

BEFORE THE FLORIDA
PUBLIC SERVICE COMMISSION

DOCKET NO. 060225-EI
FLORIDA POWER & LIGHT COMPANY

IN RE: FLORIDA POWER & LIGHT COMPANY'S
PETITION TO DETERMINE NEED FOR
WEST COUNTY ENERGY CENTER UNITS 1 AND 2
ELECTRICAL POWER PLANT

DIRECT TESTIMONY & EXHIBIT OF:
ROGER E. CLAYTON

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2 **FLORIDA POWER & LIGHT COMPANY**

3 **DIRECT TESTIMONY OF ROGER E. CLAYTON**

4 **DOCKET NO. _____-EI**

5 **MARCH 13, 2006**

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Q. Please state your name and business address.

A. My name is Roger E. Clayton and my business address is 3055 Ennis Road, Pattersonville, NY 12137.

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

A. I am the sole proprietor of Electric Power Resources, LLC. EPR is organized in the State of New York as an independent consulting firm providing engineering services to the electric power business.

Q. For what purposes have you been engaged by Florida Power & Light Company (“FPL”)?

A. I have been engaged to work for FPL on transmission impact issues, including the supervision and oversight of FPL’s analysis and development of: transmission integration and system reinforcement requirements; transmission losses; and Southeast Florida interface limits, as they relate to the resource needs identified in FPL’s 2005 Generation Capacity Request for Proposals for 2009 – 2011 (“RFP”).

1 **Q. Please state your educational background and professional association**
2 **experiences.**

3 A. I have Master of Science in Power System Engineering and Bachelor of
4 Science Honors degrees from Aston University in Birmingham, UK. I also
5 graduated from a student apprentice program with the Midlands Electricity
6 Board in the UK.

7
8 I am a Professional Engineer in the State of New York and a Senior Engineer
9 of the IEEE. I have published numerous technical articles and papers on the
10 subjects of transmission planning and transmission line design.

11
12 I presently Chair the New York State Reliability Council Reliability Rules
13 Subcommittee.

14
15 **Q. Please state your business experience.**

16 A. I have more than thirty five years of experience in the electric utility
17 consulting business in the Americas. I have worked for some of the leading
18 consultants in the United States as a technical specialist, as a developer of
19 software tools and methods, and as a manager of professional engineers
20 engaged in power system planning and economic analyses.

21
22 I founded Electric Power Resources, LLC in 2005 to provide engineering
23 support services to the electric power industry. I was Senior Vice President at

1 Conjunction LLC from 2003 through 2004 with responsibility for all electrical
2 engineering aspects of the 2,000 MW HVDC Empire Connection Project. I
3 worked for PG&E NEG from 1998 through 2003 where I was heavily
4 involved in project development of merchant generation and market
5 assessment activities such as fundamental forecasting, congestion analyses
6 and due diligence studies. I worked at GE from 1994 through 1998 and, as
7 Manager of GE's T&D Consulting Group, I led a twenty strong team that
8 provided consulting services internally to GE Power Systems and GE Capital,
9 and externally to the utility industry.

10
11 I co-founded Electric Power Consultants, Inc. in 1986 and led its consulting
12 services in IPP interconnection and wheeling analyses. I was also involved in
13 the development of its software products: Positive Sequence Load Flow
14 (PSLF); Symmetrical Components Short Circuit (SCSC); Positive Sequence
15 Dynamic Simulation (PSDS); Overhead Line Constants (OLC); and EMF
16 (EBFANRI) programs. I managed the company's operations and successfully
17 negotiated the company's sale to GE Power Systems in 1994.

18
19 I work for Power Technologies Incorporated from 1972 through 1986 where
20 my responsibilities included transmission line design studies involving
21 economic optimization, electrical performance and EMF analysis. I taught
22 PTI's courses on transmission line theory and insulation coordination to utility
23 engineers. I was Project Engineer for major transmission system planning

1 studies in Mexico, Venezuela, Argentina and Peru. These studies involved the
2 analysis of power flow, short circuit and stability performance for various
3 system expansion options. I also had a two-year assignment with EDELCA in
4 Venezuela leading their transmission planning studies for the GURI 11,000
5 MW generation project.

6
7 My initial work experience was at GE where I was engaged in studies of
8 power system transients and transmission line design. I taught GE's courses
9 on insulation coordination, transmission line design, and utility practice. I
10 was liaison engineer with GE's protective equipment department with special
11 interest in station arrester application.

12
13 **Q. What is the purpose of your testimony?**

14 **A.** The purpose of my testimony is to describe the overall evaluation process and
15 the results of transmission system related cost studies for various portfolios of
16 capacity options, as defined by the FPL Resource Assessment and Planning
17 department ("RAP"). The portfolios are comprised of various combinations
18 of the following resource proposals:

- 19 • FPL's proposed generation plan of two new combined cycle units at West
20 County Energy Center in Palm Beach County, one each in 2009 and 2010,
21 to satisfy the 2009-2011 need requirements. Each new West County
22 combined cycle unit would add approximately 1,219 MW (summer)
23 capacity.

- 1 • Proposal 1 (P1), a proposed generation plan for one new combined cycle
2 unit of 1050 MW (summer) in St. Lucie county. The PPA is proposed to
3 start in 2010 with a 25 year term.
- 4 • Proposal 4 (P4), a proposed PPA of 50 MW from existing generation for
5 5 years from 2009 through 2013.

6

7 **Q. Are you sponsoring an exhibit in this case?**

8 A. Yes. I am sponsoring an exhibit which consists of the following documents:

9 Document REC-1, Summary of the Performance of all Portfolios for:

- 10 • FPL System - Integration Impact, Interconnection Costs, Peak
11 and Average Losses and SE Florida import limits
- 12 • Non-FPL System - Integration Impact

13 Document REC-2, Transmission Loss Estimates

14

15 **Q. Are you sponsoring any sections in the Need Study document?**

16 A. Yes, I sponsor the portions of Section III addressing transmission integration
17 and co-sponsor portions of Section VI.B.5 addressing the economic evaluation
18 of the various portfolios. In addition, I sponsor Appendix L of the Need Study
19 document.

20

21

1 **Evaluation Process for Determining FPL Transmission System Related Costs**

2 **Q. Please describe FPL's process for determining the transmission system**
3 **related costs for the various portfolios.**

4 A. FPL, in its evaluation of resource proposals, considers five categories of cost
5 that arise from the proposed delivery of additional power over FPL's
6 transmission system. These categories are described in detail in FPL's RFP,
7 Appendix E-1 Evaluation Methodology and Appendix E-2, Transmission
8 Integration and Losses, under the headings of:

- 9 1) transmission interconnection costs;
10 2) third party transmission service costs (as applicable);
11 3) transmission integration costs;
12 4) costs of transmission system losses; and
13 5) impact on costs of operating existing FPL generation units in
14 Southeast Florida to maintain reliability.

15
16 Each of these categories of cost was evaluated for four portfolios of capacity
17 options as defined by RAP. I worked with and supervised FPL's transmission
18 engineers in the evaluation of the first three categories, while providing
19 transmission loss data and Southeast Florida import limits to RAP for
20 categories 4 and 5. These five categories of cost can be summarized as
21 follows:

22
23 *Transmission Interconnection Costs*

24 Transmission interconnection costs are those costs incurred by new generation
25 just to interconnect to the system. They typically include generator step-up
26 transformer and substation costs at the point of interconnection. FPL's

1 substation and transmission engineers prepared interconnection cost estimates
2 for the capacity additions proposed by FPL.

3
4 *Third Party Transmission Service Costs*

5 Proposers of new capacity that require third-party transmission service costs
6 include those costs in the Guaranteed Capacity Payment. It is noted that none
7 of the proposed Portfolios incurred Third Party Transmission Service Costs.

8
9 *Transmission Integration Costs*

10 Transmission integration costs include the cost of system upgrades of existing
11 transmission facilities and the cost of new facilities required for reliable
12 operation of the generation capacity additions included in each Portfolio as an
13 FPL Network Resource. It is noted that none of the proposed Portfolios
14 incurred transmission integration costs.

15
16 *Cost of Transmission Losses*

17 Each of the proposed Portfolios contains capacity additions at specific
18 locations in relation to the FPL transmission system and each will have a
19 unique impact on losses with respect to the FPL transmission system. The
20 cost of incremental losses for each Portfolio, as calculated by RAP, has two
21 components: the cost of generation capacity required to compensate for the
22 additional losses during peak load conditions; and the cost of energy losses
23 throughout the year.

1 *Impact on Costs of Operating Existing FPL Generation Units in Southeast*
2 *Florida to Maintain Reliability*

3 The Southeast Florida import limit is the amount of power that can be
4 imported into Southeast Florida in a reliable manner under high load
5 conditions or during planned or forced outages of generation. In this context,
6 Southeast Florida is generally defined as the portion of the eastern FPL system
7 located south and east of and including FPL's Corbett Substation. During
8 those periods where no additional power can be imported into Southeast
9 Florida, there is a need to operate more expensive generation in Southeast
10 Florida when less expensive generation is available outside of Southeast
11 Florida. Such occurrences result in increased operating cost. FPL's RAP
12 department utilized the Southeast Florida import limits calculated for each
13 proposed Portfolio in its P-MAREA production cost model to determine
14 incremental operating costs. Dr. Sim presents the results for each Portfolio,
15 including the production cost resulting from the P-MAREA analysis.

16
17 **Q. Please describe your participation in FPL's process for determining the**
18 **transmission system related costs for the various portfolios.**

19 A. I worked with FPL's transmission planning engineers prior to the issuance of
20 the RFP to define study criteria, methodologies and procedures to be used in
21 estimating transmission related costs. I had several meetings and conference
22 calls with FPL personnel to discuss and understand FPL's design practices,

1 planning and operating criteria, equipment cost basis, loss evaluation and
2 simulation procedures.

3
4 RAP defined the set of portfolios for which transmission related costs were to
5 be evaluated after the capacity proposals had been received by FPL. I
6 received the portfolio definitions from RAP, worked with FPL's transmission
7 planning engineers to evaluate the transmission related costs and transmitted
8 the results of the analysis to RAP. These results included transmission
9 integration costs, transmission loss components to be used by RAP to estimate
10 the cost of additional capacity required to compensate for losses as well as the
11 cost of energy losses, and estimates of the impact on the Southeast Florida
12 import limit for each portfolio.

13
14 **Q. What is your opinion of FPL's design practices, planning criteria and**
15 **procedures?**

16 A. FPL's design practices and FPL's planning criteria and procedures conform to
17 FRCC, NERC and industry practice. Utilities vary in their application of
18 NERC general criteria based on local conditions and experience. FPL's
19 particular design practices, planning criteria and procedures are reasonable
20 and have been applied in a consistent manner to the analysis of all portfolios.

21

22

23

1 **Q. Please describe the set of portfolios that FPL's Resource and Planning**
2 **department provided for your analysis**

3 **A. The set of portfolios is described in the table below:**
4

Portfolio	Addition in 2009	Addition in 2010	Addition in 2011
1	WCEC1 & P4	WCEC2	-
2	WCEC1	WCEC2	-
4	WCEC1 & P4	P1	-
5	WCEC1	P1	-

5

6 **KEY:**

7 WCEC1 = 1219 MW West County from 6/1/2009 through 2037

8 WCEC2 = 1219 MW West County from 6/1/2010 through 2037

9 P1 =1050 MW CC Unit, 25 year PPA from 6/1/2010 through 5/31/2035

10 P4 = 50 MW 5 year PE PPA from 1/1/2009 through 12/31/2013

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1 **I. Transmission Interconnection Costs**

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3 **Q. Please describe your work and the conclusions you reached based upon**
4 **your review of the transmission interconnection costs incurred by the**
5 **proposed portfolios**

6 A. The transmission interconnection costs for all portfolios are summarized in
7 Document REC-1, Summary of Performance of all Portfolios. Those costs
8 included all material and installation costs for interconnection of portfolios 1,
9 2, 4 and 5.

10

11 The cost estimates for FPL's West County portfolios 1 and 2 were prepared
12 by FPL's Transmission Engineering Department. They are budget grade
13 estimates (+/-10%) based upon on unit costs and current experience. They
14 include:

- 15 • Collector yard costs (WCEC1 @ 230 kV, WCEC2 @ 500kV)
- 16 • Substation and feeder costs (WCEC1 @ 230 kV, WCEC2 @ 500kV)
- 17 • Circuit breaker and overhead ground wire upgrades required for short
18 circuit duty

19

20 Cost estimates for P1 based portfolios 4 and 5 include:

- 21 • Collector yard costs (P1 @ 500kV)
- 22 • Substation and feeder costs (P1 @ 500kV)

- 1 • Circuit breaker and overhead ground wire upgrades required for short
2 circuit duty

3
4 Note that the costs of the generator step-up transformers for all portfolios were
5 assumed to be included in the generator capacity costs provided in the
6 proposals, in accordance with the RFP instructions.

7
8 I reviewed the engineering design and equipment specifications of the
9 proposed interconnections for compliance with FPL's standards and practice
10 as well as industry standards and practice. I met with and had conference
11 calls with FPL's Engineering Department where we discussed design,
12 equipment specifications and cost factors for the various portfolios.

13
14 The results of my review are summarized in Document REC-1, Summary of
15 Performance of all Portfolios. These cost estimates are based upon prudent
16 engineering design, current and local experience in performing similar work,
17 and were developed in a consistent manner for all portfolios.

18
19 **II. Third Party Transmission Service Costs**

20 **Q. Please describe the third party transmission service costs incurred by any**
21 **portfolio.**

22 **A.** Portfolios 1 and 2 involve new generation at the West County site at Corbett.
23 Portfolios 4 and 5 involve new generation at the proposed P1 site on the 500

1 kV transmission line between Midway and Martin. All of the proposed
2 portfolios are located within or directly connected to the FPL service territory
3 and, therefore, none of the proposed Portfolios incurred Third Party
4 Transmission Service Costs.

5
6 **III. Transmission Integration Costs**

7
8 **Q. Please describe FPL's transmission integration evaluation process.**

9 **A.** The integration evaluation process can be summarized as:

- 10 1. Power flow studies.
- 11 2. Cost estimates for new and/or upgraded system facilities.
- 12 3. Developing cash flow estimates for new and/or upgraded system
13 facilities.

14
15 The first step was to perform power flow studies to identify any new system
16 facilities and upgrades that may be needed to integrate the capacity resources
17 in each portfolio into the transmission system as a network resource for FPL
18 while meeting reliability criteria. I worked with FPL transmission planning
19 engineers to develop the methodology that was used to perform these power
20 flow studies and I was in constant communication with them as they
21 performed the studies. In parallel with the system studies performed by FPL
22 personnel, I personally performed power flow studies to better understand
23 system requirements and review the need for transmission upgrades and new

1 facility additions. Finally, I reviewed and approved the results of the FPL
2 power flow studies and reviewed the need for new facilities and facility
3 upgrades required to integrate the capacity resources in each portfolio into the
4 transmission system as a network resource for FPL.

5
6 My review determined that no new system facilities or facility upgrades were
7 required to integrate any of the portfolios. Therefore, it was not necessary to
8 either develop cost estimates for new and upgraded transmission facilities or
9 develop summary sheets of transmission integration costs and cash flow
10 projections for any of the portfolios. Document REC-1 summarizes the
11 performance of all of the portfolios and indicates that none of them required
12 any transmission system integration costs.

13
14 **Q. Please describe the power flow analyses performed.**

15 **A.** It is noted that the power flow simulation programs used by FPL and myself
16 perform the same function but were developed by different suppliers. FPL
17 used Siemens' PSS/E power flow program while I used GE's PSLF power
18 flow program. Thus, not only were the results confirmed independently by
19 FPL and myself but also through the use of independent analytical techniques.

20
21 Four portfolios were analyzed; Portfolios 1, 2, 4, and 5 for the years 2009,
22 2010 and 2011. First contingency, Alternating Current ("AC") power flow
23 studies were performed for each portfolio for each year to assess the need for

1 transmission system upgrades. All studies were performed using the 2005
2 Florida Reliability Coordinating Council's 2009, 2010 and 2011 power flow
3 cases representing summer peak load conditions. The cases were updated to
4 include the most up-to-date information on the FPL system. These studies
5 performed simulations to identify the facilities that may become overloaded
6 because of the integration of the capacity options in each portfolio, as well as
7 the incremental transmission facilities required to mitigate such overload(s).
8 An AC solution technique was used to also check the voltage performance of
9 the system against reliability criteria.

10
11 All portfolios and all years of analysis were subjected to a first contingency
12 screening for loss of transmission elements or generators out of service, one at
13 a time, in accordance with reliability criteria. This resulted in approximately
14 1,600 power flow calculations being performed for each portfolio and each
15 year of service. All of the Peninsular Florida interconnected system was
16 monitored in this process for thermal or voltage violations for system
17 elements at voltages of 69 kV and above. Violation of reliability criteria on
18 any FPL or other Peninsular Florida system element indicated the potential
19 need for transmission reinforcements.

20
21 A few apparent criteria violations were identified by the analysis but it was
22 determined that all could be resolved with an existing operating action

1 involving a switching action immediately after the contingency has occurred
2 or with a planned system upgrade.

3
4 My analysis confirmed that of the FPL planning personnel in determining that
5 no transmission reinforcements were needed for any portfolio, for any year of
6 analysis.

7
8 **Q. Do you have a general observation regarding the results of the analysis?**

9 A. Yes. The ability of the system to accommodate the various portfolios without
10 transmission reinforcements is not surprising given that a majority of the
11 proposed resources are within or close to the Southeast Florida load centers of
12 FPL.

13
14 It is understood, and later analysis confirmed, that there is a limited amount of
15 transmission capability for the transfer of power from the west coast of
16 Florida and from the north into Southeast Florida. Therefore, transmission
17 reinforcements are likely to be required if the majority of a new resource
18 capacity is located to the west or north of Southeast Florida.

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1 **IV. Costs Associated with Transmission Losses**

2

3 **Q. Please describe how transmission loss effects were included in the**
4 **economic comparison of portfolios and how the loss calculations were**
5 **performed.**

6 A. The transmission loss impact of each of the portfolios is a function of its
7 resource location in the FPL system and system loading conditions. The
8 economic impact of transmission losses for each portfolio was determined as
9 the net present value (NPV) of the estimated cost of transmission loss impacts
10 for 2009 through 2037. Losses were calculated for each portfolio and for each
11 year to support the estimation of two cost components: a capacity component
12 reflecting the cost of new generation capacity required to compensate for the
13 additional losses during peak load conditions and the cost of energy losses
14 throughout the year. The necessary loss calculations for each portfolio were
15 performed by FPL transmission planning engineers under my direction. I
16 confirmed FPL's calculations through independent analysis. The loss results
17 were then used to calculate cost differentials between portfolios by applying
18 appropriate capacity and energy costs to the loss values provided.

19

20 **Q. Please describe the methodology applied in the evaluation of transmission**
21 **loss costs.**

22 A. Appendix E-2, Transmission Integration and Losses of FPL's 2005
23 Generation Capacity RFP describes the loss methodology in detail. It is the

1 same methodology that was applied in FPL's most recent RFP. I will
2 summarize that methodology.

3
4 Transmission losses are incurred by current (I) flowing through transmission
5 elements that have resistance (R). Losses are calculated as I^2R and occur in
6 each transmission element as the current flows from generator to load. The
7 further the generator is from the load, the larger the value of resistance and the
8 higher the losses. Obviously, there are multiple generators, transmission
9 elements and loads distributed in the system and losses, therefore, vary as a
10 function of generator dispatch and load level.

11
12 Power flows and the losses in the transmission system will be impacted
13 whenever a new generating resource is dispatched. Therefore, the impact on
14 losses of a capacity addition and, more generally, a portfolio of capacity
15 additions, will depend both on where the new capacity resources are located
16 and the characteristics of the resources. While low cost resources may operate
17 and impact transmission losses most of the time, more expensive resources
18 tend to operate and impact losses only at higher load levels.

19
20 The impact of losses can be evaluated by power flow calculations assuming
21 that generation resources will be dispatched economically. This evaluation
22 can be performed with reasonable precision for the years 2009, 2010 and
23 2011. However, for 2012 and beyond, increasing load will require additional

1 capacity resources, the location and composition of which are unknown at this
2 time. The expansion of the transmission system beyond 2011 is also
3 uncertain. Therefore, the impact of a particular portfolio on losses becomes
4 progressively more uncertain with time.

5
6 To deal with this uncertainty in a consistent fashion, it was assumed that the
7 loss impacts for the year 2012 and beyond would be identical to the loss
8 impacts calculated for the year 2011. For portfolios where a capacity option
9 terminated prior to the end of the study period in 2037, that capacity was
10 presumed replaced by a combined cycle plant located such that the
11 incremental loss impact of this plant would equal the average year-round
12 losses on the FPL transmission system. A combined cycle plant was used as a
13 replacement for a terminating capacity option whether the terminating option
14 was base load generation or peaking capacity so as not to bias the results
15 toward a particular type of capacity option.

16
17 While the accuracy of the losses applied in this analysis can only be
18 ascertained in retrospect after the actual resource and transmission system
19 expansions over the 29 year period is known, I believe that the methodology
20 developed is reasonable and that it produces a fair assessment of the
21 differences in the cost of transmission losses between portfolios. In this
22 context it is important to note that the contribution to the present value of the

1 cost of the loss impacts is greatest for the initial years when the uncertainties
2 in future capacity resource and transmission expansion are the lowest.

3
4 **Q. Please describe how the power flow analysis was applied to calculate**
5 **losses.**

6 A. Transmission losses were calculated for each portfolio for the years 2009,
7 2010 and 2011. Losses were recalculated for portfolios with one or more
8 capacity options terminating prior to 2037 assuming that the terminated
9 capacity options were replaced by a generic combined cycle plant of equal
10 capacity. Losses were calculated for summer peak load conditions and for
11 average system load conditions. Losses calculated for summer peak load
12 conditions were used to estimate the cost of additional capacity required each
13 year to compensate for transmission losses. Energy losses for each year were
14 calculated as 10% of the summer peak losses plus 90% of the losses at a load
15 level representing FPL's average load.

16
17 Peak load losses for the year 2009, 2010 and 2011 were determined using the
18 same power flow representation applied in the transmission integration
19 studies. Also, all FPL resources, other firm resources and the capacity options
20 in the portfolio were assumed to be dispatched economically. The losses
21 calculated under this methodology reflected the transmission losses only on
22 FPL transmission facilities.

23

1 Peak losses for a future year after a capacity option is terminated used the
2 same 2011 power flow model but with dispatches adjusted to reflect the
3 replacement of the terminated capacity option with a generic combined cycle
4 unit, as discussed earlier.

5
6 Losses for average load conditions used the same system model as for peak
7 load conditions but with resources dispatched economically to the lower load
8 level.

9
10 This procedure was consistently applied to all portfolios for all years and
11 allowed efficient calculation of key loss parameters. The results fairly capture
12 the basic differences in transmission loss impacts between portfolios. Also,
13 the level of precision is appropriate considering the uncertainties associated
14 with expansion of capacity resources and the transmission system over a 29-
15 year period.

16
17 **Q. Please indicate in general terms how the portfolios compare in terms of**
18 **transmission losses.**

19 **A.** Document REC-1 lists the peak load level losses and average load level losses
20 for all portfolios and all years of analysis. In general, the West County
21 Portfolios 1 and 2 have lower peak and average losses than the P1-based
22 Portfolios 4 and 5. For example, 2010 peak losses for Portfolio 2 were
23 estimated at 536 MW and 2010 peak losses for Portfolio 5 were estimated at

1 560 MW, an increase of 24 MW. This difference is explicable by virtue of the
2 location of P1 approximately 50 miles to the north of the West County site
3 and, therefore, 50 miles further away from the FPL load center in Southeast
4 Florida.

5
6 Document REC-2 utilizes the peak and average losses reported in Document
7 REC-1 for each Portfolio and extrapolates them over the 29 year study period,
8 as discussed above. Tables E-1 (2009), E-1 (2010) and E-1 (2011-2037) show
9 the peak losses for each year. Tables E-2 (2009), E-2 (2010) and E-2 (2011-
10 2037) show the average losses for each year. These tables were utilized by
11 RAP to calculate the incremental capacity and energy costs for each Portfolio
12 relative to a reference Portfolio.

13
14 **V. Costs Associated with Increased Operation of Generating Units in**
15 **Southeast Florida**

16
17 **Q. What was the rationale for including the operating costs arising from the**
18 **uneconomic dispatch of generating units in Southeast Florida as a**
19 **transmission related cost?**

20 **A.** The Southeast Florida import limit is the amount of power that can be
21 imported into Southeast Florida in a reliable manner under high load
22 conditions or during planned or forced outages of generation. In this context,
23 Southeast Florida is generally defined as the portion of the eastern FPL system

1 located south and east of and including FPL's Corbett Substation. During
2 those periods where no additional power can be imported into Southeast
3 Florida, there is a need to operate more expensive generation in Southeast
4 Florida at times when less expensive generation is available outside of this
5 area. Such occurrences result in increased operating cost. RAP utilized the
6 Southeast Florida import limits calculated for each proposed Portfolio in its P-
7 MAREA production cost model to determine incremental operating costs. Dr.
8 Sim presents the results for each Portfolio, including the production cost
9 resulting from the P-MAREA analysis.

10
11 **Q. Please describe the methodology and results obtained from the**
12 **calculation of the Southeast Florida import limits.**

13 A. Document REC-1 shows the Southeast Florida import limit for each portfolio
14 and for each year of analysis. The limit is measured as the sum of the flows
15 on the transmission lines connecting the Southeast Florida load center to the
16 rest of the Florida system to the west and north. A power flow analysis was
17 performed by gradually increasing the interface flows and applying a critical
18 contingency until a valid solution could not be obtained. In all cases, the
19 limiting condition was the requirement to avoid voltage collapse in Southeast
20 Florida for a sudden outage of one of the Turkey Point nuclear units. These
21 import limits may be reduced as a function of planned operational outages of
22 transmission facilities in Southeast Florida. Conforming to operating

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experience, this reduction in import limit may also vary with the amount of generation on planned outages and other generation maintenance outages.

The tables in Document REC-1 show little difference in the performance of the various portfolios with respect to the Southeast Florida import limit. The difference in import limit varies from zero to 3.5%, depending upon the year of analysis. For example, in 2009, the limit for both Portfolios 2 and 5 is 8204 MW. In 2010, the limit for Portfolio 2 is 9083 MW and is 9401 MW for Portfolio 5.

Q. Do you have an opinion as to whether each and every one of these analyses is necessary and appropriate in performing an economic evaluation of the transmission-related costs for competing resources?

A. Yes. It is my opinion that these analyses provide reasonable estimates of the real transmission-related costs arising from each portfolio and that all such costs should be captured in performing an economic evaluation of competing capacity options under the RFP. These analyses and costs should be relied upon by the Commission, as they were by FPL and the independent evaluator, Sedway Consulting, in the analysis and comparison of which portfolio provides the most cost-effective alternative to meet FPL's 2009, 2010 and 2011 generation need requirement.

1 **Q. Please summarize your testimony.**

2 A. My testimony provides a description of the evaluation of transmission related
3 costs associated with four portfolios of capacity options defined by RAP. The
4 following five aspects of transmission-related costs were evaluated:

- 5 • The transmission interconnection costs required to interconnect each
6 portfolio to the system
- 7 • Third party transmission service costs
- 8 • The cost of new transmission facilities and upgrades of existing
9 transmission facilities required to integrate the capacity options in each
10 portfolio into the FPL system
- 11 • Transmission losses during peak load and average load conditions
12 considering the transmission improvements required for each portfolio
13 and the operating characteristics of the capacity options within the
14 portfolio (cost impact calculated by FPL's RAP Department)
- 15 • Southeast Florida import limits (cost impact calculated by FPL's RAP
16 Department).

17 Each of these transmission related cost impacts were included in the economic
18 comparison of proposed capacity options. Inclusion of these costs is
19 necessary and appropriate to capture a reasonable estimate of the
20 transmission-related costs arising from the competing capacity options.

21

22 I compared the transmission related costs of Portfolios 1 and 2, which are
23 based on the West County units #1 and #2 1219 MW combined cycle plants

1 proposed by FPL, to Portfolios 4 and 5 which are based on the West County
2 unit #1 plus P1, a 1050 MW combined cycle plant. The distinguishing
3 performance characteristic of Portfolios 1 and 2 is that they have significantly
4 lower transmission losses than Portfolios 4 and 5. None of the portfolios
5 considered required system integration reinforcements in the FPL or non-FPL
6 transmission systems nor incurred third party transmission service costs. All
7 portfolios have similar Southeast Florida import limits.

8
9 Portfolios 1 and 2 have virtually identical performance with respect to
10 transmission losses and both have lower transmission losses than Portfolios 4
11 and 5. The increment in peak transmission losses in favor of Portfolios 1 and
12 2 is approximately 25 MW from 2010 onwards.

13
14 **Q. Does this conclude your testimony?**

15 **A. Yes.**

PORTFOLIO 1		2009					2010					2011				
Description		West County Unit #1 Comb Cyc (1219MW) @ 230kV & a 50MW System Purchase (thru 12/31/2013) from Progress Energy					West County Unit #2 Comb Cyc (1219MW) @ 500kV									
FPL Transmission Facility	Voltage (kV)	Existing Rating		Required Rating		Cost Estimate	Existing Rating		Required Rating		Cost Estimate	Existing Rating		Required Rating		Cost Estimate
		mva	amps	mva	amps	\$,000	mva	amps	mva	amps	\$,000	mva	amps	mva	amps	\$,000
none																
FPL TOTAL \$,000																
INTERCONNECTION OF NEW GENERATION		West County #1 Comb Cyc			Cost Estimate		West County #2 Comb Cyc			Cost Estimate		None			Cost Estimate	
		Connected to FPL's Corbett 230kV Substation			\$11,240		Connected to FPL's Corbett 500kV Substation			\$19,510						
TOTAL \$,000		\$11,240					\$19,510									
LOSSES		MW					MW					MW				
FPL System Losses (MW) @ Peak		554					537					568				
FPL System Losses (MW) @ 60% Peak Load		254					245					248				
SE Fla Import																
SE Florida Import Limit (MW)		8183					9080					9015				
TOTAL COST (\$,000)																
NON-FPL TRANSMISSION FACILITIES (230kV and above) that ratings are exceeded and are materially impacted (i.e. > 3%)		Existing Rating		Overloaded by %			Existing Rating		Overloaded by %			Existing Rating		Overloaded by %		
		mva	amps				mva	amps				mva	amps			

Notes on West County Unit #1

- West County #1 Collector Yard estimate does not include three CT GSU plus one ST GSU transformers at an estimated cost of \$11.5 million: M\$11.50
- Estimates include escalation & stores charges.
- West County #1 Collector Yard site to be filled within six inches of final grade by generation EPC contractor and is NOT included in total project cost.
- Assumes that four 230 kV breakers will be replaced by another generator prior to West County Unit #1 being placed in service. If the other generator defers in service later than West County Unit #1 or drops out of the queue then the following costs will need to be added:
 Replace four 230 kV breakers K\$320.00
 Four 230 kV, 2 cycle, 3000 amp, 3-pole brkrs K\$520.00
 K\$840.00

Notes on West County Unit #2

- West County #2 Collector Yard estimate does not include three CT GSU plus one ST GSU transformers at an estimated cost of \$14.12 million: M\$14.12
- Estimates include escalation & stores charges.
- West County #2 Collector Yard site to be filled within six inches of final grade by generation EPC contractor and is NOT included in total project cost.

PORTFOLIO A	Description	Voltage (KV)			FPL Transmission Facility			FPL TOTAL \$,000			INTERCONNECTION OF NEW GENERATION			TOTAL \$,000			LOSSES			FPL System Losses (MW) @ Peak			FPL System Losses (MW) @ 60% Peak Load			SE Fla Import			SE Florida Import Limit (MW)			TOTAL COST (\$,000)			NON-FPL TRANSMISSION FACILITIES (230KV and above) that ratings are exceeded and are materially impacted (i.e., > 3%)					
		Existing Rating	Required Rating	Cost Estimate	Existing Rating	Required Rating	Cost Estimate	Existing Rating	Required Rating	Cost Estimate	Existing Rating	Required Rating	Cost Estimate	Existing Rating	Required Rating	Cost Estimate	Existing Rating	Required Rating	Cost Estimate	Existing Rating	Required Rating	Cost Estimate	Existing Rating	Required Rating	Cost Estimate	Existing Rating	Required Rating	Cost Estimate	Existing Rating	Required Rating	Cost Estimate	Existing Rating	Required Rating	Cost Estimate						
2009	West County Unit #1 Comb Cyc (1219MW) @ 230KV & a 50MW System Purchase (thru 12/31/2013) from Progress Energy																																							
2010	Purchase 1050MW from SPC Cana Unit #1																																							
2011																																								
		FPL TOTAL \$,000			None			None			None			None			None			None			None			None			None			None			None			None		
		TOTAL \$,000			\$11,240			\$27,910			\$11,240			\$27,910			\$11,240			\$27,910			\$11,240			\$27,910			\$11,240			\$27,910			\$11,240			\$27,910		
		FPL System Losses (MW) @ Peak			554			561			554			561			554			561			554			561			554			561			554			561		
		FPL System Losses (MW) @ 60% Peak Load			254			247			254			247			254			247			254			247			254			247			254			247		
		SE Fla Import																																						
		SE Florida Import Limit (MW)			8183			9401			8183			9401			8183			9401			8183			9401			8183			9401			8183			9401		
		TOTAL COST (\$,000)			9232			9232			9232			9232			9232			9232			9232			9232			9232			9232			9232			9232		
		NON-FPL TRANSMISSION FACILITIES (230KV and above) that ratings are exceeded and are materially impacted (i.e., > 3%)			Existing Rating			Existing Rating			Existing Rating			Existing Rating			Existing Rating			Existing Rating			Existing Rating			Existing Rating			Existing Rating			Existing Rating			Existing Rating			Existing Rating		
		Overloaded by %			mva			mva			mva			mva			mva			mva			mva			mva			mva			mva			mva			mva		
		Overloaded by %			Rating			Rating			Rating			Rating			Rating			Rating			Rating			Rating			Rating			Rating			Rating			Rating		
		Overloaded by %			amps			amps			amps			amps			amps			amps			amps			amps			amps			amps			amps			amps		

Notes on West County Unit #1
 1. West County #1 Collector Yard estimate does not include three CT GSU plus one ST GSU transformers
 2. SPC's CANA Collector Yard estimate does not include three CT GSU plus one ST GSU transformers

Notes on SPC CANA Unit #1
 1. Estimates include escalation & stores charges.
 2. West County #1 Collector Yard site to be filled within six inches of final grade by generation EPC contractor and is NOT included in total project cost.
 3. Assumes that four 230 KV breakers will be replaced by another generator prior to West County Unit #1 being placed in service. If the other generator defers in service later than West County Unit #1 or drops out of the queue then the following costs will need to be added:
 Replace four 230 KV breakers K\$320.00
 Four 230 KV, 2 cycle, 3000 amp, 3-pole brkrs K\$520.00
 K\$840.00

Table E - 1 (2009)

Peak Load Losses Calculation for:

Portfolio #1: For 2009 a 1219 MW West County #1 option and Bid P4, a 50 MW system purchase from Progress Energy (term - 5 yrs); For 2010 a 1219 MW West County #2 option; and For 2011 no option

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					=(3)*(4)		=(5)+(6)		= (7) - (8)
			Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
Year	West County Generation #1 230kV (1219 MW)	Progress Energy System Purchase (50 MW thru 12/31/2013)							
2009	1219	50	0	2.19%	0	554	554.00	554	0.00

Table E - 1 (2010)

Peak Load Losses Calculation for:

Portfolio #1: For 2009 a 1219 MW West County #1 option and Bid P4, a 50 MW system purchase from Progress Energy (term - 5 yrs); For 2010 a 1219 MW West County #2 option; and For 2011 no option

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
						=(4)*(5)		=(6)+(7)		= (8) - (9)
				Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
Year	West County Generation #1 230kV (1219 MW)	Progress Energy System Purchase (50 MW thru 12/31/2013)	West County Generation #2 500kV (1219 MW)							
2010	1219	50	1219	0	2.19%	0	537	537.00	536	1.00

Table E - 1 (2011)

Peak Load Losses Calculation for:

Portfolio #1: For 2009 a 1219 MW West County #1 option and Bid P4, a 50 MW system purchase from Progress Energy (term - 5 yrs); For 2010 a 1219 MW West County #2 option; and For 2011 no option

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
					= (4)*(5)		= (6)+(7)		= (8)-(9)	
			Filler Capacity Needed to Replace	Filler Capacity	Filler Capacity	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity	FPL Transmission System Losses with the Reference Portfolio	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio	
Year	West County Generation #1 230kV (1219 MW)	Progress Energy System Purchase (50 MW thru 12/31/2013)	West County Generation #2 230kV (1219 MW)	Portfolio's Expired Components (MW)	Losses (%)	Losses (MW)	Components (MW)	Losses (MW)	Losses (MW)	
2011	1219	50	1219	0	2.19%	0.00	568	568.00	567	1.00
2012	1219	50	1219	0	2.19%	0.00	568	568.00	567	1.00
2013	1219	50	1219	0	2.19%	0.00	568	568.00	567	1.00
2014	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2015	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2016	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2017	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2018	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2019	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2020	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2021	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2022	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2023	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2024	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2025	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2026	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2027	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2028	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2029	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2030	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2031	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2032	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2033	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2034	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2035	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2036	1219		1219	50	2.19%	1.10	567	568.10	567	1.10
2037	1219		1219	50	2.19%	1.10	567	568.10	567	1.10

Table E - 2 (2009)

Average Load Losses Calculation for:

Portfolio #1: For 2009 a 1219 MW West County #1 option and Bid P4, a 50 MW system purchase from Progress Energy (term - 5 yrs); For 2010 a 1219 MW West County #2 option; and For 2011 no option

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
				= (3)*(4)		= (5)+(6) FPL		= (7) - (8)	
					FPL Transmission System Losses with Portfolio's Remaining Components	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)	
Year	West County Generation #1 230kV (1219 MW)	Progress Energy System Purchase (50 MW thru 12/31/2013)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	Remaining Components (MW)	Losses (MW)	Reference Portfolio (MW)	Portfolio (MW)
2009	1219	50	0	2.19%	0	254	254.00	253	1.00

Table E - 2 (2010)

Average Load Losses Calculation for:

Portfolio #1: For 2009 a 1219 MW West County #1 option and Bid P4, a 50 MW system purchase from Progress Energy (term - 5 yrs); For 2010 a 1219 MW West County #2 option; and For 2011 no option

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
						=(4)*(5)		=(6)+(7)		=(8)-(9)
							FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
Year	West County Generation #1 230kV (1219 MW)	Progress Energy System Purchase (50 MW thru 12/31/2013)	West County Generation #2 500kV (1219 MW)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)				
2010	1219	50	1219	0	2.19%	0	245	245.00	243	2.00

Table E - 2 (2011)

Average Load Losses Calculation for:

Portfolio #1: For 2009 a 1219 MW West County #1 option and Bid P4, a 50 MW system purchase from Progress Energy (term - 5 yrs); For 2010 a 1219 MW West County #2 option; and For 2011 no option

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
					=(4)*(5)		=(6)+(7) FPL		=(8)-(9)	
						FPL Transmission System Losses with Portfolio's Remaining Components (MW)	Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)	
Year	West County Generation #1 230kV (1219 MW)	Progress Energy System Purchase (50 MW thru 12/31/2013)	West County Generation #2 230kV (1219 MW)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)				
2011	1219	50	1219	0	2.19%	0.00	248	248.00	246	2.00
2012	1219	50	1219	0	2.19%	0.00	248	248.00	246	2.00
2013	1219	50	1219	0	2.19%	0.00	248	248.00	246	2.00
2014	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2015	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2016	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2017	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2018	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2019	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2020	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2021	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2022	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2023	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2024	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2025	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2026	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2027	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2028	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2029	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2030	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2031	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2032	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2033	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2034	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2035	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2036	1219		1219	50	2.19%	1.10	246	247.10	246	1.10
2037	1219		1219	50	2.19%	1.10	246	247.10	246	1.10

Table E - 1 (2009)

Peak Load Losses Calculation for:

Portfolio #2: For 2009 a 1219 MW West County #1 option; For 2010 a 1219 MW West County #2 option; and For 2011 no option

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
West County Generation #1 230kV (1219 MW)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	$-(6) - (7)$ Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
2009	0	2.19%	0	554	554.00	554	0.00

Table E - 1 (2010)

Peak Load Losses Calculation for:

Portfolio #2: For 2009 a 1219 MW West County #1 option; For 2010 a 1219 MW West County #2 option; and For 2011 no option

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					=(3)*(4)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	=(5)+(6)	FPL Transmission System Losses with the Reference Portfolio (MW)	= (7) - (8) Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
Year	West County Generation #1 230kV (1219 MW)	West County Generation #2 500kV (1219 MW)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)				
2010	1219	1219	0	2.19%	0	536	536.00	536	0.00

Table E - 1 (2011)

Peak Load Losses Calculation for:

Portfolio #2: For 2009 a 1219 MW West County #1 option; For 2010 a 1219 MW West County #2 option; and For 2011 no option

Year	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	West County Generation #1 230kV (1219 MW)	West County Generation #2 230kV (1219 MW)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	$=(3)*(4)$ FPL Transmission System Losses with Portfolio's Remaining Components (MW)	$=(5)+(6)$ FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	$=(7)-(8)$ Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
2011	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2012	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2013	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2014	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2015	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2016	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2017	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2018	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2019	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2020	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2021	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2022	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2023	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2024	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2025	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2026	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2027	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2028	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2029	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2030	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2031	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2032	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2033	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2034	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2035	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2036	1219	1219	0	2.19%	0.00	567	567.00	567	0.00
2037	1219	1219	0	2.19%	0.00	567	567.00	567	0.00

Table E - 2 (2009)

Average Load Losses Calculation for:

Portfolio #2: For 2009 a 1219 MW West County #1 option; For 2010 a 1219 MW West County #2 option; and For 2011 no option

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				-(2)*(3)		-(4)+(5)		-(6)-(7)
		Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio and Reference Portfolio (MW)
Year	West County Generation #1 230kV (1219 MW)							
2009	1219	0	2.19%	0	253	253.00	253	0.00

Table E - 2 (2010)

Average Load Losses Calculation for:

Portfolio #2: For 2009 a 1219 MW West County #1 option; For 2010 a 1219 MW West County #2 option; and For 2011 no option

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					= (3)*(4)		= (5)+(6)		= (7) - (8)
			Filler Capacity Needed to Replace Portfolio's Expired Components	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
Year	West County Generation #1 230kV (1219 MW)	West County Generation #2 500kV (1219 MW)	(MW)						
2010	1219	1219	0	2.19%	0	243	243.00	243	0.00

Table E - 2 (2011)

Average Load Losses Calculation for:

Portfolio #2: For 2009 a 1219 MW West County #1 option; For 2010 a 1219 MW West County #2 option; and For 2011 no option

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
				= (3)*(4)		= (5)+(6)		= (7) - (8)	
		Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)	
Year	West County #1 230kV (1219 MW)	West County #2 500kV (1219 MW)							
2011	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2012	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2013	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2014	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2015	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2016	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2017	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2018	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2019	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2020	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2021	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2022	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2023	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2024	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2025	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2026	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2027	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2028	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2029	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2030	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2031	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2032	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2033	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2034	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2035	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2036	1219	1219	0	2.19%	0.00	246	246.00	246	0.00
2037	1219	1219	0	2.19%	0.00	246	246.00	246	0.00

Table E - 1 (2009)

Peak Load Losses Calculation for:

Portfolio #4: For 2009 a 1219 MW West County #1 option and Bid P4, a 50 MW system purchase from Progress Energy (term - 5 yrs); For 2010, Bid P1, a 1050 MW SPC Cana option (term - 25 yrs); and For 2011 no option

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					=(3)*(4)		=(5)+(6)		=(7)-(8)
			Filler Capacity Needed to Replace	Filler Capacity Losses	Filler Capacity Losses	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio In question and Reference Portfolio (MW)
Year	West County Generation #1 230kV (1219 MW)	Progress Energy System Purchase (50 MW thru 12/31/2013)	Portfolio's Expired Components (MW)	Losses (%)	(MW)				
2009	1219	50	0	2.19%	0	554	554.00	554	0.00

Table E - 1 (2010)

Peak Load Losses Calculation for:

Portfolio #4: For 2009 a 1219 MW West County #1 option and Bid P4, a 50 MW system purchase from Progress Energy (term - 5 yrs); For 2010, Bid P1, a 1050 MW SPC Cana option (term - 25 yrs); and For 2011 no option

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
						=(4)*(5)		=(6)+(7)		=(8) - (9)
				Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
Year	West County Generation #1 230kV (1219 MW)	Progress Energy System Purchase (50 MW thru 12/31/2013)	SPC Cana option (1050 MW)							
2010	1219	50	1050	0	2.19%	0	561	561.00	536	25.00

Table E - 1 (2011)

Peak Load Losses Calculation for:

Portfolio #4: For 2009 a 1219 MW West County #1 option and Bid P4, a 50 MW system purchase from Progress Energy (term - 5 yrs); For 2010, Bid P1, a 1050 MW SPC Cana option (term - 25 yrs); and For 2011 no option

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
					=(4)*(5)		=(6)+(7)		=(8)-(9)	
			Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)	
Year	West County Generation #1 230kV (1219 MW)	Progress Energy System Purchase (50 MW thru 12/31/2013)	SPC Cana option (1050 MW)							
2011	1219	50	1050	0	2.19%	0.00	593	593.00	567	26.00
2012	1219	50	1050	0	2.19%	0.00	593	593.00	567	26.00
2013	1219	50	1050	0	2.19%	0.00	593	593.00	567	26.00
2014	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2015	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2016	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2017	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2018	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2019	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2020	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2021	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2022	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2023	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2024	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2025	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2026	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2027	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2028	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2029	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2030	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2031	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2032	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2033	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2034	1219		1050	50	2.19%	1.10	593	594.10	567	27.10
2035	1219		437.5	662.5	2.19%	14.51	564	578.93	567	11.93
2036	1219			1100	2.19%	24.09	544	568.09	567	1.09
2037	1219			1100	2.19%	24.09	544	568.09	567	1.09

note (1): The losses for 2035 have been adjusted to account for the Portfolio Option ending on 5/31/2035.

Table E - 2 (2009)

Average Load Losses Calculation for:

Portfolio #4: For 2009 a 1219 MW West County #1 option and Bid P4, a 50 MW system purchase from Progress Energy (term - 5 yrs); For 2010, Bid P1, a 1050 MW SPC Cana option (term - 25 yrs); and For 2011 no option

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
				= (3)*(4)		= (5)+(6) FPL		= (7) + (8)	
					FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)	
Year	West County Generation #1 230kV (1219 MW)	Progress Energy System Purchase (50 MW thru 12/31/2013)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	Filler Capacity Losses (MW)	Filler Capacity Losses (MW)	Filler Capacity Losses (MW)	
2009	1219	50	0	2.19%	0	254	254.00	253	1.00

Table E - 2 (2010)

Average Load Losses Calculation for:

Portfolio #4: For 2009 a 1219 MW West County #1 option and Bid P4, a 50 MW system purchase from Progress Energy (term - 5 yrs); For 2010, Bid P1, a 1050 MW SPC Cana option (term - 25 yrs); and For 2011 no option

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Year	West County Generation #1 230KV (1219 MW)	Progress Energy System Purchase (50 MW thru 12/31/2013)	SPC Cana option (1050 MW)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	= (8) - (9)
2010	1219	50	1050	0	2.19%	0	247	247.00	243
									4.00

= (4)*(5)

= (6)+(7)

Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)

Table E - 1 (2009)

Peak Load Losses Calculation for:

Portfolio #5: For 2009 a 1219 MW West County #1 option; For 2010, Bid P1, a 1050 MW SPC Cana option (term - 25 yrs); and For 2011, no option

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
West County Generation #1 230KV (1219 MW)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	$=(6)-(7)$ Difference in FPL System Losses between Portfolio in question and Reference Portfolio (MW)
2009	0	2.19%	0	554	554.00	554	0.00
$=(2)*(3)$ $=(4)+(5)$							

Table E - 1 (2010)

Peak Load Losses Calculation for:

Portfolio #5: For 2009 a 1219 MW West County #1 option; For 2010, Bid P1, a 1050 MW SPC Cana option (term - 25 yrs); and For 2011, no option

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
West County Generation #1 230kV (1219 MW)	SPC Cana option (1050 MW)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
				= (3)*(4)		= (5)+(6)		= (7)-(8)
2010	1219	1050	2.19%	0	560	560.00	536	24.00

Table E - 1 (2011)

Peak Load Losses Calculation for:

Portfolio #5: For 2009 a 1219 MW West County #1 option; For 2010, Bid P1, a 1050 MW SPC Cana option (term - 25 yrs); and For 2011, no option

Year	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	West County Generation #1 230kV (1219 MW)	SPC Cana option (1050 MW)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	-(7)-(8) Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
2011	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2012	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2013	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2014	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2015	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2016	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2017	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2018	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2019	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2020	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2021	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2022	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2023	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2024	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2025	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2026	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2027	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2028	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2029	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2030	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2031	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2032	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2033	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2034	1219	1050	0	2.19%	0.00	592	592.00	567	25.00
2035	1219	437.5	612.5	2.19%	13.41	566	579.75	567	12.75
2036	1219		1050	2.19%	23.00	548	571.00	567	4.00
2037	1219		1050	2.19%	23.00	548	571.00	567	4.00

note (1)

note (1): The losses for 2035 have been adjusted to account for the Portfolio Option ending on 5/31/2035.

Table E - 2 (2009)

Average Load Losses Calculation for:

Portfolio #5: For 2009 a 1219 MW West County #1 option; For 2010, Bid P1, a 1050 MW SPC Cana option (term - 25 yrs);
 and For 2011, no option

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				=(2)*(3)		=(4)+(5)		=(6)-(7)
		Filler Capacity Needed to Replace Portfolio's Expired Components	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
Year	West County Generation #1 230kV (1219 MW)	(MW)						
2009	1219	0	2.19%	0	253	253.00	253	0.00

Table E - 2 (2011)

Average Load Losses Calculation for:

Portfolio #5: For 2009 a 1219 MW West County #1 option; For 2010, Bid P1, a 1050 MW SPC Cana option (term - 25 yrs); and For 2011, no option

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
				= (3)*(4)		= (5)+(6)		= (7) - (8)	
Year	West County Generation #1 230kV (1219 MW)	SPC Cana option (1050 MW)	Filler Capacity Needed to Replace Portfolio's Expired Components (MW)	Filler Capacity Losses (%)	Filler Capacity Losses (MW)	FPL Transmission System Losses with Portfolio's Remaining Components (MW)	FPL Transmission System Losses with Portfolio's Remaining Components + Filler Capacity Losses (MW)	FPL Transmission System Losses with the Reference Portfolio (MW)	Difference in FPL Transmission System Losses between Portfolio in question and Reference Portfolio (MW)
2011	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2012	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2013	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2014	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2015	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2016	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2017	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2018	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2019	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2020	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2021	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2022	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2023	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2024	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2025	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2026	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2027	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2028	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2029	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2030	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2031	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2032	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2033	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2034	1219	1050	0	2.19%	0.00	257	257.00	246	11.00
2035	1219	437.5	612.5	2.19%	13.41	241	254.08	246	8.08 note (1)
2036	1219		1050	2.19%	23.00	229	252.00	246	6.00
2037	1219		1050	2.19%	23.00	229	252.00	246	6.00

note (1): The losses for 2035 have been adjusted to account for the Portfolio Option ending on 5/31/2035.