BEFORE THE FLORIDA
PUBLIC SERVICE COMMISSION

DOCKET NO. 110309 -EI
FLORIDA POWER & LIGHT COMPANY

IN RE: FLORIDA POWER & LIGHT COMPANY'S PETITION TO DETERMINE NEED FOR MODERNIZATION OF PORT EVERGLADES PLANT

DIRECT TESTIMONY & EXHIBIT OF:

PEDRO MODIA, P.E.

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DIRECT TESTIMONY OF PEDRO MODIA, P.E.

DOCKET NO. _____-EI

NOVEMBER 21, 2011

Q. Please state your name and business address.

A. My name is Pedro Modia, P.E. My business address is 4200 W. Flagler Street, Miami, Florida 33134.

Q. By whom are you employed and what position do you hold?

A. I am employed by Florida Power & Light Company ("FPL" or the "Company") as Director of Transmission Services and Planning.

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

A. I am responsible for the transmission planning aspects of new generator and utility interconnections, transmission and substation expansion planning, and transmission service-related activities, including contract negotiations, legal and regulatory proceedings, and contract interpretations.

Q. Please describe your educational background and professional experience.

A. I received a Bachelor's degree in Electrical Engineering Technology from Florida International University. I am a Registered Professional Engineer in the State of Florida. Prior to assuming my present role in 2009, I served as FPL's Director of Power Supply. I began my career with FPL in 1977 and have 33 years of service with the Company including the following positions: Director of Substations,

General Manager Generation, Director of Transmission, and Director of Protection and Control.

Q. Are you sponsoring an exhibit in this case?

A. Yes. I am sponsoring Exhibit PM-1, Summary of Required Facilities for the Port Everglades Next Generation Clean Energy Center (PEEC), which is attached to my direct testimony.

Q. What is the purpose of your testimony?

A. My testimony presents three aspects related to FPL's transmission system and the PEEC Project. First, I present a general overview of the FPL transmission system, the Southeast Florida area, and in particular the Miami-Dade and Broward County area. Second, I describe the overall transmission evaluation process and the results of transmission system-related cost studies for the PEEC Project and its alternatives. Finally, I discuss the reliability benefits of the PEEC Project.

Q. Please summarize your testimony.

A. FPL has analyzed its transmission capability to reliably serve its customers in the future. These analyses have identified concerns with maintaining a regional balance between customer demand and generating capacity in the general Southeast Florida area. Most recently, these concerns are focused on the Miami-Dade and Broward County area and FPL continues to monitor these concerns.

The balance between customer demand and generating capacity in an area is maintained by the capability of the transmission system to make up the

differences, however the transmission system capability is finite. While FPL could construct new transmission facilities to import more generation into the area, such construction would be very costly and not without significant risk, including uncertainty regarding approvals for siting, licensing, and permitting for the construction of major transmission facilities necessary to maintain adequate reliability for FPL's customers. FPL estimates that these transmission facilities would cost approximately $638 million (2016$) and would be required by 2020, in order to maintain reliability. Alternatively, FPL could locate new generation in the area such as the PEEC Project that FPL is proposing.

The FPL Transmission Planning group also has performed an evaluation of the FPL transmission system under my direction and control that provided inputs to FPL's Resource Assessment and Planning (RAP) department to support the economic evaluation of the competing alternatives for meeting FPL's generation need in 2016, including the PEEC Project, and also identified the transmission related requirements for the interconnection and integration of the PEEC Project. The total transmission cost of both interconnection and integration facilities for the PEEC Project is estimated to be approximately $32.5 million (2016$).

FPL's proposal to modernize the existing Port Everglades plant adequately provides for FPL system reliability by siting efficient, base load generation in Broward County, a location within FPL's service area with a high concentration

of customer load, and postpones the need for significant transmission investment to increase import capability.

FPL'S TRANSMISSION SYSTEM AND THE SOUTHEAST FLORIDA AREA

Q. Please describe FPL's transmission system.

A. FPL is part of the nation's Eastern Interconnection transmission network. It has multiple points of interconnection with other utilities that enable power to be exchanged among utilities. The FPL transmission system is comprised of approximately 6,721 circuit miles of transmission lines. Integration of the generation, transmission and distribution system is achieved through FPL's 586 substations.

The FPL transmission system is designed to integrate all of FPL's generation resources to serve FPL's retail customers and to meet FPL's firm long-term transmission service obligations in a reliable and cost effective manner. It is planned and designed consistent with reliability standards and criteria established by the North American Electric Reliability Corporation (NERC) and the Florida Reliability Coordinating Council (FRCC).

Q. In previous need determination regulatory proceedings, FPL has addressed the need for siting generation in or increasing the transmission capability to the Southeast Florida area. What does FPL consider to be the Southeast Florida area?

A. The Southeast Florida area of FPL's transmission system has been described as the region south and east of, and including FPL's Corbett Substation; geographically, this includes a portion of southern Palm Beach County and all of Broward and Miami-Dade Counties.

Q. Please describe FPL's transmission concerns for the Southeast Florida area.

A. The concern originated from transmission assessments performed by FPL as far back as 2002, which identified the growing load-to-generation imbalance in Southeast Florida, as well as the finite capability of the transmission system to import power into Southeast Florida in the future. As the load in the area continues to grow, FPL must either build new generation within the Southeast Florida area or make transmission system improvements to increase the transmission import capability, or both, at some time in the near future. This was the load-to-generation imbalance concern that FPL had previously identified in prior need determination proceedings before the Commission.

Q. How did the additions of Turkey Point Unit 5 and West County Units 1, 2, and 3 impact FPL's transmission system and the load-to-generation imbalance in the Southeast Florida area?

A. The additions of Turkey Point Unit 5 in 2007 and West County Units 1, 2, and 3 in 2009, 2010, and 2011 mitigated but did not entirely eliminate the load-to-

generation imbalance concern in the Southeast Florida area. Two other projects that are currently in progress -- the uprates to the Turkey Point nuclear units in 2012 and 2013 and the addition of the Riviera Beach Energy Center in 2014 -- will also help to mitigate the Southeast Florida area imbalance.

Q. Is there currently an imbalance between load and generation in the Southeast Florida area?

A. Yes. Although the generating capacity additions discussed above have helped to mitigate the imbalance issue, the benefits are partly offset by the fact that old, inefficient generating capacity existing within the area will be retired or have been placed on Inactive Reserve status and eventually retired, as witness Enjamio explains in his direct testimony. Cutler Units 5 and 6 are planned to be retired by the end of 2012, and Port Everglades Units 1-4 and Turkey Point Unit 2 have been placed on Inactive Reserve. If all the units that are retired or placed in Inactive Reserve are not returned to service or replaced with generation in this area, the generating capacity within the Southeast Florida area will be reduced by approximately 1800 MW. In addition, Turkey Point Unit 1 is planned to be placed on Inactive Reserve in 2016, as witness Enjamio explains in his direct testimony. This will be a total reduction of approximately 2200 MW. Since the potential reduction in Southeast Florida capacity is primarily in the central and southernmost portion of the area (Miami-Dade and Broward Counties), and the recent generation additions at West County are primarily in the north portion of the area (Palm Beach County), these changes have resulted in a shift in the imbalance to a smaller geographic area of concern within the Southeast Florida

area. The area of concern regarding an imbalance between load and generation is now confined to Miami-Dade and Broward Counties.

Q. Please explain the specific concerns for the Miami-Dade and Broward County area.

A. Miami-Dade and Broward Counties are the most populated counties in FPL's territory with the highest concentration of customer load. The two counties together represent approximately 44% of FPL's total load, based on recent history. Based on this trend, by 2016, FPL projects it will have about 10,000 MW of peak load in the Miami-Dade and Broward County area, and the peak load in this area is estimated to grow by about 150-200 MW per year. With the planned retirements of old, inefficient units such as Cutler Units 5 and 6, and with Port Everglades Units 1-4 and Turkey Point Units 1 and 2 placed on Inactive Reserve, FPL will have only 4,896 MW of active installed capacity in Miami-Dade and Broward Counties (this includes approximately 1,260 MW of 1970's vintage aero-derivative gas turbine generation which is primarily utilized for emergency reserves). As the load in Miami-Dade and Broward Counties continues to grow, FPL will need to rely upon its transmission system to import greater amounts of power into the area to serve the load. However, the existing transmission capability to import power into Miami-Dade and Broward Counties is limited to about 6,400 MW. Later in my testimony I discuss how the transmission import capability was determined in the transmission assessment.

Another concern related to the power import capability of the area is the need for voltage support. In areas of high concentrations of load, the voltage must be supported by either generation close to the loads or additional facilities installed on the system to maintain adequate voltage while importing the power. Generators inherently provide voltage support to the transmission systems to which they are connected. For this reason, the Turkey Point Unit 2 generator was modified to operate as a "synchronous condenser" when it was placed on Inactive Reserve status. A synchronous condenser is a term used to define a generator that is connected to the system to provide voltage support without using fuel or generating power. The Turkey Point nuclear switchyard has voltage requirements that necessitated the use of Turkey Point Unit 2 as a synchronous condenser to maintain adequate voltage in this area. When Turkey Point Unit 1 is removed from generation service for economic reasons, it will be modified to also operate as a synchronous condenser for voltage support at the Turkey Point switchyard.

If the inefficient generation at Port Everglades that has been placed in Inactive Reserve is not returned to service or replaced with generation sited within the Miami-Dade and Broward County area, the imbalance between customer demand versus generation capacity in the area will require an investment of approximately $638 million (2016$) in transmission infrastructure build out by 2020, in order to maintain reliability. FPL would have to construct transmission facilities to move power from remote locations into the area. Aside from the significant cost associated with these transmission infrastructure additions, it is not clear that the

needed enhancements could be completed by 2020 because the siting, licensing, permitting, and construction of major transmission facilities can take a significant amount of time; in fact, in some instances major transmission facilities could take as long as 5 to 7 years to put in service. For this reason, the decision to proceed with such an infrastructure build out would have to be made as early as 2013.

If there is a delay beyond 2016 in either returning the inefficient generation at Port Everglades to service, or constructing the PEEC Project, there is an increased transmission reliability risk. This is due to the increased reliance upon the 1970's vintage aero-derivative gas turbine generation (which is primarily utilized for emergency reserves and not designed to run on a long term continuous basis) to mitigate transmission constraints in the Miami-Dade and Broward County area. To illustrate this potentially serious transmission reliability concern, we assume the possibility that one of the large generating units in the Miami-Dade and Broward County area (i.e. Turkey Point Unit 3, 4 or 5) is unavailable due to a forced outage. In this circumstance, the aero-derivative gas turbine generation would be utilized to replace the outaged generation in the area and maintain the balance between generation and load in the Miami-Dade and Broward area, and also meet the Turkey Point voltage requirements. After 2016, the amount of gas turbine generation required to maintain the balance approaches the available capacity of gas turbines in the area, leaving little margin available for mitigation of potential transmission contingencies. If the available transmission and generation capacity to serve the Miami-Dade and Broward county area is

exhausted, the only remaining remedy to maintain transmission system reliability is to curtail electric service to FPL's customers in this scenario. By 2020 the margin is negative and significant transmission upgrade is required as discussed above. However, delaying the addition of generation into the area beyond 2016 carries a significant risk and is a serious concern, and therefore is not recommended from a system reliability perspective.

To summarize, the existing transmission system import capability into the Miami-Dade and Broward County area is 6,400 MW. Unless adequate generation is added in this area to replace the generation that will be retired, and that which will be in Inactive Reserve, by either bringing the Port Everglades units back into generation service, or preferably by modernizing the Port Everglades Plant, significant transmission upgrades will be required by no later than 2020 to increase the area's transmission import capability. If there is a delay beyond 2016 in adding generation to the area there is a serious concern, and therefore is not recommended from a system reliability perspective.

Q. Would the proposed Turkey Point 6 & 7 nuclear units mitigate the generation to load imbalance in Miami-Dade and Broward Counties?

A. Yes, the new baseload capacity associated with these two new units will improve the generation to load imbalance in the region. However, because the projected in-service dates of those units are 2022 and 2023, respectively, these new units will be unable to mitigate the imbalance that will occur by 2020. Consequently, either

new transmission facilities, or new generation capacity in the area (such as PEEC), will be needed before Turkey Point 6 & 7 will be added.

Q. Will the PEEC Project improve the Miami-Dade and Broward County imbalance between generation and load?

A. Yes. For the reasons discussed above, the PEEC Project reduces the imbalance between generation and load in the Miami-Dade and Broward County area and also provides voltage support, when compared to the case of not utilizing Port Everglades as a generating site.

TRANSMISSION ASSESSMENT AND SYSTEM REQUIREMENTS FOR PEEC

Q. Please describe FPL's evaluation process for transmission interconnection and integration of new generation resources.

A. The evaluation process considers many factors, as outlined below, in order to develop an effective transmission interconnection and integration plan. In some instances, the determination of the plan is relatively straightforward; however, at other times it requires an iterative assessment of various factors and a substantial amount of time to perform appropriate studies. The resultant plan must be in compliance with NERC and FRCC Reliability Standards.

Generally, the first step in the process is to evaluate the proposed generating plant site location to determine its proximity to existing transmission facilities. To the extent there are existing transmission facilities nearby, those facilities are assessed

to determine their capabilities for reliably interconnecting and integrating the proposed new generation into the transmission system as a firm FPL generation resource. Next, other factors such as those listed below are considered (as applicable):

- Compliance with NERC and FRCC Reliability Standards;
- Amount of generation (MW) being added at the new generation site, and the dispatch profile of the new generation resource relative to FPL's other generation resources in serving FPL's load;
- Capabilities to upgrade existing facilities (can the conductor on an existing transmission line be upgraded on the existing structures or would the entire transmission line have to be rebuilt?);
- Need for new transmission lines, right-of-way requirements, existing right-of-way capabilities, siting of new right-of-way, permitting requirements, and expected time-frame to acquire right-of-way and necessary permits;
- Ability to transport power efficiently (would using higher voltages be more efficient by reducing the amounts of transmission losses incurred when moving large amounts of power over long distances?);
- Existing and new substation requirements, capabilities, and availability;
- Impact on existing facilities (does the proposed interconnection and integration plan result in an overload on an existing facility or does it result in a material adverse impact somewhere else on the transmission system?);

- Constructability (can the necessary transmission facilities be constructed without having to take existing operating facilities out of service during periods that would result in an adverse reliability impact?);
- Overall compatibility with the system (do the new facilities require new material stocking requirements or the need for new tools to maintain?);
- Operating considerations (what are the maintenance requirements of the proposed interconnection and integration facilities and how will they impact the on-going operation of the system?);
- The timing and amount of power needed for testing of equipment such as pumps and motors;
- Expected in-service testing and commercial operations dates for new generation (which transmission facilities necessary for interconnection and integration need to be in-service prior to the commercial operation in-service date for testing?);
- The need for procuring transmission service from a third party;
- Material adverse impacts on third party transmission owner; and,
- Initial and recurring costs of facilities and operations.

The next step in the interconnection and integration evaluation process is to perform power flow studies for a proposed transmission interconnection and integration plan. These power flow studies are used to evaluate the performance of the system and to converge on specific new system facilities and upgrades that

would be needed to reliably interconnect and integrate the new generation into the transmission system.

Q. Was this the process FPL used to evaluate transmission interconnection and integration requirements for the PEEC Project?

A. Yes.

Q. What was the result of FPL's evaluation?

A. The evaluation determined that most of the existing facilities in and around the Port Everglades switchyard are adequate to reliably integrate the PEEC Project and some facilities will require upgrading. This is primarily due to the higher winter capability of the PEEC generator's combined cycle technology.

Q. Please summarize the transmission facilities and costs associated with the PEEC Project.

A. The interconnection facilities required for the PEEC Project consist of four string busses needed to connect the three combustion turbine generators and the steam generator to the Port Everglades switchyard at a cost of approximately $6.9 million (2016$). These costs do not include the generator step-up transformers (GSU), which are considered part of the generator power block.

The facilities required in order to fully integrate the PEEC Project into the FPL transmission system include upgrading four existing 138 kV line sections in close proximity to the Port Everglades plant switchyard to accommodate the proposed PEEC unit. In addition, the Port Everglades switchyard requires an upgrade to increase the fault-withstanding capability for faults on, or in close proximity to,

the switchyard busses. The cost of all the required integration facility upgrades is estimated to be about $25.6 million (2016$). These upgrades are necessary due to thermal overloads under various contingencies, primarily in winter conditions when the output of the unit is higher, and under fault conditions, due to the higher fault current available from the new generators.

The total transmission cost of both interconnection and integration facilities for the PEEC Project is estimated to be approximately $32.5 million (2016$). The specific facility upgrades and estimated costs of each are listed in Exhibit PM-1 Summary of Required Facilities for PEEC. These transmission costs are included in the projected total cost of the PEEC Project presented by FPL Witness Gnecco in his direct testimony.

Q. Did FPL also assess the potential transmission-related costs to a third party to interconnect to the FPL transmission system from a site other than Port Everglades within the Miami-Dade or Broward area?

A. Yes. Using the process described above, FPL performed a hypothetical assessment for the interconnection and integration of a generation project of the same size and scope as the PEEC Project located at a potential site in western Broward County that could be acquired by a third party with zoning for industrial use, suitable for power generation. Interconnection costs were estimated to be approximately $75 million (2016$), and generic integration costs were essentially in the range of $290-$406 million (2016$). These transmission costs are significantly higher than the PEEC Project costs because there are no locations on

the transmission system in the Miami-Dade or Broward County area that have existing capacity to integrate the generation from a project similar in size to the PEEC Project.

Q. Please generally describe the impact on transmission losses of the location of generating resources in the transmission system.

A. Transmission losses occur in transmission facilities as the electrical current flows from generators to loads. The farther the generator is from the load, the higher the losses. Since there are numerous generators, transmission elements, and loads distributed on the system, losses vary as a function of what generation is dispatched and the load level.

Power flows and the losses in the transmission system are affected whenever a generating resource is dispatched. Therefore, the impact on losses of an alternative will depend both on where the resource is located and the dispatch characteristic of the resource. While low cost resources may operate and impact transmission losses most of the time, less efficient generating resources are needed to serve higher load levels and generally tend to operate and impact losses during these times.

In this case, one of the alternatives to the PEEC Project was to return existing units to service (at Port Everglades). The generation in both of these alternatives is located in the same area, in fact mostly at the same site. Therefore the

difference in losses between the two options is minimal and was not included in the economic analysis described by FPL witness Enjamio in his direct testimony.

The other generation alternative to PEEC is the construction of a greenfield combined cycle (CC) unit outside the Southeast Florida area. This greenfield CC alternative would most likely have higher system transmission losses. However, since a specific site has not been identified for this unit, losses have not been quantified nor included in the economic analysis of the PEEC Project.

Q. Is the Miami-Dade/Broward import limit an input in the economic analysis?

A. Yes.

Q. Please discuss the methodology used to determine the Miami-Dade/Broward import limit.

A. Calculation of the transmission import limit into the Miami-Dade and Broward County area is performed by load flow analysis. In this case, the load flow analysis indicated potential for the limit to be set by either thermal overload conditions that are system operating limits, or voltage requirement limits at the Turkey Point switchyard. In order to establish which type of condition would be reached first in any case, two types of load flow analysis were used. For determination of a thermal overload limit, incremental transfer capability power flow analysis was used. To determine if a voltage limit is reached, Power/Voltage (P/V) analysis techniques were used. The limiting conditions for both analyses converged on a value of 6400 MW of power being reliably imported into the Miami-Dade and Broward County area, without observing either thermal

overloads on facilities in the area or the voltage limit at the Turkey Point switchyard being reached.

Q. How is the import limit used in the economic analysis of the PEEC Project and its alternatives?

A. The import limit value discussed above is an input to the production costing model used by RAP. RAP uses this import limit to determine the impact on costs of any out of economic dispatch of existing FPL generating units in the Miami-Dade and Broward County area that would be needed to avoid exceeding the limit. Witness Enjamio discusses the results of the production costing model in more detail in his direct testimony.

TRANSMISSION RELIABILITY BENEFITS OF THE PEEC PROJECT

Q. How will the PEEC Project improve reliability to FPL's customers?

A. The PEEC Project will result in a more reliable power supply to FPL's customers in two ways. First, a generation source that is geographically and electrically close to the load is not as dependent upon the transmission system to transfer power over long distances to reach the load. As a result, adding generation close to the load contributes to system stability and reliability. This is because in general, areas of concentrated load have multiple transmission lines serving densely populated centers. Having more lines disperses the amount of power flowing on each line, and in turn reduces the criticality of any particular line. Also, the lines in a densely populated area are typically shorter and therefore have

less exposure to natural elements which may cause interruptions (lightning, etc.) While FPL always strives to plan and operate its transmission system in a reliable manner, from a reliability perspective, it is preferable to have generation located in close proximity to major load centers whenever possible. Generation located close to the load also adds a level of operating flexibility and margin that contributes to increased reliability. Operating flexibility allows for improved maintainability.

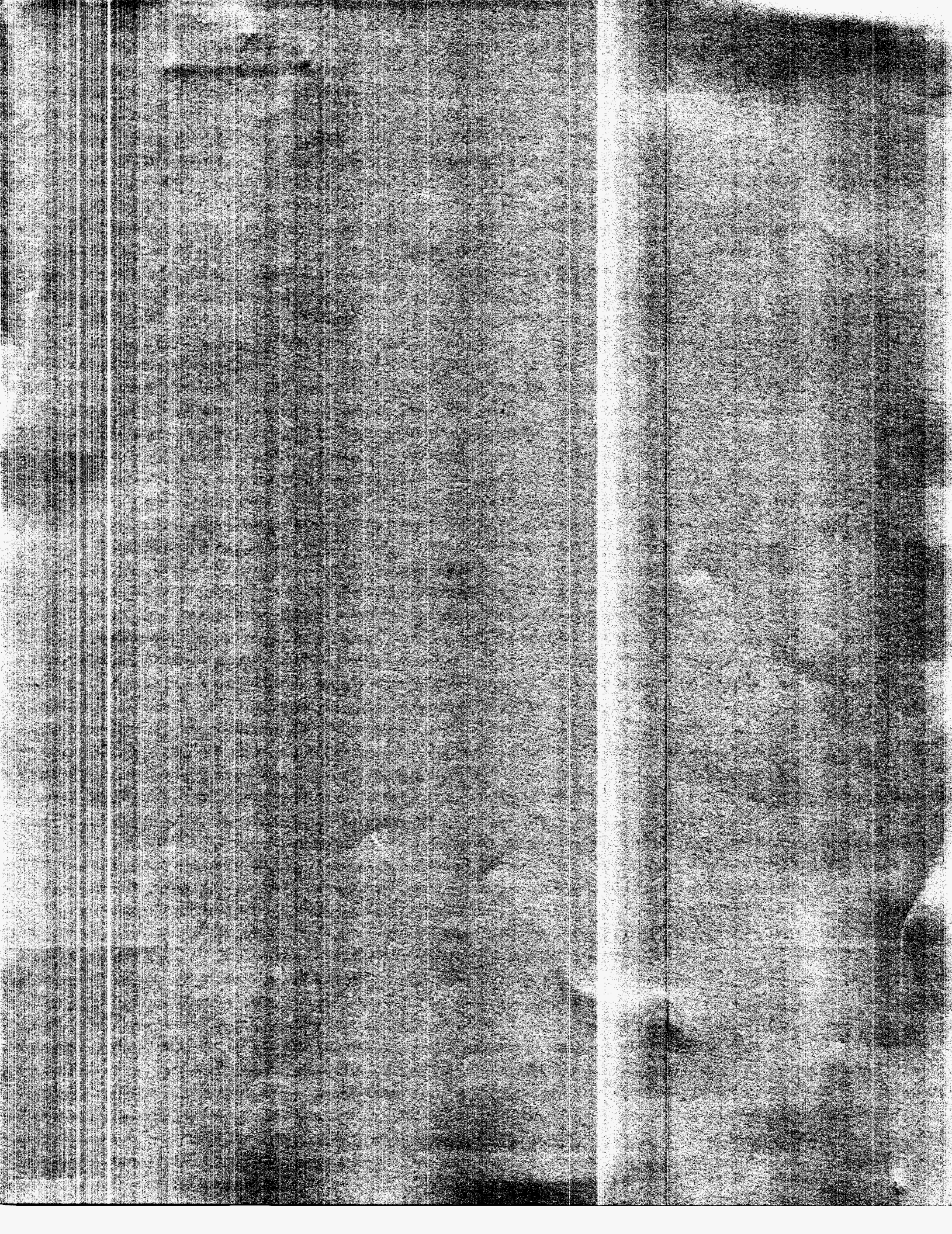
Second, since the new unit is very efficient, it will be base load dispatched, which means it will reduce the use of imported power from the grid and which will in turn eliminate or postpone the need for new transmission investment to increase import capability. Conversely, if the PEEC Project is not built and instead, the existing Port Everglades units are returned to service from Inactive Reserve, they will not normally dispatch very often because these older and less efficient units have higher operating costs. Power imported via the transmission system would have lower operating costs, so imported power will be relied upon more frequently, except when the existing Port Everglades Units are required to be dispatched out of economics as "must-run" units to maintain reliability. Over time, as loads continue to grow, this situation will be exacerbated, and this area will require more frequent out-of-economic dispatch of the Port Everglades Units 1-4 to maintain reliability during both peak and off peak periods in order to maintain an adequate level of reliability, increasing costs to customers.

Q. Why is the Port Everglades site location preferred over other potential sites for new generation?

A. From a transmission perspective, the Port Everglades site has several advantages over other potential new sites. The transmission system has been planned and designed for the Port Everglades site to be a generation source. Since the Port Everglades site already has an existing transmission switchyard, the infrastructure necessary to transfer the power from the generators to the distribution system is already in place. Further, the Port Everglades switchyard has transformation to support injecting the output of PEEC into FPL's transmission system at both 230 kV and 138 kV voltage levels. This flexibility is valuable because the ability to split the output of PEEC between the 138 kV and 230 kV voltage levels will defer the need to upgrade the 138 kV transmission system in the local area. The ability to connect at the 230 kV level also increases FPL's options for serving the local area, providing for the bulk transfer of power to other areas, and backing up the 500 kV backbone of FPL's transmission system.

Q. Does this conclude your direct testimony?

A. Yes.



Summary of Required Facilities for PEEC

Transmission Facility Item #	Voltage Level (kV)	Description		Cost 2016$ (000s)		
PEEC TF - 1	138	2-138 kV String Buses w/ fiber optic to connect generators A and B to Port Everglades switchyard	$	1,074		
PEEC TF - 2	230	2-230 kV String Buses w/ fiber optic to connect generators C and STM to Port Everglades switchyard	$	1,074		
PEEC TF - 3	138/230	Port Everglades System Yard - Upgrade 2-138 kV, 2-230 kV terminals, associated equipment	$	4,777		
		Subtotal Interconnection			$	6,924
PEEC TF - 4	138	Port Everglades 138 kV System Yard - Replace 10 - 138 kV breakers w/ 63 kA, 2-cycle	$	6,509		
PEEC TF - 5	230	Port Everglades 230 kV System Yard - Replace 8 - 230 kV breakers w/ 63 kA, 2-cycle	$	5,377		
PEEC TF - 6	138	Port Sub - Upgrade Port Tap terminal to 2000 amps	$	737		
PEEC TF - 7	230	Port Everglades System Yard - Upgrade 230 kV bus due to fault current	$	1,957		
PEEC TF - 8	138	Port Everglades System Yard - Upgrade 138 kV bus due to fault current	$	828		
PEEC TF - 9	138	Hollywood Substation - Upgrade terminal to Port Everglades circuit	$	122		
PEEC TF - 10	138	Dania Substation - Upgrade terminal to Port Everglades circuit	$	557		
PEEC TF - 11	138	Transmission circuits - Upgrade Port Tap1-Dania - Hollywood to 1695 amps	$	7,201		
PEEC TF - 12	138	Transmission circuits - Upgrade Port-Port Tap-Port Tap 2 to 1905 amps	$	1,581		
PEEC TF - 13	138/230	OHGW Replacements due to Fault Current	$	719		
		Subtotal Integration			$	25,588
			Total	$ 32,513		