capability** (MW)	Firm Peak Load (MW)	Summer Reserves (MW)	Summer Total Reserve Margin (%)	MW Needed to Meet 20% Total Reserve Margin*** (MW)	Generation-Only Reserve Margin (GRM) (%)	MW Needed to Meet 10% GRM**** (MW)
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
2017	26,058	826	0	26,884	24,009	1,851	22,157	4,727	21.3%	(295)	---	---
2018	26,357	826	0	27,182	24,297	1,906	22,391	4,791	21.4%	(313)	---	---
2019	27,895	114	0	28,009	24,496	1,950	22,547	5,462	24.2%	(953)	14.3%	(1,063)
2020	28,204	114	0	28,317	24,605	1,994	22,612	5,706	25.2%	(1,183)	15.1%	(1,251)
2021	28,363	114	0	28,476	24,717	2,038	22,679	5,798	25.6%	(1,262)	15.2%	(1,288)
2022	28,610	114	0	28,723	24,967	2,083	22,883	5,840	25.5%	(1,263)	15.0%	(1,260)
2023	28,854	114	0	28,967	25,338	2,130	23,209	5,758	24.8%	(1,117)	14.3%	(1,095)
2024	29,011	114	0	29,125	25,756	2,177	23,579	5,546	23.5%	(830)	13.1%	(793)
2025	29,007	114	0	29,121	26,137	2,224	23,914	5,207	21.8%	(425)	11.4%	(370)
2026	29,004	114	0	29,117	26,552	2,271	24,281	4,836	19.9%	**20**	9.7%	**90**
2027	29,000	110	0	29,110	26,956	2,318	24,639	4,471	18.1%	**457**	8.0%	**542**
2028	28,996	110	0	29,106	27,387	2,364	25,023	4,083	16.3%	**922**	6.3%	**1,020**
2029	28,992	110	0	29,102	27,916	2,411	25,505	3,598	14.1%	**1,503**	4.3%	**1,605**
2030	28,989	110	0	29,099	28,422	2,457	25,965	3,134	12.1%	**2,059**	2.4%	**2,165**

* MW values shown in Columns (1) & (2) include: existing FPL units and PPAs, the 2019 Okeechobee CC, and the firm capacity values associated with FPL's planned PV implementation schedule, as described in FPL's 2017 TYSP.

** The DSM values shown in Column (6) account for FPL's DSM Goals through the year 2024, plus an assumed continuation of DSM signups from 2025-on at the same annual level.

*** MW values shown in Column (10) represent new generating capacity needed to meet the 20% total reserve margin criterion.

**** MW values shown in Column (12) represent new generating capacity needed to meet the 10% generation-only reserve margin criterion (GRM) beginning in 2019.

The Three Resource Plans Analyzed in 2017

	Plan 1	Plan 2	Plan 3
Year	**Lauderdale Units 4 & 5 continue to operate (a status quo case)**	**Lauderdale Units 4 & 5 retire in 2018, a 2x1 CC of 1,163 MW Summer capacity (DBEC Unit 7) is added in 2022**	**Lauderdale Units 4 & 5 retire in 2018, 1033 MW of PV and 755 MW of storage are added in SE Florida by 2022 (to add ~1,163 MW of firm capacity in SE Florida region)**
2017	---	---	---
2018	---	Lauderdale 4 & 5 (884 MW total) are retired on 10/01/2018	Lauderdale 4 & 5 (884 MW total) are retired on 10/01/2018 100 MW Storage 150 MW DG Solar
2019	---	---	200 MW Storage 150 MW DG Solar
2020	---	---	200 MW Storage 125 MW DG Solar
2021	---	---	200 MW Storage 100 MW DG Solar
2022	---	Dania Beach 2x1 CC (1,163 MW)	55 MW Storage 75 MW DG Solar 433 MW Universal Solar
2023	---	---	---
2024	---	---	---
2025	---	---	---
2026	90 MW PPA	---	---
2027	OCEC CC	263 MW PPA	263 MW PPA
2028	---	OCEC CC	OCEC CC
2029	---	---	---
2030	415 MW PPA	136 MW PPA	136 MW PPA
2031	TP 6	TP 6	TP 6
2032	TP 7 122 MW PPA	TP 7	TP 7
2033	Equalizing filler unit of 1,518 MW	Equalizing filler unit of 1,239 MW	Equalizing filler unit of 1,239 MW

Notes:
- *All plans assume the CSQ line is in-service by mid-2019, Okeechobee CC (1,748 MW) is in-service by mid-2019, and an additional ~ 2,100 MW of PV are in-service by the end of 2023.*
- *In Plan 3, the first 265 MW of additional PV are assumed to have a firm capacity value of 54%. All subsequent PV has a firm capacity value of 35%. Batteries are assumed to be 4-hour duration and have a 100% firm capacity* factor.

The Economic Results for the Three Resource Plans Analyzed in 2017

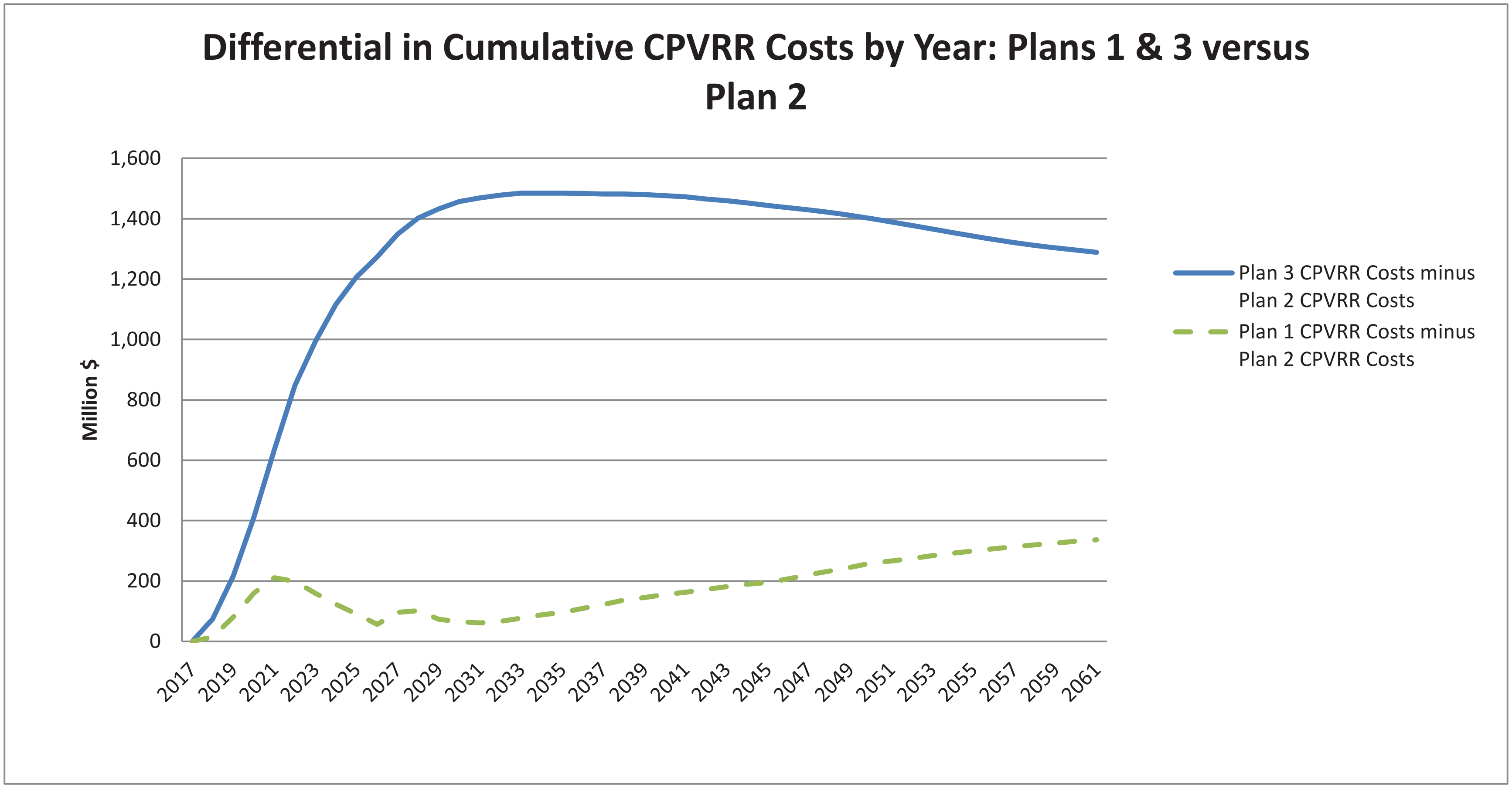
(CPVRR, millions, 2017$, 2017-2061)

	Plan 1	Plan 2	Plan 3
Year	**Lauderdale Units 4 & 5 continue to operate (a status quo case)**	**Lauderdale Units 4 & 5 retire in 2018, a 2x1 CC of 1,163 MW Summer capacity (DBEC Unit 7) is added in 2022**	**Lauderdale Units 4 & 5 retire in 2018, 1033 MW of PV and 755 MW of storage are added in SE Florida by 2022 (to add ~1,163 MW of firm capacity in SE Florida region)**
Resource Plan Variable Costs (Fuel, Emissions, VOM, etc.)	$58,079	$57,790	$57,045
Resource Plan Fixed Costs (Capital, FOM, Capital Replacement)	$7,652	$7,604	$9,637
Resource Plan Total Costs	**$65,731**	**$65,394**	**$66,682**
Difference in Total Costs Compared to Plan 2 *(Other Plan Total Costs - Plan 2 Total Costs)*	**$337**	**$0**	**$1,288**

Notes:
- *All plans assume the CSQ line is in-service by mid-2019, Okeechobee CC (1,748 MW) is in-service by mid-2019, and an additional ~ 2,100 MW of PV are in-service by the end of 2023.*
- *Solar installed from 2019-on is subject to a 42% property tax exemption.*
- *In Plan 3, the first 265 MW of additional PV are assumed to have a firm capacity value of 54%. All subsequent PV has a firm capacity value of 35%. Batteries are assumed to be 4-hour duration and have a 100% firm capacity factor.*
- *Costs to continue to operate existing Lauderdale Units 4 & 5 consistent with each Plan are included within the Resource Plan Fixed Costs category.*

The Economic Results for the Three Resource Plans Analyzed in 2017

(Projected cumulative CPVRR costs for Plans 1 & 3 versus CPVRR costs for Plan 2)



Note: For purposes of this analysis, it was assumed that the additional solar and storage facilities in Plan 3 have extended operating lives and, therefore, no capital costs for new, replacement solar and storage facilities are incurred for the duration of the analyses.

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

FLORIDA POWER & LIGHT COMPANY

PETITION FOR DETERMINATION OF NEED

REGARDING DANIA BEACH CLEAN ENERGY CENTER UNIT 7

DIRECT TESTIMONY OF RICHARD FELDMAN

DOCKET NO. 2017______-EI

OCTOBER 20, 2017

TABLE OF CONTENTS

I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Richard Feldman, and my business address is 700 Universe Boulevard, Juno Beach, Florida 33408.

Q. By whom are you employed and what is your position?

A. I am employed by Florida Power & Light Company (FPL or the Company) as a Production Analysis Lead in the Load Forecasting group of FPL's Finance department.

Q. Please describe your duties and responsibilities as a Production Analysis Lead.

A. I am responsible for developing the models and analysis supporting FPL's official peak demand, energy, and customer forecasts that are used in FPL's Ten Year Site Plans (TYSP) and long-term planning. I produce reports for management on a regular basis and provide variance analysis on these forecasts. I also oversee the work of more junior analysts.

Q. Please describe your educational background and professional experience.

A. I hold a bachelor's degree (B.B.A.) in economics from the University of Miami, and I completed my coursework and thesis towards a master's degree in economics from the University of Miami, along with additional graduate course work in statistics. I am also a certified Six Sigma Black Belt. As a Six Sigma Black Belt, I am trained in the use of statistical tools and techniques to document and improve existing processes. I am also tasked with assisting others in improving their processes through the use of Six Sigma methodologies and tools.

I began my career with FPL in 1982 as a Load Research Analyst. I have since held a variety of positions in the areas of market research and economics and forecasting. I spent over ten years working for FPL Energy Services where I conducted tariff analysis and developed an electric pricing model for the Northeast U.S. I also managed an FPL real-time electric pricing program, and was the product manager for FPL Energy Services' insurance products and retail natural gas business, where I developed a retail natural gas pricing model and had profit and loss responsibility for the natural gas business. I assumed my current position in 2009.

Q. Have you previously testified on the Load Forecast before the Florida Public Service Commission?

A. Yes. I testified on the Load Forecast before the Florida Public Service Commission (FPSC) in Docket No. 150196-EI. This docket was for the determination of need regarding the Okeechobee Clean Energy Center.

Q. Are you sponsoring any exhibits in this case?

A. Yes. I am sponsoring Exhibits RF-1 through RF-3, which are attached to my Direct Testimony.

Exhibit RF-1 Total Average Customers

Exhibit RF-2 Summer Peak Load (MW)

Exhibit RF-3 Calendar Net Energy for Load (GWh)

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to present and describe FPL's load forecasts, methodologies, and assumptions. These long-term forecasts include projections of customers, summer peak, and net energy for load. These forecasts are inputs into the evaluation of FPL's Dania Beach Clean Energy Center Unit 7 (DBEC Unit 7).

Q. Please summarize your testimony.

A. My testimony addresses FPL's customer growth forecast, summer peak demand forecast, and the net energy for load forecast. In my testimony, I explain how these forecasts are developed and why they are reasonable. FPL is expected to experience continued growth in its customer base through 2030. By 2030, the cumulative increase in customers from 2016 is expected to exceed 900,000. Summer peak demands are also projected to experience continued growth. Although the percentage growth rates projected for the summer peak are somewhat lower than those experienced historically, the absolute increases will remain significant. By 2030, the summer peak is projected to reach 28,422 megawatts (MW), an increase of 4,564 MW relative to the 2016 summer peak, which equates to a cumulative increase of approximately 19%. I also discuss the growth in the summer peak demand expected in Southeastern Florida and the significance of this load relative to the total FPL system load. The load in Southeastern Florida is nearly the size of Duke Energy Florida's (DEF) entire system and is part of one of the largest

Metropolitan Statistical Areas (MSAs) in the United States. Finally, I explain that a 9.0% cumulative increase in FPL's net energy for load is also expected between 2016 and 2030, a net increase of nearly 11,000 gigawatt-hours (GWh).

II. FPL'S EXISTING CUSTOMER BASE

Q. Please describe FPL's service territory.

A. FPL's service territory covers approximately 27,650 square miles within peninsular Florida, which ranges from St. Johns County in the north to Miami-Dade County in the south, and westward to Manatee County. FPL serves customers in 35 counties within this region.

Q. How many customers receive their electric service from FPL?

A. FPL currently serves approximately 4.9 million customer accounts, as shown on Exhibit RF-1. This amounts to a population of approximately ten million people.

Q: Geographically, where is the largest concentration of FPL's load?

A. The largest concentration of load is in Southeastern Florida. Although FPL's service area covers 35 counties, two counties, Miami-Dade and Broward, account for 44% of the Company's summer peak load.

Q. What is the current economic outlook for Florida?

A. Florida's economy continues to experience a broad based expansion. Florida has seen positive job growth for the last seven years with the unemployment rate in Florida falling to its lowest level since mid-2007. The tourism and manufacturing sectors have experienced particularly strong growth over the past year. The real estate market continues to improve with positive growth in the number of housing starts as well as in housing prices. Population growth has also been strong with Florida adding more than 300,000 people to the state in each of the last three years, making Florida the third most populous state in the nation.

III. LOAD FORECASTING PROCESS AND RESULTS

Q. Please describe FPL's forecasting process.

A. FPL relies on econometrics as the primary tool for projecting future levels of customer growth, net energy for load, and peak demand. An econometric model is a numerical representation, obtained through statistical estimation techniques, of the degree of relationship between a dependent variable, *e.g.*, the level of net energy for load, and the independent (explanatory) variables. A change in any of the independent variables will result in a corresponding change in the dependent variable. On a historical basis, econometric models have proven to be highly effective in explaining changes in the level of customer or load growth.

Q. How does FPL determine the independent variables that should be used to forecast customer growth, net energy for load, and peak demand?

A. FPL has found that population growth, the economy, energy efficiency codes and standards, and weather are the primary drivers of future electricity needs. Accordingly, the models used to forecast customer growth, net energy for load, and peak demand rely on independent variables representing these various drivers. As discussed later in my testimony, the models used to forecast customer growth, net energy for load, and demand vary in terms of the specific independent variables used. However, a consistent set of assumptions regarding population growth, the economy, federal and state energy efficiency codes and standards, and weather are used throughout the load forecast.

Q. What sources does FPL rely on for projections of these independent variables?

A. The projected population growth and economic conditions are from IHS Markit, a reputable economic forecasting firm. The weather factors are obtained from WSI, a division of The Weather Company, the world's leading provider of weather data and information. Estimates of the impact of energy efficiency codes and standards are provided by ITRON, one of the leading consultants on energy issues.

IV. CUSTOMER GROWTH FORECAST

Q. Please explain the development of FPL's customer growth forecast.

A. The growth of customers in FPL's service territory is a primary driver of the growth in the level of net energy for load and peak demand. In order to project the growth in the number of customers, FPL utilized the August 2016 population projections from IHS Markit, the most current projections available at the time the forecast was developed.

Q. What is FPL's projected customer growth?

A. The number of customers is expected to grow, averaging an annual increase of 1.2% between 2017 and 2030. As shown in Exhibit RF-1, by 2030, the number of customers is expected to exceed 5.7 million. The cumulative increase in customers from 2016 is expected to reach over 900,000. This level of growth in customers is consistent with IHS Markit's population projections.

Q. Is FPL's customer forecast reasonable?

A. Yes. The forecast incorporates the most recent IHS Markit population projections available at the time the forecast was developed, relies on the sound and proven forecasting methods previously reviewed and accepted by the FPSC, and is consistent with historical trends in customer growth.

V. SUMMER PEAK DEMAND FORECAST

Q. What are the factors that affect FPL's summer peak demand?

A. FPL's peak demand has been a function of a larger customer base, weather conditions, economic growth, and energy efficiency codes and standards.

Q. What weather information does FPL utilize?

A. FPL utilizes information from four weather stations scattered throughout its service territory. Composite estimates of the hourly temperatures representative of the FPL system as a whole are developed by weighting the values by weather station with the proportion of sales served in that area.

Q. How are weather conditions incorporated into the summer peak per customer model?

A. The summer peak per customer model is calibrated using historical data on two weather series: the maximum temperature on the day of the summer peak and the sum of the cooling degree hours two days prior to the peak day. In forecasting these weather variables, FPL relies on a normal weather outlook. Normal weather is based on historical averages over the last twenty years.

Q. How are economic conditions incorporated into the summer peak per customer model?

A. The impact of the economy is captured through a variable based on Florida real household disposable income. Real disposable income is based on the real (inflation-adjusted) level of income in Florida adjusted for taxes. Florida's real household disposable income is provided by IHS Markit.

Between 2017 and 2030, Florida's real household disposable income is expected to increase at an average annual rate of 1.4%, which is the same rate experienced between 1990 and 2016.

Q. How is the impact from energy efficiency codes and standards incorporated into the summer peak per customer model?

A. A variable is included for the impact of energy efficiency codes and standards based on end-use estimates developed by ITRON, a leading expert in this area. Included in ITRON's estimates are savings from federal and state energy efficiency codes and standards, including the Energy Policy Act of 2005, the Energy Independence and Security Act of 2007, and the savings occurring from the use of compact fluorescent and LED bulbs. This reduction is inclusive of ITRON's end-use engineering estimates and any resulting behavioral changes. By 2030, after accounting for the reserve margin, the cumulative reduction to the summer peak, since 2005, from energy efficiency codes and standards are expected to reach 5,735 MW. For perspective, this is larger than TECO's entire summer peak demand. It should be noted that the savings from energy efficiency codes and standards discussed here do not include the impact from incremental utility sponsored demand-side management (DSM) programs. As discussed in Witness Sim's Direct Testimony, the impact of incremental DSM is addressed in the resource planning process.

Q. What assumptions regarding the impact of energy prices were used in the summer peak per customer model?

A. The CPI for Energy, averaged over three months, was incorporated into the summer peak model as a proxy for energy prices. The CPI for Energy is provided by IHS Markit. As overall energy prices fall, more income is available for the purchase of other commodities including electricity.

Q. How is the output from the summer peak per customer model incorporated into the summer peak forecast?

A. The output from the summer peak per customer model is multiplied by the forecasted number of customers. The result is a preliminary estimate of the forecasted summer peak. The forecasted summer peak is then adjusted for the impacts from incremental wholesale loads, plug-in electric vehicles, private solar, and the economic development rider and existing facility economic rider.

Q. What is FPL's projected summer peak demand?

A. FPL's summer peak demand is presented in Exhibit RF-2. As shown on this exhibit, FPL projects an annual increase of 1.3% in the summer peak demand between 2017 and 2030. While the projected percentage growth is lower than the long term rate experienced historically, the absolute level of growth remains very large. An annual increase of 339 MW is projected between 2017 and 2030. By 2030 the summer peak is projected to reach 28,422 MW, a cumulative increase of 4,564 MW relative to the actual 2016 summer peak.

Q. Is FPL's summer peak demand forecast reasonable?

A. Yes. The forecast incorporates the most recent weather and economic assumptions and includes the most updated research on the impact of energy efficiency codes and standards. The summer peak model relies on sound and proven forecasting methods previously reviewed and accepted by the commission. The model coefficients for all of the variables have the expected sign (+/-) and are statistically significant. This indicates that the variables influencing the summer peak demand have been properly identified and their predicted impact is statistically sound. Additionally, there is no observable pattern in the residuals. Overall, the summer peak model has excellent diagnostic statistics. Finally, the summer peak forecast is consistent with historical trends in summer peak load growth.

Q. Is FPL's load distributed evenly throughout its service territory?

A. No. Much of FPL's load is located at the tip of the Florida peninsula, in Miami-Dade and Broward counties. In fact, Miami-Dade and Broward counties, which I will refer to as Southeastern Florida, contribute a disproportionate share of FPL's load, accounting for 44% of FPL's system summer peak. This represents a load of more than 10,000 MW.

Q. Please provide some perspective regarding the load in Southeastern Florida and its geography.

A. The summer peak load in Southeastern Florida is nearly as large as Duke Energy Florida's (DEF) entire system. The load in Southeastern Florida is also much more concentrated. Whereas DEF's service territory covers approximately 20,000 square miles, Southeastern Florida, with nearly the same load, spans only 3,100 square miles. This clearly illustrates the size and concentration of load that exists in Southeastern Florida.

I would also like to provide some perspective on the population in Southeastern Florida. Based on 2016 Census estimates, the Miami-Ft. Lauderdale-West Palm Beach Metropolitan Statistical Area (MSA) ranks as the eighth largest MSA in the United States and the largest in Florida. It is nearly twice the size of the second largest MSA in the state, Tampa-St. Petersburg-Clearwater. To summarize, Southeastern Florida has a very high concentration of load in one of the largest MSA's in the country and, by itself, is roughly the size of DEF's entire service territory in terms of load.

Q. What is the forecast load growth in Southeastern Florida?

A. The load in Southeastern Florida is expected to grow by over 1,600 MW between 2016 and 2030. During this time period, customers are expected to increase by more than 297,000.

VI. NET ENERGY FOR LOAD FORECAST

Q. How does FPL forecast energy sales?

A. FPL forecasts energy sales using an econometric model for total net energy for load. Net energy for load is a measure of electric sales that takes into account the MWh FPL generates and the net flow of interchange sales into and out of the FPL system. An econometric model for net energy for load is more reliable than models for billed energy sales because the explanatory variables can be better matched to usage. This is so because the net energy for load data do not have to be attuned to account for billing cycle adjustments, which might distort the real time match between the production and consumption of electricity.

Q. What inputs does the econometric model use to forecast net energy for load?

A. FPL has found that the customer base, weather, the economy, and energy efficiency codes and standards are the principal factors influencing net energy for load. Accordingly, a net energy for load per customer model has been developed incorporating these variables. The model output is multiplied by the number of customers to derive a preliminary net energy for load forecast.

Q. How are weather conditions incorporated into the net energy for load per customer model?

A. The weather variables included in the net energy for load per customer model are monthly cooling degree hours using a base of 72°F and monthly winter heating degree days using a base of 66°F. In addition, a second measure of heating degree days is included using a base of 45°F in order to capture the additional heating load resulting from sustained periods of unusually cold weather as occurred in January 2010.

Q. How are economic conditions incorporated into the net energy for load per customer model?

A. A composite variable based on Florida real per capita income weighted by the percent of the state's population employed is used as a measure of economic conditions.

Q. How is the impact from energy efficiency codes and standards incorporated into the net energy for load per customer model?

A. A variable is included for the impact of energy efficiency codes and standards based on end-use estimates developed by ITRON. This variable is calculated as a net energy for load per customer impact of energy efficiency codes and standards and is inclusive of ITRON's end-use engineering estimates and any resulting behavioral changes. From 2005 to 2030, the cumulative reduction to net energy for load due to energy efficiency codes and standards are expected to reach 17,324 GWh.

Q. What is FPL's projected net energy for load?

A. The projected net energy for load is shown in Exhibit RF-3. FPL is projecting a 0.8% annual growth rate in net energy for load between 2017 and 2030. This projected annual growth in net energy for load reflects the impact of continued economic and population growth. The absolute level of increase in GWh, however, is expected to be lower than that experienced historically. The forecast shows an annual increase in net energy for load of 1,033 GWh between 2017 and 2030, resulting in a cumulative increase of 13,429 GWh.

Q. Is FPL's net energy for load forecast reasonable?

A. Yes. The forecast incorporates the most recent weather and economic assumptions and includes the most updated research on the impact of codes and standards on energy sales. The net energy for load forecast relies on sound and proven forecasting methods previously reviewed and accepted by the commission. The model coefficients for all the variables have the expected sign (+/-) and are statistically significant. This indicates that the variables influencing net energy for load have been properly identified and their predicted impact is statistically sound. Additionally, there is no observable pattern in the residuals. Overall, the net energy for load model has excellent diagnostic statistics. Finally, the forecast is consistent with historical trends in net energy for load growth.

Q. Is FPL's net energy for load forecast consistent with the forecast for summer peak demand?

A. Yes. Both forecasts rely on the same set of assumptions regarding population, weather, and economic growth and rely on similar modeling techniques. Additionally, similar out-of-model adjustments are made to both forecasts.

Q. Does the 2017 TYSP forecast use a methodology and drivers consistent with previous forecasts?

A. Yes, FPL's forecasts use consistent methodologies and rely on similar drivers as previous forecasts. Econometric modeling is the tool used in developing each of these forecasts. Additionally, the same basic drivers obtained from the same independent experts are used as explanatory variables in each of these forecasts. Each TYSP forecast uses the best and most current assumptions available at the time the forecasts were developed, and result in models that have sound model statistics. Each forecast was reasonable for planning purposes at the time the forecasts were employed. As part of FPL's on-going commitment to process improvement, minor modifications are made at times to take advantage of more current data and recent learnings in order to make improvements to the models. However, the primary drivers of future electricity needs and the forecast methodologies remain the same in all forecast vintages.

Q. What are your conclusions regarding the load forecast.

A. FPL's customers and load are expected to experience continued growth. Load in Southeastern Florida will see significant load growth. These loads, located at the tip of the Florida peninsula, are expected to grow by over 1,600 MW between 2016 and 2030.

Q. Does this conclude your direct testimony?

A. Yes.

TOTAL AVERAGE CUSTOMERS

AVERAGE ANNUAL GROWTH

HISTORY (1990 to 2016)	64,672	1.7%
2017 TYSP Forecast (2017 to 2030)	65,471	1.2%

HISTORY

		Growth	
		Absolute	%
1990	3,158,817		
1991	3,226,455	67,638	2.1%
1992	3,281,238	54,783	1.7%
1993	3,355,794	74,556	2.3%
1994	3,422,187	66,393	2.0%
1995	3,488,796	66,609	1.9%
1996	3,550,747	61,951	1.8%
1997	3,615,485	64,738	1.8%
1998	3,680,470	64,985	1.8%
1999	3,756,009	75,539	2.1%
2000	3,848,350	92,341	2.5%
2001	3,935,281	86,931	2.3%
2002	4,019,805	84,523	2.1%
2003	4,117,221	97,416	2.4%
2004	4,224,509	107,289	2.6%
2005	4,321,895	97,386	2.3%
2006	4,409,563	87,667	2.0%
2007	4,496,589	87,027	2.0%
2008	4,509,730	13,141	0.3%
2009	4,499,067	-10,663	-0.2%
2010	4,520,328	21,261	0.5%
2011	4,547,051	26,723	0.6%
2012	4,576,449	29,398	0.6%
2013	4,626,934	50,486	1.1%
2014	4,708,829	81,895	1.8%
2015	4,775,382	66,552	1.4%
2016	4,840,279	64,897	1.4%

FORECAST

2017	4,909,904	69,625	1.4%
2018	4,979,325	69,421	1.4%
2019	5,047,004	67,679	1.4%
2020	5,113,137	66,133	1.3%
2021	5,178,908	65,770	1.3%
2022	5,244,656	65,748	1.3%
2023	5,310,238	65,582	1.3%
2024	5,375,524	65,285	1.2%
2025	5,440,459	64,935	1.2%
2026	5,505,072	64,614	1.2%
2027	5,569,466	64,394	1.2%
2028	5,633,700	64,234	1.2%
2029	5,697,574	63,873	1.1%
2030	5,761,029	63,455	1.1%

SUMMER PEAK LOAD (MW)

AVERAGE ANNUAL GROWTH

HISTORY (1980 to 2016)	389	2.1%
2017 TYSP Forecast (2017 to 2030)	339	1.3%

HISTORY

		Growth	
		Absolute	%
1990	13,754		
1991	14,123	369	2.7%
1992	14,661	538	3.8%
1993	15,266	605	4.1%
1994	15,179	-87	-0.6%
1995	15,813	634	4.2%
1996	16,064	251	1.6%
1997	16,613	549	3.4%
1998	17,897	1,284	7.7%
1999	17,615	-282	-1.6%
2000	17,808	193	1.1%
2001	18,754	946	5.3%
2002	19,219	465	2.5%
2003	19,668	449	2.3%
2004	20,545	877	4.5%
2005	22,361	1,816	8.8%
2006	21,819	-542	-2.4%
2007	21,962	143	0.7%
2008	21,060	-902	-4.1%
2009	22,351	1,291	6.1%
2010	22,256	-95	-0.4%
2011	21,619	-637	-2.9%
2012	21,440	-179	-0.8%
2013	21,576	136	0.6%
2014	22,935	1,359	6.3%
2015	22,959	24	0.1%
2016	23,858	899	3.9%

FORECAST

2017	24,009	151	0.6%
2018	24,297	289	1.2%
2019	24,496	199	0.8%
2020	24,605	109	0.4%
2021	24,717	112	0.5%
2022	24,967	250	1.0%
2023	25,338	372	1.5%
2024	25,756	417	1.6%
2025	26,137	382	1.5%
2026	26,552	415	1.6%
2027	26,956	404	1.5%
2028	27,387	431	1.6%
2029	27,916	528	1.9%
2030	28,422	506	1.8%

CALENDAR NET ENERGY FOR LOAD (GWh)

AVERAGE ANNUAL GROWTH

HISTORY (1980 to 2015)	2,049	2.1%
2017 TYSP Forecast (2017 to 2030)	1,033	0.8%

HISTORY

		Growth	
		Absolute	%
1990	71,528		
1991	73,426	1,897	2.7%
1992	73,321	-105	-0.1%
1993	76,074	2,753	3.8%
1994	80,673	4,599	6.0%
1995	84,546	3,873	4.8%
1996	85,028	482	0.6%
1997	87,056	2,028	2.4%
1998	92,802	5,747	6.6%
1999	91,683	-1,119	-1.2%
2000	96,313	4,630	5.1%
2001	98,612	2,299	2.4%
2002	104,657	6,045	6.1%
2003	108,214	3,557	3.4%
2004	108,122	-93	-0.1%
2005	111,443	3,321	3.1%
2006	113,406	1,963	1.8%
2007	114,532	1,126	1.0%
2008	111,100	-3,432	-3.0%
2009	111,237	137	0.1%
2010	114,604	3,366	3.0%
2011	111,542	-3,061	-2.7%
2012	110,866	-677	-0.6%
2013	111,655	790	0.7%
2014	115,968	4,313	3.9%
2015	122,756	6,788	5.9%
2016	121,619	-1,137	-0.9%

FORECAST

2017	119,186	-2,433	-2.0%
2018	120,500	1,314	1.1%
2019	121,122	622	0.5%
2020	122,325	1,203	1.0%
2021	122,053	-272	-0.2%
2022	122,806	753	0.6%
2023	123,653	847	0.7%
2024	124,933	1,280	1.0%
2025	125,680	747	0.6%
2026	126,825	1,145	0.9%
2027	127,419	595	0.5%
2028	128,593	1,173	0.9%
2029	130,480	1,888	1.5%
2030	132,616	2,136	1.6%

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

FLORIDA POWER & LIGHT COMPANY

PETITION FOR DETERMINATION OF NEED

REGARDING DANIA BEACH CLEAN ENERGY CENTER UNIT 7

DIRECT TESTIMONY OF JACQUELYN K. KINGSTON

DOCKET NO. 2017____________-EI

OCTOBER 20, 2017

TABLE OF CONTENTS

I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Jacquelyn K. Kingston. My business address is Florida Power & Light Company, 700 Universe Boulevard, Juno Beach, Florida, 33408.

Q. By whom are you employed and what is your position?

A. I am employed by Florida Power & Light Company (FPL or the Company) as a Manager of Project Development for gas-fired generation, including the proposed Dania Beach Clean Energy Center Unit 7 (DBEC Unit 7 or the Project).

Q. Please describe your duties and responsibilities in that position.

A. I manage the development of new gas-fired generation projects. I am responsible for overseeing the activities of the project team that collectively make the project successful, including early stage due diligence, permitting, and engineering. Ultimately, my goal is to ensure that the development project is transitioned to construction on schedule to support the required commercial operation date. I have overall responsibility for the development of DBEC Unit 7.

Q. Please describe your education and professional experience.

A. I received a Bachelor of Science in Biological Sciences from Florida Institute of Technology in 2004 and a Master of Science from Florida Atlantic University in 2006. Additionally, I am a certified Project Management Institute (PMI) Project Management Professional (PMP). PMI's PMP credential is the most important industry-recognized certification for project managers. Globally recognized and demanded, the PMP demonstrates that one has the experience, education, and competency to lead and direct projects.

Throughout my eleven year career with FPL, I have been involved in the development, permitting, and construction of multiple gas-fired power plants. In addition to the development of DBEC Unit 7, I have been responsible for the permitting of three (3) combined cycle (CC) projects, construction compliance (ensuring projects were constructed in accordance with environmental permits and applicable regulations) for two (2) CC projects, development of two (2) gas turbine peaker replacement projects (replacement of gas turbines with combustion turbines (CTs) for peaking capacity), and development of a combined cycle power plant project totaling over 6,800 megawatts (MW) of electrical generating capacity. These projects include FPL's Cape Canaveral Next Generation Clean Energy Center, Riviera Beach Next Generation Clean Energy Center, West County Energy Center Unit 3, Lauderdale Gas Turbine Power Park Unit 6, Ft. Myers Gas Turbine Power Park, and the Okeechobee Clean Energy Center Unit 1.

I have also held responsibilities with Power Delivery, specifically environmental permitting, construction compliance, and environmental operations support for the FPL transmission system. This included overseeing completion of over 840 environmental assessments, obtaining over 130 environmental permits for transmission projects, and providing daily environmental support to transmission operations, construction, and engineering.

I have also held responsibilities with FPL's parent company, NextEra Energy Inc. (NextEra Energy), providing oversight in obtaining environmental permits to construct two new natural gas pipelines in the United States under joint ventures with other companies. These two projects totaled over 800 miles in length.

Q. Have you previously testified on project development issues before the FPSC?

A. Yes. I testified in a 2015 need determination proceeding before the FPSC for another gas-fired generation project.

Q. What is the purpose of your testimony?

A. The purpose of my Direct Testimony is two-fold. First, I discuss FPL's experience building and operating CC generating units. Second, I describe the proposed Project in detail, including a description of the site, the technology, engineering design parameters, operating characteristics, and overall project cost and schedule. I will demonstrate that the performance standards assumed for the DBEC Unit 7 are both reasonable and achievable.

Q. Please summarize your testimony.

A. FPL plans to construct and operate DBEC Unit 7, a 2-on-1 (2x1) advanced CC unit at an existing power generation site in Broward County. The Project will consist of two advanced technology CTs, two heat recovery steam generators (HRSGs), and one steam turbine/electric generator. A significant amount of infrastructure that was used to support the operation of Lauderdale Units 4 & 5 will be reused for Unit 7 including the existing natural gas pipeline and gas yard, the existing fuel oil tanks, existing intake and discharge structures for the once-through cooling water system, the existing site entrances, the existing cooling pond, the existing switchyard, existing offsite transmission lines, the existing Broward County water supply line, the existing City of Hollywood potable water line, and the existing City of Hollywood sanitary sewer connection.

Natural gas will be the primary fuel for DBEC Unit 7 and will be delivered to the site by an existing pipeline. Ultra low-sulfur distillate (light fuel oil) will be used as a back-up fuel for the CTs. The cooling water source for the Project will continue to be the Dania Cutoff Canal with an auxiliary cooling system to help limit the temperature rise of the water. Process and potable water will continue to be obtained from existing county and city suppliers. By using natural gas as the primary fuel for DBEC Unit 7 and technology that is recognized by the Florida Department of Environmental Protection (FDEP) as the Best Available Control Technology (BACT) for minimizing air emissions, DBEC Unit 7 is projected to be one of the most fuel-efficient CC units of its kind in the state of Florida and among the cleanest and most efficient gas-fired, electric-power generating units of its kind in the world.

DBEC Unit 7 is expected to have an in-service date of June 1, 2022. The projected total cost of the DBEC Unit 7 is approximately $888 million ($764 per kW installed cost).

The Project is estimated to generate approximately $297 million in tax revenue over the life of the project, and it is expected to provide a number of significant public welfare benefits, including the creation of an estimated 650 direct jobs at its peak during construction.

FPL has significant experience building and operating CC plants to achieve the best possible efficiencies. Accordingly, FPL is confident of the accuracy of its construction cost estimates and projected unit capabilities.

Q. Are you sponsoring any exhibits in this case?

A. Yes. I am sponsoring Exhibits JKK-1 through JKK-11. The titles to each exhibit are shown below, and they are all attached to my direct testimony.

Exhibit JKK-1	Typical 2x1 Combined Cycle Unit Schematic
Exhibit JKK-2	FPL Combined Cycle Power Plants
Exhibit JKK-3	History of FPL Combined Cycle Capital Construction Costs
Exhibit JKK-4	DBEC Unit 7 Site Regional Map
Exhibit JKK-5	DBEC Unit 7 Site Property Delineation
Exhibit JKK-6	Rendering of Existing FPL Power Plant Site

Exhibit JKK-7	DBEC Unit 7 Proposed Site Plan Rendering
Exhibit JKK-8	DBEC Unit 7 Plant Specifications
Exhibit JKK-9	Emissions Comparison of Lauderdale Units 4 & 5 versus Dania Beach Unit 7
Exhibit JKK-10	DBEC Unit 7 Expected Construction Schedule
Exhibit JKK-11	DBEC Unit 7 Plant Construction Cost Components

II. OVERVIEW OF COMBINED CYCLE TECHNOLOGY

A. Description of Technology

Q. Please describe the combined cycle technology that will be used for the DBEC Unit 7 Project.

A. The CC technology generates electric power in two cycles. As shown on Exhibit JKK-1, a CC unit is comprised of electric generators, CTs, HRSGs, and a steam turbine generator (STG). During the first cycle of energy production, each of the CTs compresses outside air into a combustion area where fuel, typically natural gas or light fuel oil (back-up), is burned. The hot gases from the burning fuel-air mixture cause the turbine to rotate, which, in turn, directly rotates a generator to produce electricity. The exhaust gas produced by each turbine is passed through a HRSG where heat is extracted before exiting the stack. During the second cycle of energy production, the energy extracted by the HRSG converts water into steam, which then drives an STG. The residual steam is then cooled into water in a condenser and returned to the HRSG, beginning its cycle all over again.

The recovery of exhaust heat from the CTs for utilization in an STG improves the overall plant efficiency beyond that of just CTs or conventional steam electric generating units, because additional power is produced without burning additional fuel.

Each CT/HRSG combination is called a "train." The size and number of CT/HRSG trains used establishes the general size of the STG. For the proposed DBEC Unit 7 Project, two CT/HRSG trains will be connected to one STG, giving rise to the characterization of the Project as a 2x1 CC unit.

B. Operating Advantages

Q. What level of operating efficiency is anticipated for the DBEC Unit 7 Project?

A. In general, modern CC plants can be expected to achieve a fuel-to-electrical energy conversion rate (heat rate) of less than 7,000 British thermal units (Btu) per kilowatt hour (kWh). The existing Lauderdale Units 4 & 5 have a heat rate of approximately 7,800 Btu/kWh. FPL anticipates that DBEC Unit 7 will have an average base load heat rate as low as 6,119 Btu/kWh (based on an average ambient air temperature of 75°F) over the life of this Project, which is a 22% improvement compared to the existing Units 4 & 5. The addition of this highly efficient unit to the FPL system is projected to improve the overall system heat rate. The lower the heat rate, the more efficient the generating fleet is and the greater the fuel savings are to the benefit of FPL's customers. In addition, a CC plant can operate in variable weather conditions on an around-the-clock basis.

Q. What is the difference in ramp rates between the existing Units 4 & 5 and the proposed Unit 7?

A. One of the major measures of a generating unit's flexibility is the ramp rate of generators: how many MW can be ramped up or down over a given time period. The existing Lauderdale Units 4 & 5 have ramp rates of approximately 6 MW/minute which are the slowest ramp rates of any generator in FPL's system. In comparison, DBEC Unit 7's ramp rate is projected to be as high as 60 MW/minute which would be the fastest ramp rate of any generating unit on FPL's system.

Q. Are there other operational advantages to combined cycle technology?

A. Yes. An advantage of the multi-train CC arrangement is that it allows for greater flexibility in matching unit output to generation requirements over time. This is possible because each of the CTs can be cycled independent of the steam turbine, allowing the unit greater flexibility in matching the load requirements at any given point in time.

C. FPL's History of Building and Operating Combined Cycle Plants

Q. Does FPL have experience in building combined cycle plants?

A. Yes. FPL has extensive experience in building CC plants on time and within budget. FPL's first CC plant (Putnam Units 1 & 2) went into service in 1976. More recently, FPL successfully constructed three new CC "greenfield" units at its West County Energy Center and three new CC modernizations at its Cape Canaveral, Riviera Beach, and Port Everglades sites. Currently, FPL is constructing a new greenfield CC unit at its Okeechobee site.

Q. Please describe FPL's history of operating combined cycle plants.

A. Currently, there are 16 CC units in operation in FPL's service territory as shown in Exhibit JKK-2. These 16 existing CC units comprise 16,054 MW (net summer) of capacity in service, with an additional 1,748 MW currently under construction, for a total of over 17,800 MW.

Q. Please describe FPL's track record in building and operating combined cycle units.

A. FPL has consistently demonstrated its ability to cost-effectively construct reliable and efficient plants that save money for customers over the project lives. In December 2014, *Power Engineering* and *Renewable Energy World* magazines honored FPL's Riviera Beach Clean Energy Center with its "Project of the Year" award in the "Best Gas-Fired Project" category. The "Project of the Year" award recognizes the world's best power projects, honoring excellence in design, construction, and operation of power generation facilities. Most recently, in 2016, *Engineering News and Record* honored FPL's Port Everglades Energy Center with its "Best Project" award. The "Best Project" award recognizes the best construction projects and the companies that design and build them in the U.S. and Puerto Rico. Examples of other FPL CC plants that have received similar recognitions include Martin Units 3 and 4, Sanford Units 4 and 5, Fort Myers Unit 2, Turkey Point Unit 5, West County Energy Center Units 1, 2, & 3, and Cape Canaveral Clean Energy Center.

FPL's generation fleet performance has consistently exceeded industry performance averages and is frequently ranked "Top Decile" or "Best in Class" among FPL's large electric utility peers. Since 1990, as FPL transformed its generating fleet, FPL has substantially improved its operating performance across key factors integral to generating electricity for the benefit of its customers. These performance factor improvements include the reduction of system heat rate, forced outage rate, total non-fuel O&M costs, and air emissions.

With world-class operational skills, FPL maximizes the value of its existing and new assets to the benefit of its customers. FPL's employment of operational best practices has resulted in its industry leading positions. FPL's gas-fired fleet has achieved an Equivalent Availability Factor (EAF) of 91.7% averaged over the past 10 years. This compares very favorably to the latest available U.S. gas-fired industry average EAF of 86.4%. EAF represents plant availability and is a measure of the percentage of time within a given period that a generating unit is available to provide electricity, regardless of whether the generating unit is actually called upon to operate.

Q. Please describe how FPL monitors the operational performance and reliability of its power plants.

A. FPL uses technology to optimize plant operations, gain process efficiencies, and leverage the deployment of technical skills as demand for services increases. For example, the Company's Fleet Performance and Diagnostics Center (FPDC) in Juno Beach, Florida, provides FPL with the capability to monitor every plant in its system. The FPDC uses advanced monitoring technology and predictive analytics to identify potential issues and take action before they occur. FPL can compare the performance of like components on similar generating units, determine how it can make improvements, and often avoid problems, ultimately saving customers money. Live video links can be established between the FPDC and plant control rooms to immediately discuss challenges that may arise, thus enabling FPL to prevent, mitigate, and/or solve problems.

Q. Please address FPL's record in constructing CC units at or below estimated budgets.

A. FPL has a proven track record of constructing CC power plants within budget. Since 2005, FPL has placed nine CC units in service and all were completed on or below budget. Exhibit JKK-3 lists the CC projects constructed by FPL and the approved/projected and actual construction costs. On average, the actual construction costs for the combined cycle projects placed in service since 2005 have been approximately 5.4% lower than the projected costs. This includes power plants built at new sites as well as modernizations of power plants at existing sites. Based on this track record, the construction costs for DBEC can be projected with a very high level of certainty.

III. DBEC UNIT 7 COMBINED CYCLE PROJECT

A. Site Description

Q. Please describe the DBEC Plant site.

A. DBEC Unit 7 will be located on approximately 392 acres of FPL-owned land within the Cities of Dania Beach and Hollywood in Broward County, Florida (Exhibits JKK-4 and JKK-5). The existing Lauderdale Site has been used for power generation since 1927 and currently includes two nominal 440 MW combined cycle units (Units 4 & 5), five nominal 200 MW combustion turbines (Units 6A through 6E) and two 1970's vintage nominal 35 MW gas turbines. Units 6A through 6E began commercial operation in 2016 and these units replaced 22 gas turbines at the Lauderdale Site and 12 gas turbines at the nearby Port Everglades Plant. Units 4 & 5 began operation in May 1993 and June 1993, respectively. Lauderdale Units 4 & 5 were repowered using the existing steam turbines and condensers from the original units built in the 1950's. The Lauderdale Site also includes 138 kV and 230 kV transmission facilities (system substation) as well as an existing natural gas pipeline and fuel oil storage facilities. Exhibit JKK-6 includes a rendering of the Site.

B. Project Description

Q. Please describe the proposed DBEC Unit 7 project in more detail.

A. A rendering of DBEC Unit 7 is shown on Exhibit JKK-7. Unit 7 will be a 2x1 CC unit consisting of two nominal 400-MW advanced CTs, with dry low-NO_x combustors, inlet evaporative cooling, wet compression, and two HRSGs, which will use the exhaust heat from the CTs to produce steam to be utilized in a new steam turbine generator.

Each CT is projected to utilize inlet air evaporative cooling. Evaporative coolers achieve cooling using water evaporation to remove heat from the inlet air. This increases the density of air flowing through the turbine, allowing additional power to be produced during periods of high ambient air temperature. The evaporative coolers normally would be utilized when the ambient air temperature is greater than 60°F. The base unit capacity at 95°F is 1,117 MW with the evaporative coolers in service. For additional power production at peak periods, wet compression, which sprays additional water in a fine mist into the gas turbine inlet air, can be turned on. Wet compression can be utilized during peak demand periods to add about 46 MW of capacity to the unit, totaling 1,163 MW summer capacity. The projected winter capacity is approximately 1,173 MW.

With its anticipated average heat rate of 6,119 Btu/kWh during baseload operation (based on an average ambient air temperature of 75°F), DBEC Unit 7 is projected to be one of the most fuel-efficient CC units of its kind in the state of Florida. The unit will have an estimated EAF of approximately 95.5%, based on an estimated average forced outage factor of approximately 1.0%, and a planned outage factor of 3.5%. Plant specifications are shown in Exhibit JKK-8.

The performance level of CC plants continues to evolve and advance in the marketplace. As a result, FPL will competitively procure the DBEC Unit 7's CTs, HRSGs, and steam turbine (collectively, the "Power Train Components") and other related equipment necessary for operation of the unit, and optimize the design as a part of FPL's continuing efforts to determine which technology will provide the greatest benefits to FPL's customers.

For example, FPL is continuing to evaluate the optimal steam cycle equipment configuration, which may potentially increase capital costs but provide an overall system cumulative present value of revenue requirements (CPVRR) cost savings benefit to FPL's customers, based on increased output and a lower heat rate resulting from the optimization. Similarly, if an enhanced design or model emerges as a result of continued evaluation, FPL will optimize the condenser and auxiliary cooling system needed for DBEC Unit 7 as a part of FPL's continuing efforts to provide the greatest benefits to its customers.

In the event that FPL selects an enhanced design or model for the Power Train Components and other related equipment other than the analyzed technology subsequent to the Florida Public Service Commission (FPSC or the Commission) having granted a determination of need for DBEC Unit 7, FPL would make an informational filing to the Commission, as also discussed in the Direct Testimony of FPL witness Sim.

Q. Please describe the potential air emissions of the DBEC Unit 7 project.

A. The use of natural gas as a primary fuel source, with light fuel oil as a back-up fuel, combined with combustion control technologies, will minimize emissions from the unit and ensure compliance with applicable emission limiting standards. Maximum total air quality impacts for DBEC Unit 7 are predicted to be below and in compliance with the National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) increments. The NAAQS are standards required by the Clean Air Act and established by the Environmental Protection Agency (EPA) that protect the public health of the most sensitive populations as well as public welfare. The PSD increments are levels of air pollutants established by the Clean Air Act and EPA that make sure "clean air remains clean." The low impacts to air quality, well below these standards, are achieved by meeting best available control technology (BACT) for regulated air pollutants that include particulate matter (PM), sulfur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), and sulfuric acid mist. The use of natural gas and light fuel oil (with maximum sulfur content of 0.0015%) minimizes emissions of SO_x, PM, and other fuel-bound contaminants. Combustion design and emission controls similarly minimize the formation of NO_x, CO, and VOCs. When firing natural gas, NO_x emissions will be controlled using dry-low NO_x combustion technology and Selective Catalytic Reduction (SCR). Water injection and SCR will be used to reduce NO_x emissions during operations when using light fuel oil as back-up fuel. This emission control design is accepted by the FDEP and EPA as BACT for air emissions.

The NO_x emission rate for the new unit (2 parts per million (ppm) when firing natural gas) will be 95% lower than the existing units (42 ppm), with significant reductions in the Carbon Dioxide (CO_2) emission rate as well as total air emissions. Exhibit JKK-9 includes the NO_X and Total Emissions (tons/year and lb/MWh) and CO_2 Emissions (lb/MWh) comparisons between the existing Lauderdale Units 4 & 5 and DBEC Unit 7.

Q. What types of fuel will DBEC Unit 7 be capable of burning?

A. The Project will use the same fuel sources as Lauderdale Units 4 & 5. Natural gas will be used as the primary fuel source. The existing natural gas pipeline will be used with no new pipeline or offsite modifications needed to serve

Unit 7. DBEC Unit 7 also will be capable of using light fuel oil, more specifically a distillate fuel oil with a maximum sulfur content of 0.0015%, as a back-up fuel. The site design allows for operation at full capacity for seventy-two (72) hours of continuous operation using back-up fuel which will be delivered to the site by truck and stored in two existing light distillate fuel oil storage tanks.

C. Water Supply - Access and Availability

Q. What are the water requirements for the DBEC Unit 7 project, and how will they be met?

A. There will be no additional water sources required as a result of this Project. The primary water source for cooling will continue to be the Dania Cutoff Canal, with process and potable water coming from Broward County and City of Hollywood, respectively. The modernization will result in an improvement in technology allowing the reduction of the allocation of process water for power generation from 1.69 million gallons per day (MGD) for the existing Units 4 and 5 to 1.0 MGD for Unit 7 (based on a 12-month rolling average). Primary water uses will be for condenser cooling, combustion turbine evaporative coolers, steam cycle makeup, and service water. Water will also be used on a limited basis for NO_x control when using light fuel oil. Condenser cooling for the steam cycle portion will be accomplished using an auxiliary cooling system.

D. Electric Transmission Interconnection Facilities

Q. How will the DBEC Unit 7 project be interconnected to FPL's transmission network?

A. DBEC Unit 7 will connect into the existing onsite Lauderdale Plant 230kV/138kV transmission switchyard. No new offsite transmission lines or network upgrades are required as a result of the Project.

FPL has completed its System Impact Study and found no reliability concerns. The Florida Reliability Coordinating Council (FRCC) is currently reviewing the interconnection and integration plan for the Project to confirm that it will be reliable and adequate and will not adversely impact the reliability of the FRCC transmission system.

E. Proposed Construction Schedule

Q. What is the proposed construction schedule for the DBEC Unit 7?

A. A summary of estimated construction milestone dates is shown on Exhibit JKK-10. FPL will commence construction upon receipt of the necessary regulatory approvals, which FPL anticipates will occur by late 2018. Following the retirement and subsequent dismantlement of Units 4 and 5, construction of Unit 7 will require approximately 27 months, and the Project is expected to start commercial operations on June 1, 2022.

Q. What is the current status of the certifications and permits required to begin construction of DBEC Unit 7?

A. Several local, state, and federal approvals are required prior to start of construction for DBEC Unit 7. FPL filed for FDEP site certification under the Florida Electrical Power Plant Siting Act in July 2017. Concurrently, FPL filed for a Prevention of Signification Deterioration air construction permit, Industrial Wastewater Facility permit, and a U.S. Army Corps of Engineers (USACE) Section 404, Clean Water Act, Dredge & Fill Permit application for impacts to onsite wetlands. Local approval processes are in progress.

F. Estimated Construction Costs

Q. What does FPL estimate that the DBEC Unit 7 will cost?

A. A summary of estimated costs is shown on Exhibit JKK-11. FPL estimates that the total cost will be approximately $888 million. Principal components include the power block and generator transformers at $764 million, transmission interconnection and integration at $21 million, and Allowance for Funds Used During Construction (AFUDC) at $103 million. FPL will annually report to the FPSC Director of Economic Regulation updates to the budgeted and actual cost of DBEC Unit 7, compared to the estimated total in-service cost.

G. Other Benefits

Q. What other benefits are associated with DBEC Unit 7?

A. Several additional benefits come to mind. First, the Lauderdale Site provides the infrastructure and land for a new combined cycle unit that includes an existing developed site dedicated to generation of electricity, existing cooling water intake and discharge structures, cooling pond, existing gas delivery infrastructure, and access to the FPL transmission system. Second, the Project will result in additional property tax revenues to governmental agencies of some $297 million over the projected life of the unit, assuming current millage rates continue into the future. This will be a significant benefit to the local economy. Third, during construction of the unit there will be, at the peak of construction, some 650 additional jobs brought into the local economy. Fourth, beyond the significant payroll and tax impacts on the local economy, there will be indirect economic effects on the local economy through additional demands for goods and services. These are significant economic benefits of the Project beyond system fuel savings and system reliability improvements for the FPL system and southeastern Florida region as discussed in FPL witness Sim's Direct Testimony.

IV. CONCLUSION

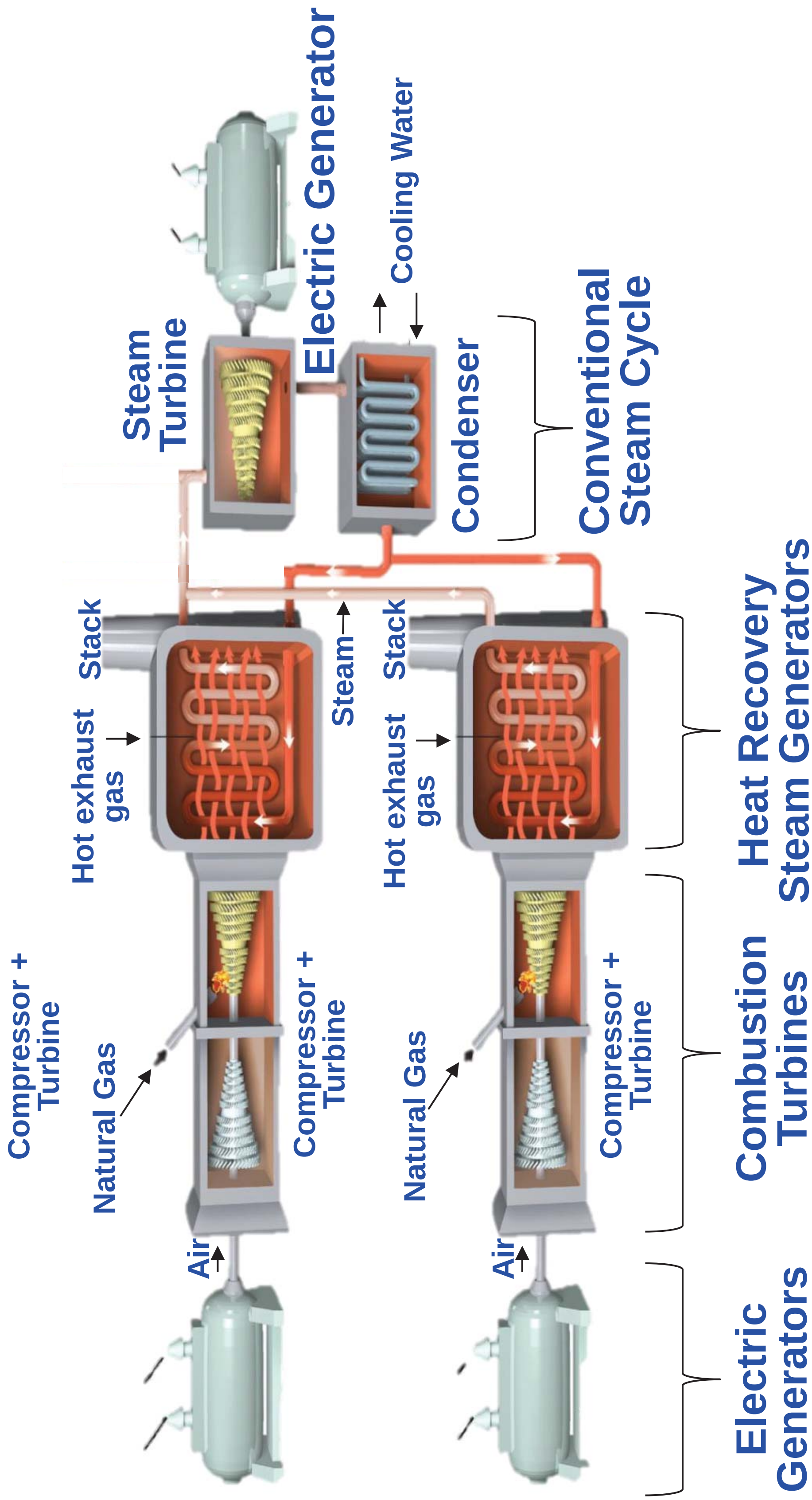
Q. What level of confidence does FPL have in the cost, projection and construction schedule for the unit discussed herein?

A. As previously discussed, FPL has a proven track record of constructing combined cycle power plants within budget and on schedule. Based on this experience, I am confident that the project will be completed on time and within the projected budget.

Q. Does this conclude your testimony?

A. Yes.

Typical 2x1 Combined Cycle Unit Schematic



FPL Operational Combined Cycle Power Plants

Facility[1]	In-Service Year	Technology	Summer Capacity (MW)[2]
Port Everglades Unit 5	2016	3x1 combined cycle	1,237
Riviera Beach Unit 5	2014	3x1 combined cycle	1,212
Cape Canaveral Unit 3	2013	3x1 combined cycle	1,210
West County Unit 3	2010	3x1 combined cycle	1,219
West County Unit 2	2009	3x1 combined cycle	1,219
West County Unit 1	2008	3x1 combined cycle	1,219
Turkey Point Unit 5	2007	4x1 combined cycle	1,187
Martin Unit 8	2005	4x1 combined cycle	1,129
Manatee Unit 3	2005	4x1 combined cycle	1,141
Sanford Unit 4	2003	4x1 combined cycle	1,005
Fort Myers Unit 2	2002	6x2 combined cycle	1,524
Sanford Unit 5	2002	4x1 combined cycle	1,005
Martin Unit 3	1994	2x1 combined cycle	487
Martin Unit 4	1994	2x1 combined cycle	478
Lauderdale Unit 4	1993	2x1 combined cycle	442
Lauderdale Unit 5	1993	2x1 combined cycle	442
TOTAL:			**16, 054**

FPL Combined Cycle Power Plants in Construction

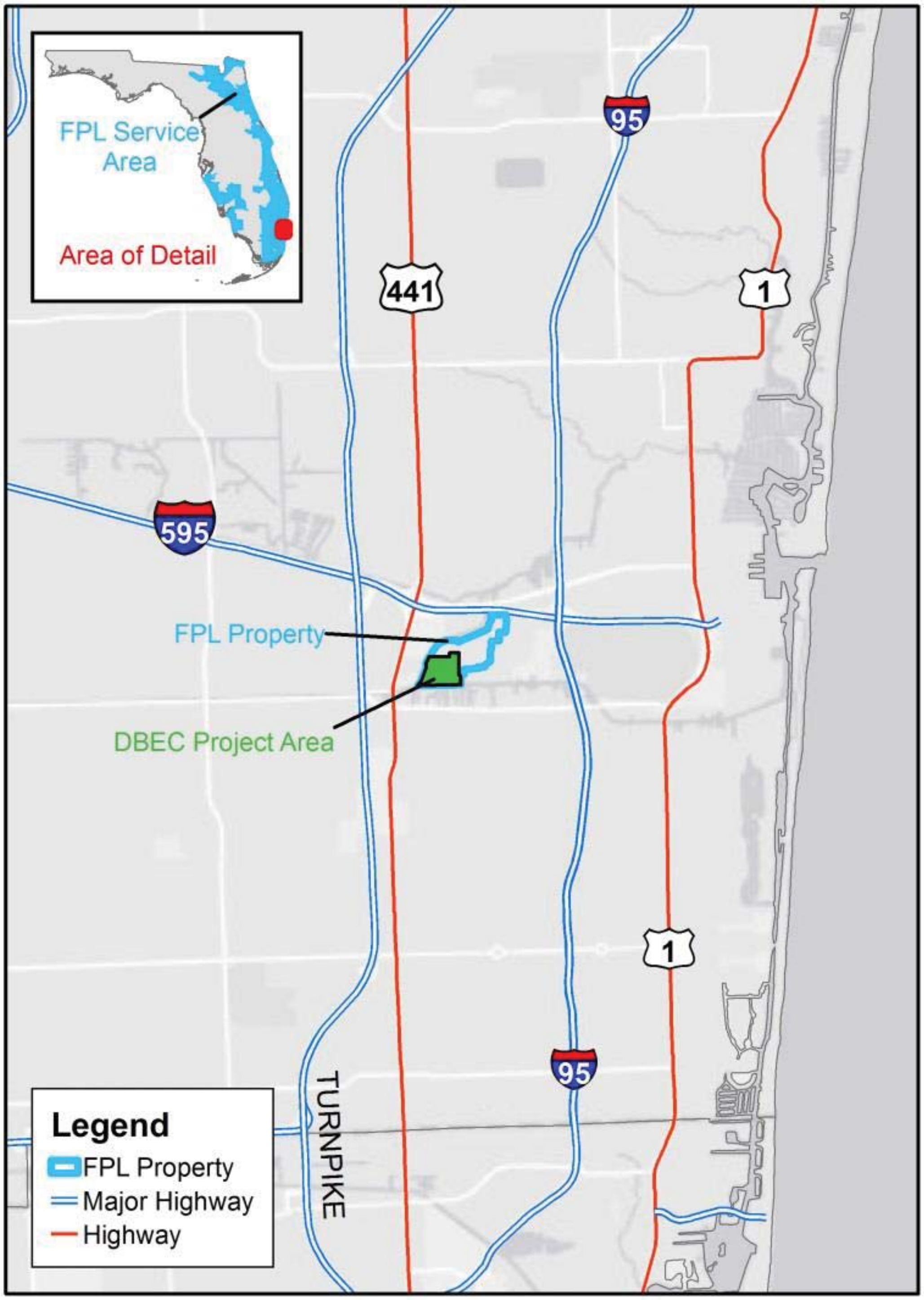
Facility[1]	Projected In-Service Year	Technology	Summer Capacity (MW)
Okeechobee Unit 1	2019	3x1 combined cycle	1,748
TOTAL:			**1,748**

[1]All facilities are located in Florida. The primary fuel for all facilities is natural gas.
[2]As stated in the FPL 2017 Ten Year Site Plan

History of FPL Combined Cycle Capital Construction Costs

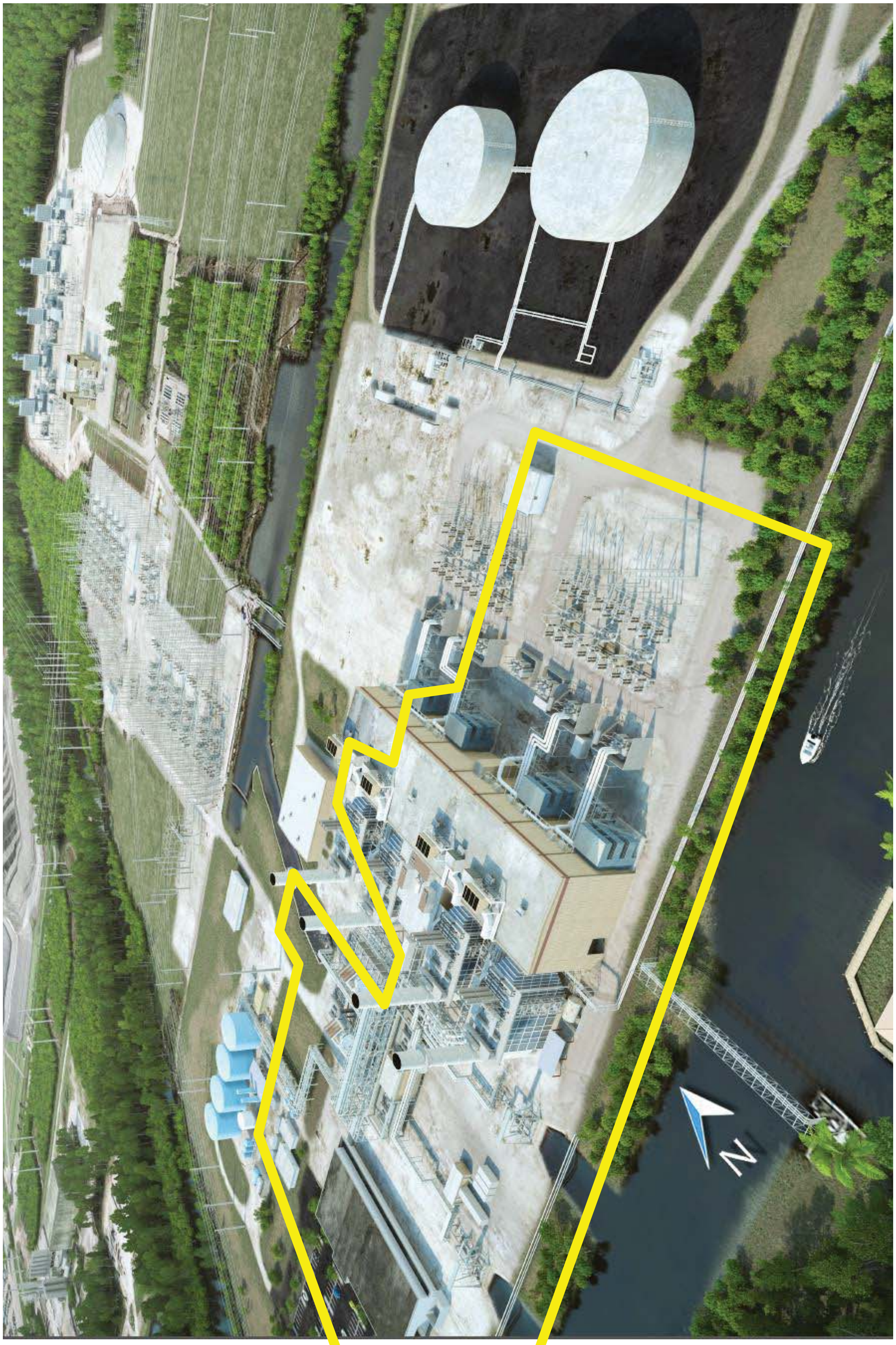
Project	Approved Plan ($ Millions)	Actual Cost ($ Millions)
Martin Unit 8	$462.7	$391.2
Manatee Unit 3	$552.8	$476.8
Turkey Point Unit 5	$580.3	$552.4
West County Units 1 & 2[1]	$1,321.0	$1,320.8
West County Unit 3	$864.7	$842.4
Cape Canaveral Unit 3	$1,114.7	$962.8
Riviera Beach Unit 5	$1,276	$1,271.1
Port Everglades Unit 5	$1,185.2	$1,139.5

[1] FPL considers the combined costs for these two generating units to be the most meaningful way to evaluate project costs because it best aligns in practical terms with how the construction was actually managed.


FPL Service Area
Area of Detail
95
441
1
595
FPL Property
DBEC Project Area
1
95
TURNPIKE
Legend
FPL Property
Major Highway
Highway

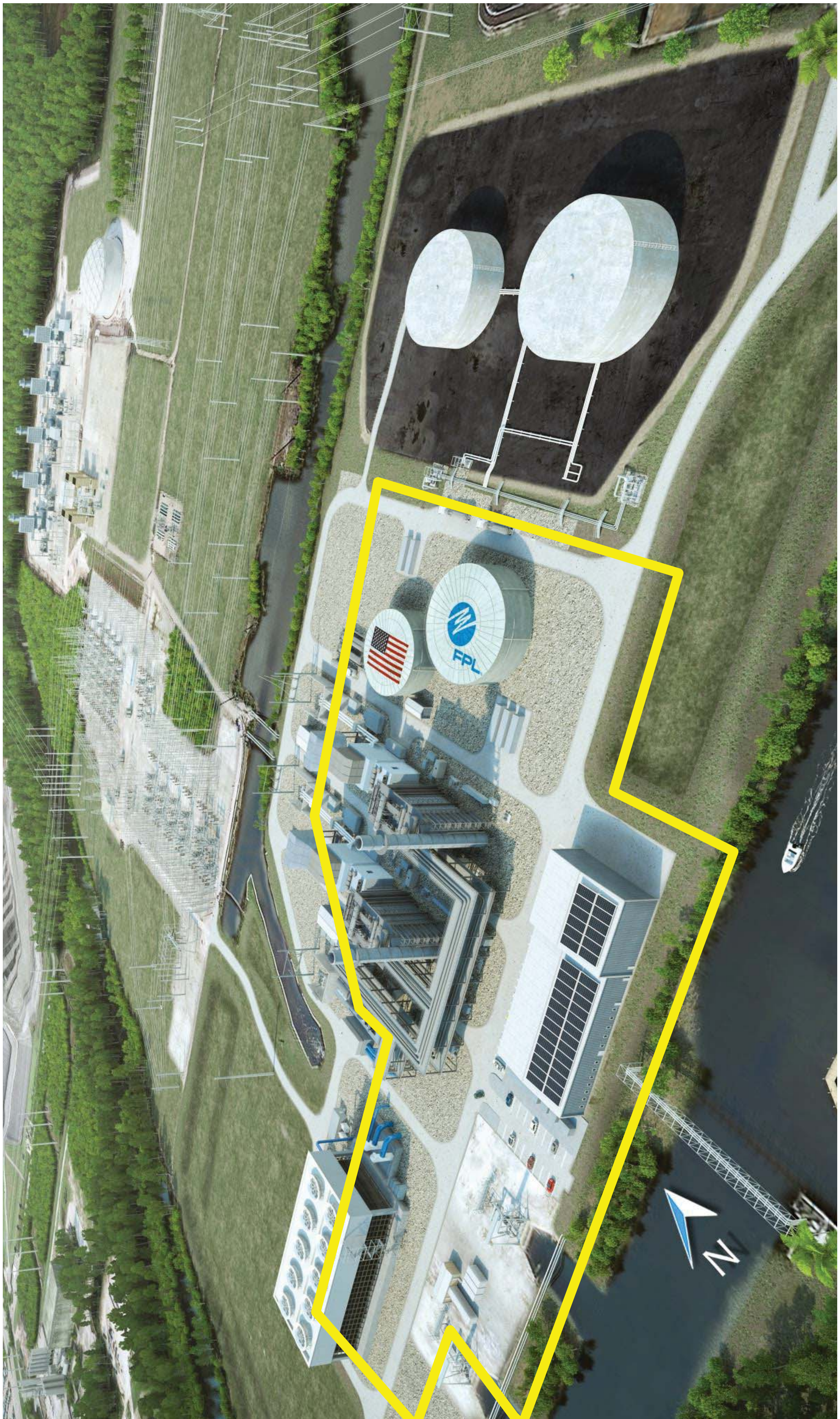

736
Davie Blvd
Davie Blvd
SW 31
7
SHAD
RIVER RUN
Broadview Park
Riverland
SW 24th St
84
HACIENDA
VILLAGE
Florida's Tpke
ALANDCO
Ravenswood Rd
SW 48th St
818
Playland Isles
441
OAKRIDGE
Seminole
Anglers Ave
Stirling Rd
N Park
Legend
Existing 230 kV Transmission
FPL Property

Rendering of Existing FPL Power Plant Site



Outline of Units 4 and 5

DBEC Unit 7 Proposed Site Plan Rendering



Outline of Unit 7

DBEC Unit 7 Plant Specifications

Generating Technology – "Two on One" (2x1) Combined Cycle Configuration:

- Two (2) Advanced Combustion Turbines with Evaporative Coolers
- Two (2) Heat Recovery Steam Generators with Selective Catalytic Reduction System for NO_X control
- One (1) Single-Reheat Steam Turbine Generator

Expected Plant Peak Capacity:

• Summer (95°F / 50% Relative Humidity (RH))	1,163 MW
• Winter (35°F / 60% RH)	1,173 MW

Projected Unit Performance Data:

• Planned Outage Factor	3.5%
• Forced Outage Factor	1.0%
• Resulting Equivalent Availability Factor	95.5%
• Resulting Capacity Factor (%)	90.0% (First Full Year Base Operation)
• Avg. Net Operating Heat Rate (Base operation @ 75°F, 100%)	6,119 Btu/kWh
• Projected ramp rate (MW/minute)	60
• Annual Fixed O&M[1]	$19.73/kW-yr
• Variable O&M - excluding fuel[2]	$0.23/MWh

Fuel Type and Base Load Typical Usage @ 75°F[3]:

• Primary Fuel	Natural Gas
• Natural Gas Consumption	6,761,741 scf/hr[4]
• On Site Back Up Fuel	Light Fuel Oil
• Light Fuel Oil Consumption	48,959gal/hr

Expected Base Load Air Emissions Per Combustion Turbine/Heat Recovery Steam Generator @ 75°F (Baseload):

	Natural Gas	Light Fuel Oil
• NO_x (@15% O_2)	2 ppmvd @ 15% O_2[5]	8 ppmvd @ 15% O_2
• CO	9 ppmvd	20 ppmvd
• SO_2	< 0.0003 lb Sulfur/100 cubic feet	<0.0015% Sulfur

Water Balance:

- Primary Water Source – Dania Cutoff Canal

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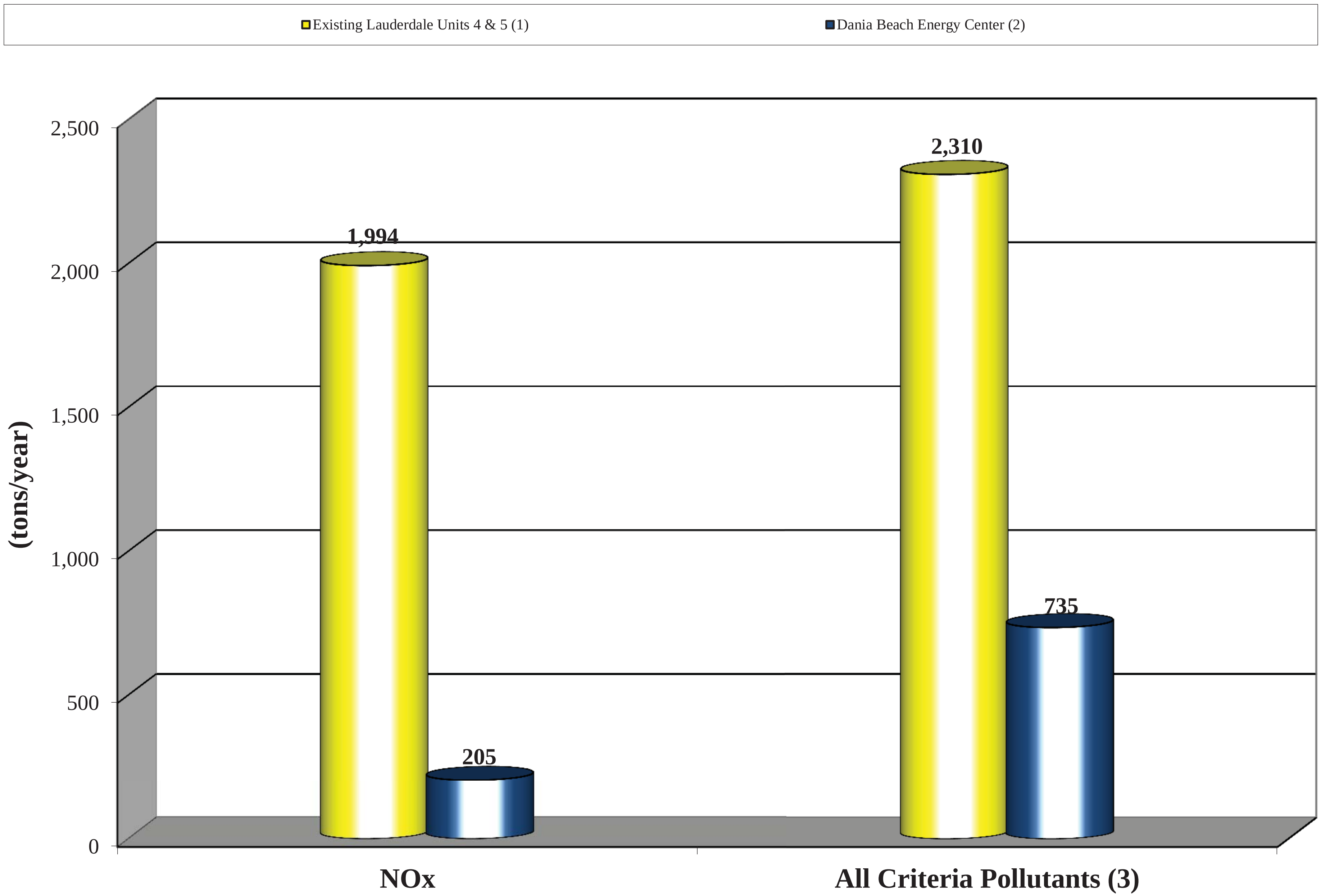
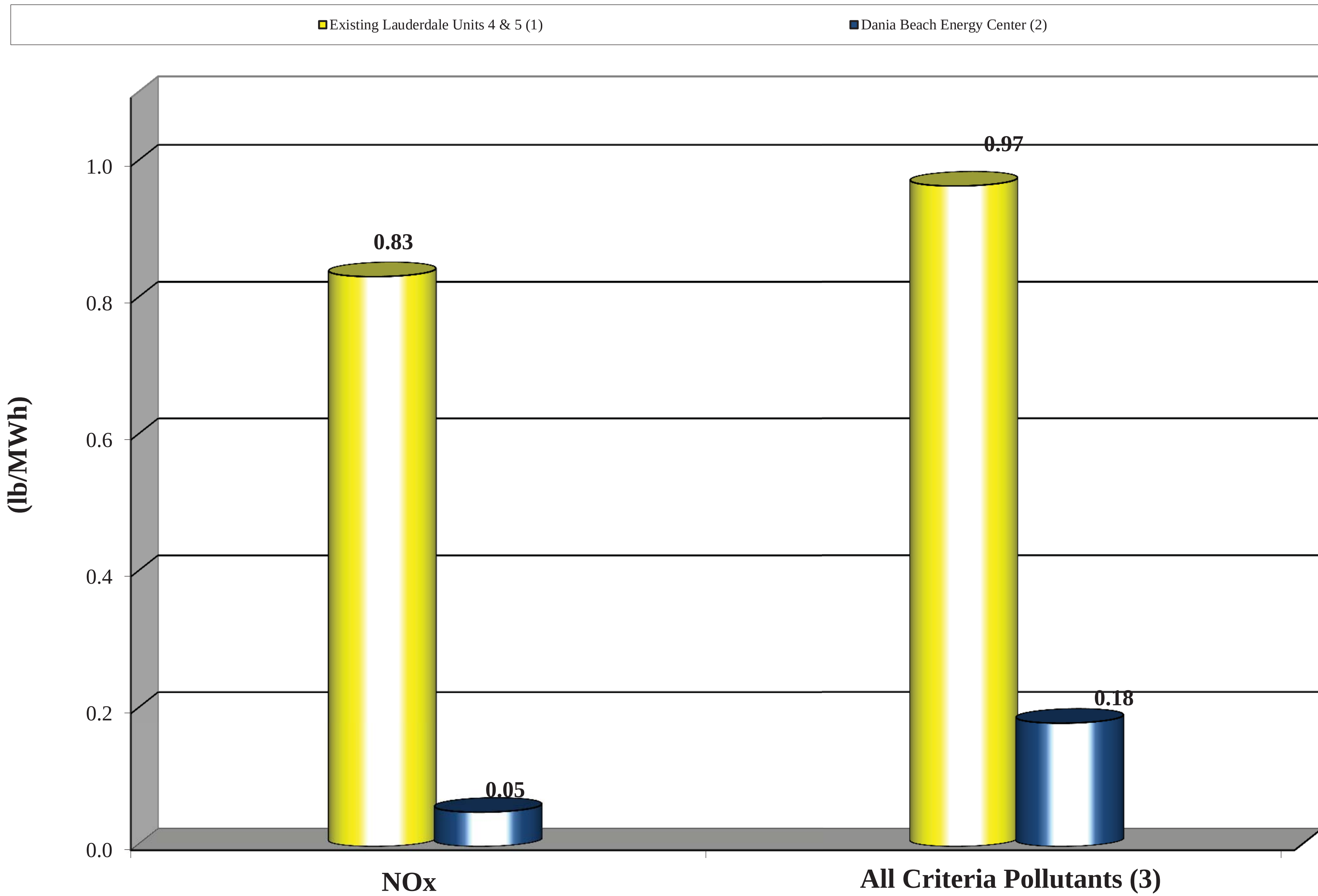
[1] Annual fixed O&M value includes capital replacement costs and fixed O&M presented as a levelized value to year 2022
[2] Variable O&M represents the value for year 2022
[3] Evaporative coolers in service
[4] Standard cubic feet per hour with heat content of 1030 Btu/scf
[5] Parts per million volumetric dry

NO_X and Total Emissions (tons/year)

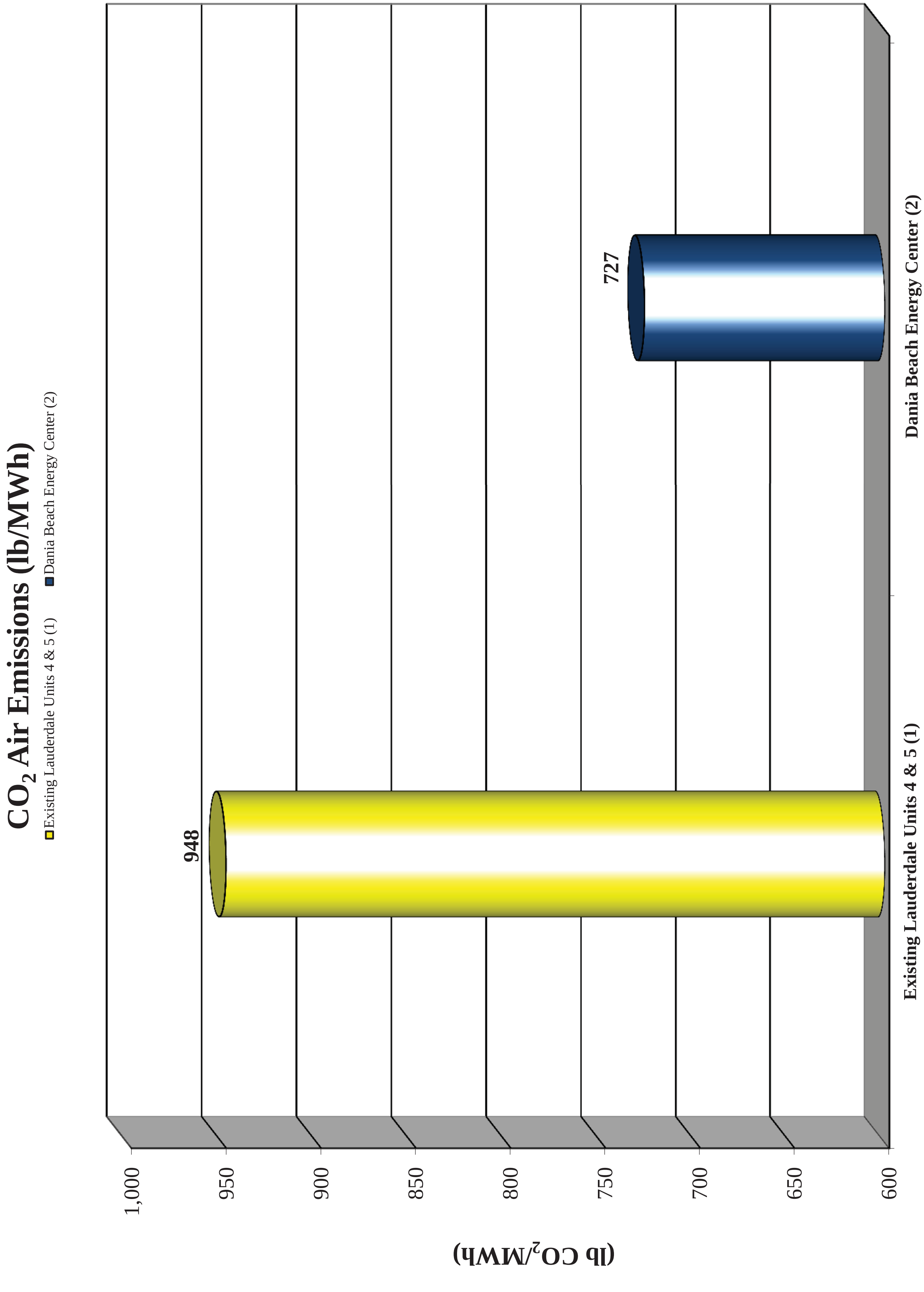


Footnotes: (1) Existing Lauderdale Units 4&5 based on "baseline actual emissions" for 2012-2016 (FDEP Rule 62.210.200(28) F.A.C.; highest 24-month annual average); data represents the average of 2013-2014 with Units 4 & 5 at approximately 61.8% capacity factor. (2) DBEC based on 80% capacity factor on natural gas using expected performance and emission limits for NOx, PM10/PM2.5, CO, and VOC; SO2 based on actual sulfur content of gas at Lauderdale plant. (3) All criteria pollutants are the sum of NOx, PM10/PM2.5, SO2, CO, and VOC.

NO_X, Other and Total Air Emissions (lb/MWh)



Footnotes: (1) Existing Lauderdale Units 4&5 based on "baseline actual emissions" 2012-2016 and actual generation from EPA Acid Rain database (FDEP Rule 62.210.200(28) F.A.C.; highest 24-month annual average); data represents the average of 2013-2014 with Units 4 & 5 at approximately 61.8% capacity factor. (2) DBEC based on 80% capacity factor on natural gas using expected performance and emission limits for NOx, PM10/PM2.5, CO, and VOC; SO2 based on actual sulfur content of gas at Lauderdale plant. (3) All criteria pollutants are the sum of NOx, PM10/PM2.5, SO2, CO, and VOC.



Footnotes: (1) Existing Lauderdale Units 4&5 based on "baseline actual emissions" for 2012-2016 and generation (MWh) from EPA Acid Rain Database (FDEP Rule 62.210.200(28) F.A.C.; highest 24-month annual average); data represents the average of 2013-2014. (2) DBEC based heat rate of 6,119 Btu/kWh (HHV) and natural gas firing.

DBEC Unit 7 Expected Construction Schedule

Milestone	**Begin**	**End**
Initiate sequence of HRSG orders (NTP[1] x 2)	Dec, 2018	-
Initiate NTP[1] for steam turbine	Dec, 2018	-
Initiate sequence of CT orders (NTP[1] x 2)	Dec, 2018	-
Receive approvals necessary to begin construction	-	Oct, 2018
Begin dismantlement of existing Units 4 and 5	Oct, 2018	-
Site preparation and install foundations	Mar, 2020	Dec, 2020
Balance of Plant	Mar, 2020	Oct, 2021
Erect HRSGs	Aug, 2020	Oct, 2021
Erect CTs	Dec, 2020	Oct, 2021
Erect steam turbine	Jan, 2021	Oct, 2021
Startup and testing	Nov, 2021	Jun, 2022
Commercial Operation	-	Jun, 2022

[1] Notice to Proceed

DBEC Unit 7 Plant Construction Cost Components

Component	**Cost in millions (2022$)**
Power Block and Generator Step-up Transformers	$764
Land	$0
Transmission Interconnection and Integration	$21
Third Party Gas Infrastructure[1]	$0
Allowance for Funds Used During Construction (AFUDC)	$103
Total Plant Cost	**$888**

[1]Does not include cost of fuel charges

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

FLORIDA POWER & LIGHT COMPANY

PETITION FOR DETERMINATION OF NEED

REGARDING DANIA BEACH CLEAN ENERGY CENTER UNIT 7

DIRECT TESTIMONY OF HEATHER C. STUBBLEFIELD

DOCKET NO. 2017 ___________-EI

OCTOBER 20, 2017

TABLE OF CONTENTS

I. INTRODUCTION AND CREDENTIALS

Q. Please state your name and business address.

A. My name is Heather C. Stubblefield. My business address is 700 Universe Boulevard, Juno Beach, Florida 33408.

Q. By whom are you employed and what is your position?

A. I am employed by Florida Power & Light Company (FPL) as Senior Manager of Project Development in the Energy Marketing and Trading (EMT) Business Unit.

Q. Please describe your duties and responsibilities in that position.

A. I am responsible for managing existing gas transportation contracts and evaluating gas transportation alternatives for FPL's gas-fired generation units. This includes evaluating proposals from pipeline companies, negotiating terms and conditions, and executing transportation agreements which are in the best interest of FPL's customers.

Q. Please describe your educational background and professional experience.

A. I graduated from Auburn University with a Bachelor of Arts degree in Business Administration in 1986. I joined Sonat, Inc. (NKA Kinder Morgan, Inc.) in 1988, where I held various positions in Human Resources, Internal Auditing, and the Sonat Marketing Company. In 2003, I joined FPL Group Resources (now called NextEra Energy Resources) as the Director of Marketing for liquefied natural gas initiatives. In 2005, I transferred to the

EMT Business Unit of FPL, where my duties include evaluating gas transportation alternatives for FPL's gas-fired generation units. This includes evaluating proposals from pipeline companies, negotiating terms and conditions, and executing gas transportation agreements that are in the best interest of FPL's customers.

Q. Have you previously served as a witness for FPL?

A. Yes. I have sponsored testimony in numerous dockets before the Florida Public Service Commission, including many Need Determination cases.

Q. Are you sponsoring any exhibits in this case?

A. Yes. I am sponsoring Exhibit HCS-1, FPL's November 7, 2016 Fuel Price Forecast, which is attached to my Direct Testimony.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to present and explain (1) the fossil fuel price forecast used in the evaluation of FPL's Dania Beach Clean Energy Center Unit 7 (DBEC Unit 7); and (2) the proposed fuel and fuel transportation plan for DBEC Unit 7.

Q. Please summarize your testimony.

A. FPL's fuel price forecast reflects the projected commodity and transportation costs for fuel oil, natural gas, and coal. The November 2016 Fuel Price Forecast is the same fuel price forecast that was used in FPL's 2017 Ten Year Site Plan (TYSP) and which is used in the analyses of DBEC Unit 7 and alternatives to that project. In addition, the fuel price forecast was developed using the same methodology that was presented in my testimony for the

Determination of Need filings for the Okeechobee Clean Energy Center, West County Energy Center Unit 3, and the modernizations of the Cape Canaveral, Riviera, and Port Everglades Plants. Therefore, the November 2016 forecast methodology is consistent with the methodology previously used for approved projects and is reasonable for the evaluation of DBEC Unit 7.

DBEC Unit 7 will burn natural gas as its primary fuel. Because DBEC Unit 7 is replacing an existing gas-fired unit, FPL will serve DBEC Unit 7 using the existing Florida Gas Transmission Company (FGT) gas transportation infrastructure currently serving the site.

Finally, DBEC Unit 7 will utilize a form of light fuel oil known as ultra-low sulfur distillate as a backup fuel source in the event of a natural gas supply disruption. Light fuel oil storage is currently located onsite to serve the existing units. Light fuel oil will be stored in sufficient quantities to allow both DBEC Unit 7 and the existing simple-cycle combustion turbines to operate at full capacity for approximately seventy-two (72) hours of continuous operation and can be resupplied with truck deliveries.

II. FUEL FORECAST

Q. What was FPL's methodology for developing the November 2016 forecast for fuel oil, natural gas, and coal presented in Exhibit HCS-1?

A. For natural gas and fuel oil commodity prices, FPL's forecast applied the following methodology: (1) for 2016 through 2018, the methodology uses the November 2016 forward curve for Henry Hub natural gas, New York Harbor 0.7% sulfur heavy oil, and ultra-low sulfur distillate fuel oil commodity prices; (2) for the next two years (2019 and 2020), FPL uses a 50/50 blend of the November 2016 forward curve and the most current projections from The PIRA Energy Group; (3) for years 2021 through 2035, FPL uses the annual projections from The PIRA Energy Group; and (4) for the period beginning in 2036, FPL used the real rate of escalation from the Energy Information Administration.

In addition to the development of oil and natural gas commodity prices, price forecasts were also prepared for fuel oil transportation and natural gas transportation costs. These transportation costs, when added to the projected commodity prices, resulted in the delivered price forecasts used to evaluate the economics of DBEC Unit 7. Coal prices were based on mine-mouth, and transportation costs were provided by JD Energy, Inc. This methodology is consistent with the approach to fuel forecasting used in previous filings, including FPL's 2017 TYSP.

Q. Please identify the key drivers that affect the future prices of fossil fuels.

A. These drivers include worldwide demand, production capacity, economic growth, environmental legislation, and politics.

Q. Is FPL's long-term fossil fuel price forecast reasonable for the evaluation of capacity options such as DBEC Unit 7?

A. Yes. The FPL long-term fossil fuel price forecast is reasonable for the evaluation of DBEC Unit 7 and is consistent with the methodology used in evaluating previous Determination of Need filings. FPL's fuel price forecast reflects the projected supply, demand, and price for fuel oil, natural gas, and coal, as well as the transportation of these fuels to the FPL's existing sites and DBEC Unit 7.

III. FUEL TYPE AND FUEL TRANSPORTATION

Q. What is the primary fuel type that will be utilized in DBEC Unit 7?

A. DBEC Unit 7 will burn natural gas as the primary fuel source.

Q. Does FPL currently have natural gas delivery to the DBEC Unit 7 site?

A. Yes. No new gas pipeline or pipeline expansion is needed for DBEC Unit 7.

Q. Does FPL have sufficient gas transportation capacity to serve DBEC Unit 7?

A. Yes. Because DBEC Unit 7 is replacing two existing gas-fired units, FPL will use the existing FGT gas transportation infrastructure to serve DBEC Unit 7.

The existing gas transportation capacity is sufficient to meet the expected DBEC Unit 7 requirements.

Q. Will DBEC Unit 7 have a backup fuel source in the event of a natural gas supply disruption?

A. Yes. As is the case with the existing generating units that will be replaced by DBEC Unit 7, the new unit will be capable of burning light fuel oil in the event of a natural gas supply disruption. Light fuel oil will be trucked to the existing fuel oil facilities located at the site and stored on-site in sufficient quantities to allow the site to operate at full capacity for approximately seventy-two (72) hours of continuous operation.

Q. Does this conclude your direct testimony?

A. Yes.

Docket No. 2017________-EI
FPL's November 7, 2016 Fuel Price Forecast
Exhibit HCS-1, Page 1 of 1

FPL'S November 7, 2016 Fuel Price Forecast

	NATURAL GAS			OIL			COAL		
YEAR	FGT $/MMBTU	GULFSTREAM $/MMBTU	FSC / SABAL TRAIL $/MMBTU	MARTIN PLANT RESIDUAL 0.7% $/MMBTU	MANATEE / TURKEY POINT PLANTS RESIDUAL 0.7% $/MMBTU	ALL PLANTS DISTILLATE $/MMBTU	SCHERER 4 $/MMBTU	ICL $/MMBTU	ST. JOHNS $/MMBTU
2016	$2.51	$2.47		$7.40	$7.09	$10.91	$2.33	$4.47	$3.00
2017	$3.12	$3.08	$3.11	$8.59	$8.28	$12.26	$2.29	$4.33	$3.44
2018	$3.07	$3.02	$3.04	$8.80	$8.49	$12.95	$2.38	N/A	N/A
2019	$3.60	$3.55	$3.55	$10.64	$10.32	$15.31	$2.48	N/A	N/A
2020	$3.59	$3.54	$3.55	$11.15	$10.84	$15.95	$2.73	N/A	N/A
2021	$3.95	$3.90	$3.90	$13.79	$13.47	$18.62	$2.84	N/A	N/A
2022	$3.74	$3.69	$3.69	$14.20	$13.89	$19.23	$2.98	N/A	N/A
2023	$3.98	$3.92	$3.92	$14.51	$14.20	$19.71	$3.08	N/A	N/A
2024	$4.19	$4.13	$4.13	$14.78	$14.47	$20.55	$3.15	N/A	N/A
2025	$4.39	$4.33	$4.32	$15.14	$14.83	$21.65	$3.23	N/A	N/A
2026	$4.57	$4.50	$4.50	$15.41	$15.10	$21.93	$3.31	N/A	N/A
2027	$4.74	$4.67	$4.66	$15.81	$15.49	$22.12	$3.39	N/A	N/A
2028	$4.90	$4.83	$4.82	$16.20	$15.89	$22.25	$3.47	N/A	N/A
2029	$5.05	$4.98	$4.96	$16.60	$16.29	$22.24	$3.56	N/A	N/A
2030	$5.20	$5.12	$5.11	$17.03	$16.71	$22.44	$3.66	N/A	N/A
2031	$5.34	$5.26	$5.24	$17.38	$17.06	$22.65	$3.74	N/A	N/A
2032	$5.48	$5.40	$5.38	$17.75	$17.44	$22.87	$3.82	N/A	N/A
2033	$5.62	$5.53	$5.51	$18.13	$17.81	$23.09	$3.90	N/A	N/A
2034	$5.75	$5.67	$5.64	$18.51	$18.20	$23.32	$3.99	N/A	N/A
2035	$5.88	$5.80	$5.77	$18.89	$18.58	$23.59	$4.08	N/A	N/A
2036	$5.99	$5.90	$5.87	$19.27	$18.96	$24.09	$4.18	N/A	N/A
2037	$6.10	$6.01	$5.97	$19.65	$19.34	$24.60	$4.28	N/A	N/A
2038	$6.21	$6.11	$6.08	$20.05	$19.74	$25.13	$4.39	N/A	N/A
2039	$6.32	$6.22	$6.19	$20.45	$20.14	$25.67	$4.50	N/A	N/A
2040	$6.43	$6.34	$6.30	$20.86	$20.55	$26.22	$4.61	N/A	N/A
2041	$6.54	$6.45	$6.41	$21.28	$20.97	$26.78	$4.73	N/A	N/A
2042	$6.66	$6.56	$6.52	$21.71	$21.39	$27.35	$4.85	N/A	N/A
2043	$6.78	$6.68	$6.64	$22.15	$21.83	$27.94	$4.97	N/A	N/A
2044	$6.90	$6.80	$6.75	$22.59	$22.28	$28.54	$5.10	N/A	N/A
2045	$7.03	$6.92	$6.87	$23.05	$22.74	$29.16	$5.23	N/A	N/A
2046	$7.15	$7.05	$7.00	$23.52	$23.21	$29.78	$5.36	N/A	N/A
2047	$7.28	$7.17	$7.12	$24.00	$23.68	$30.43	$5.49	N/A	N/A
2048	$7.41	$7.30	$7.25	$24.48	$24.17	$31.08	$5.63	N/A	N/A
2049	$7.54	$7.43	$7.37	$24.98	$24.67	$31.76	$5.78	N/A	N/A
2050	$7.68	$7.56	$7.51	$25.49	$25.18	$32.44	$5.92	N/A	N/A
2051	$7.81	$7.70	$7.64	$26.02	$25.70	$33.15	$6.07	N/A	N/A
2052	$7.95	$7.84	$7.77	$26.55	$26.24	$33.86	$6.23	N/A	N/A
2053	$8.10	$7.98	$7.91	$27.09	$26.78	$34.60	$6.39	N/A	N/A
2054	$8.24	$8.12	$8.05	$27.65	$27.34	$35.35	$6.55	N/A	N/A
2055	$8.39	$8.27	$8.20	$28.22	$27.91	$36.12	$4.28	N/A	N/A
2056	$8.54	$8.41	$8.34	$28.80	$28.49	$36.91	$6.89	N/A	N/A
2057	$8.69	$8.56	$8.49	$29.40	$29.09	$37.71	$7.06	N/A	N/A
2058	$8.85	$8.72	$8.64	$30.01	$29.69	$38.53	$7.24	N/A	N/A
2059	$9.00	$8.87	$8.79	$30.63	$30.32	$39.37	$7.42	N/A	N/A
2060	$9.17	$9.03	$8.95	$31.26	$30.95	$40.23	$7.61	N/A	N/A
2061	$9.33	$9.19	$9.11	$31.91	$31.60	$41.11	$7.80	N/A	N/A