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January 28, 2002

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- VIA HAND DELIVERY -

Ms. Blanca S. Bayó
Director of the Commission Clerk and Administrative Services
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

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COMMISSION
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Re: Docket No. 001148-EI

Dear Mr. Bayó:

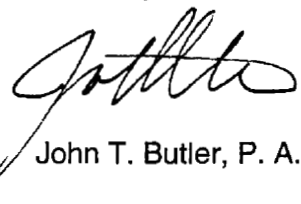
I am enclosing for filing in the above docket the original and fifteen (15) copies of the prefiled testimony and exhibits for the following Florida Power & Light Company ("FPL") witnesses:

- Mark R. Bell 01061-02
- M. Dewhurst 01062-02
- William W. Hamilton 01063
- 01064 Dr. J. Stuart McMenamin
- Armando J. Olivera 01065
- John M. Shearman 01066
- K. Michael Davis 01067-02
- Paul J. Evanson 01068-02
- Steven P. Harris 01069-02
- Rosemary Morley 01070-02
- James K. Peterson 01071-02
- Samuel S. Waters 01072-02

FPL is filing these witnesses' testimonies today in accordance with Order No. PSC-02-0089-PCO-EI, dated January 15, 2002. FPL's witnesses sponsor and explain the MFRs FPL has previously filed in this docket. Together with the MFRs, their testimonies demonstrate that FPL's 2002 test year results do not support any reduction in FPL's base rates.

- AUS _____
- CAF _____
- CMP _____
- COM Stay
- CTR _____
- ECR _____
- GCL _____
- OPC _____
- MMS _____
- SEC _____
- OTH _____

Sincerely,


John T. Butler, P. A.

Enclosures
cc: Counsel of record (w/copy of enclosures)

RECEIVED & FILED

FPSC BUREAU OF RECORDS
Miami West Palm Beach Tallahassee

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that true and correct copies of the prefiled testimony and exhibits of Mark R. Bell, K. Michael Davis, M. Dewhurst, Paul J. Evanson, William W. Hamilton, Steven P. Harris, Dr. J. Stuart McMenemy, Rosemary Morley, Armando J. Olivera, James K. Peterson, John M. Shearman and Samuel S. Waters were served by hand delivery (*) or overnight delivery this 28th day of January, 2002 to the following:

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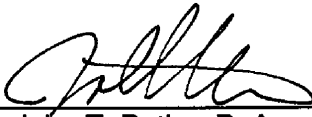
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By: 
John T. Butler, P. A.

**BEFORE THE FLORIDA
PUBLIC SERVICE COMMISSION**

**DOCKET NO. 001148-EI
FLORIDA POWER & LIGHT COMPANY**

JANUARY 28, 2002

**IN RE: REVIEW OF THE RETAIL RATES
OF FLORIDA POWER & LIGHT COMPANY**

TESTIMONY & EXHIBITS OF:

DR. J. STUART MCMENAMIN

DOCUMENT NUMBER DATE

01064 JAN 28 02

FPSC-COMMISSION CLERK

1 **BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION**

2 **FLORIDA POWER & LIGHT COMPANY**

3 **TESTIMONY OF DR. J. STUART MCMENAMIN**

4 **DOCKET NO. 001148-EI**

5 **JANUARY 28, 2002**

6

7 **Q. Please state your name and address.**

8 A. My name is Stuart McMenamin. My business address is 11236 El Camino
9 Real, San Diego, CA 92130.

10 **Q. By whom are you employed and in what capacity?**

11 A. I am the Executive Vice President of Regional Economic Research, Inc.
12 ("RER"), a consulting firm that specializes in the energy industry. I am in
13 charge of the Forecasting and Software Development divisions at RER.

14 **Q. Please state your academic background.**

15 A. My training is in the fields of mathematics, statistics, and economics. I have a
16 B.S. in mathematics and economics from Occidental College and a Ph.D. in
17 economics from the University of California, San Diego.

18 **Q. Please explain your work experience regarding energy forecasting.**

19 A. I have specialized in the area of energy forecasting for the last 25 years,
20 including the most recent 15 years with RER. Over this period, I have worked
21 for most of the major utilities in North America on topics related to regional
22 forecasting, long-term end-use forecasting, monthly sales forecasting, and
23 short-term operational forecasting. In the end-use modeling area, I directed

1 the development of the Electric Power Research Institute (“EPRI”) end-use
2 models (REEPS, COMMEND, and INFORM), that are widely used for long-run
3 forecasting. This work, which was funded by EPRI, included the
4 development of the modeling framework, implementation of software
5 systems, and development of national and regional databases to support the
6 models. Related to these efforts, I was the director of the EPRI Forecast
7 Support Office, which provided support for these models throughout the
8 1990s.

9
10 More recently, my efforts have been focused on short-run forecasting using
11 statistical models based on the MetriXND forecasting package. I directed the
12 development of this package including the development of the specific
13 estimation algorithms for ARIMA modeling, exponential smoothing,
14 multivariate regression, and artificial neural networks. This package is used
15 to develop statistical forecasts of annual, monthly, weekly, daily, and hourly
16 loads. This package is used by many of the major utilities in the U.S. and
17 Canada, and it was used by Florida Power & Light Company (“FPL” or the
18 “Company”) to develop the statistical models used to develop the sales and
19 peak load forecasts.

20
21 Over the last few years, I have developed statistical forecasting models for
22 numerous entities, including Southern Company Services, Portland General
23 Electric, Bonneyville Power Administration, Florida Power Corporation, the

1 California ISO, the New York ISO, the Electric Reliability Council of Texas,
2 Pennsylvania Power and Light, Southern California Edison, Texas Utilities,
3 Tennessee Valley Authority, San Diego Gas & Electric, Ontario Hydro, and
4 Entergy, among others.

5 **Q. What is the purpose of your testimony?**

6 A. My testimony sets forth conclusions from a review of the forecasting models
7 and economic assumptions used by FPL in this proceeding to forecast
8 customers, net energy for load, and sales by revenue class. I have been asked
9 to review the models, inputs and forecasts developed by FPL and to provide
10 my opinion about the validity of the forecasting methods and results as well as
11 the changes that have been implemented between the initial forecast and the
12 updated forecast.

13 **Q. Please provide an overview of the system FPL used to forecast customers,
14 energy sales, and net energy for load for this proceeding.**

15 A. The FPL forecasting system uses statistical models to forecast customers, total
16 monthly energy requirements, revenue class monthly sales, and system peak
17 loads. The models are straightforward and are described in detail in MFR F-9.
18 The models relate the forecast elements to key driving factors. The main
19 factors are:

20 Customer levels depend on

21 -- Florida population

22 -- Florida commercial sector employment

- 1 Net Energy per Customer in each month depends on
- 2 -- Weather (heating degree days and cooling degree days)
 - 3 -- Heating and cooling equipment saturation levels
 - 4 -- Real price of electricity
 - 5 -- Real per capita income
- 6 Sector level monthly sales (Residential, Commercial, Industrial, and other)
- 7 depend on
- 8 -- Weather (heating degree days and cooling degree days)
 - 9 -- Heating and cooling equipment saturation levels
 - 10 -- Real price of electricity
 - 11 -- Real personal income
 - 12 -- Commercial employment, and
 - 13 -- Manufacturing employment

14

15 In the monthly energy forecasting system, the Net Energy equation is used to

16 forecast total volume at the system level. This volume is allocated to the

17 revenue class level in a way that maintains the net energy value. This is often

18 called “top-down” forecasting. Forecasts from the monthly sales models for

19 each revenue class are used to allocate the Net Energy total into revenue class

20 components that are consistent with that total. These forecasts of sales by

21 revenue class are then used to develop forecasts of revenues, as addressed in

22 witness Morley’s testimony.

1 **Q. Please provide your assessment of the FPL statistical models used in this**
2 **case for customers, energy sales, and net energy for load for this**
3 **proceeding.**

4 A. The model configuration used by FPL is broadly used in the industry for
5 medium-term monthly forecasting systems. The approach is sound and has a
6 long history of producing accurate and sensible forecasts. I have examined
7 the FPL data, model statistics, and model sensitivities and find them to be in
8 line with expectations for this type of model. Specifically,

9 -- In the Residential Customer model, the Florida population variable has
10 a long-run elasticity close to 1. That is, a 10% increase in population
11 will eventually produce about a 10% increase in FPL residential
12 customers. An elasticity value close to 1 is expected in situations
13 where customer growth is roughly proportional to population growth.

14 -- In the Commercial Customer model, the commercial employment
15 variable has a long-run elasticity slightly below 1. In this model, a
16 10% increase in employment will eventually produce about a 9.5%
17 increase in FPL commercial customers. An elasticity value close to 1
18 is expected in situations where customer growth is roughly
19 proportional to employment growth.

20 -- In the Net Energy model, the real price elasticity is about -.13. In this
21 model, a 10% increase in electricity prices will cause a reduction in
22 electricity use of about 1.3%. This is consistent with the majority of

1 utility results, which typically produce price elasticities between -.10
2 and -.25.

3 -- In the Net Energy Model, the elasticity on real per capita income is
4 about .45. This implies that a 10% increase in real per capita income
5 will cause a 4.5% increase in electricity use. This is consistent with
6 results for stable long-run models that do not control explicitly for
7 appliance and equipment stocks.

8
9 In addition to looking at the model sensitivities, I looked at the fit of the
10 model to the data and conducted some tests of the stability of the model. The
11 fit for the Net Energy model is extremely strong (R square = .98, Mean
12 Absolute Percentage Error = 1.7%). To test model stability, I estimated the
13 model withholding a randomly selected subset of ¼ of the data from
14 estimation. The out-of-sample fit was very strong (Mean Absolute Percentage
15 Error = 1.3%), and the elasticities were not impacted significantly, indicating
16 that the model is stable.

17 **Q. After filing its initial forecast using these models, FPL updated the**
18 **forecast to reflect the consequences of the tragedies of September 11. Did**
19 **FPL use these same models to develop its updated forecast?**

20 A. The same models were used, although some of the input assumptions were
21 changed.

22 **Q. Have you reviewed FPL's initial and updated sales forecast?**

23 A. Yes.

1 **Q. Please explain the changes that were made in the updated forecast.**

2 A. Four changes were made that account for the differences in the FPL forecast.

3 These are:

4 -- Lower Customer Growth

5 -- Lower Real Per Capita Income

6 -- Removal of an Added Telecom Load

7 -- Removal of an error adjustment term.

8 **Q. In your opinion, should FPL have adjusted its sales forecast downward?**

9 A. Yes. The economic forecast underlying the initial forecast was based on an
10 economic slowdown rather than the recession we are now experiencing.
11 FPL's decision to reassess the forecast after the events of September 11 and
12 the economic responses to those events was appropriate.

13 **Q. In your opinion, was FPL's downward adjustment in customer growth**
14 **from 85,643 to 65,001 in 2002 and from 79,314 to 74,000 in 2003**
15 **reasonable?**

16 A. It is my opinion that a downward adjustment was appropriate. However, in
17 light of events since the update, it appears that the revised forecast of
18 customer growth may still be overstated. When the forecast update was made
19 in late September, there were no official data indicating a recession. Further,
20 the updated economic forecast that was available at that time still showed real
21 per capita income growth. It appears that this economic forecast may have
22 been optimistic as well. Since late September, government data have become
23 available (on November 26) indicating that we are officially in a recession that

1 began in March. Also, the economic impacts in Florida appear to be more
2 severe, and this has been evidenced by significantly decreased customer gains
3 in October and November.

4
5 To get some perspective on the issue of customer gains, I looked at the pattern
6 that has occurred with past recessions. I concluded that there is a clearly
7 established pattern of slower customer growth in years following recessions
8 relative to years preceding recessions.

9
10 In reaching this conclusion, I examined FPL data related to the four past
11 recessions. These recessions began in November of 1973, January of 1980,
12 July of 1981, and July of 1990. For these recessions, I looked at the annual
13 customer gains in the 12-month period beginning 9 months after the start of
14 the recession (comparable to 2002) and the customer gains in the 12-month
15 period beginning 21 months after the start of the recession (comparable to
16 2003). These gains were compared to the gains in the two-year period 15
17 months before the start of the recession and extending until nine months after
18 the start of the recession (comparable to 2000 and 2001).

19
20 In all cases, gains in the first year following the recession were significantly
21 below the annual customer gains of the preceding two years. In three of the
22 four cases, gains in the second year following the recession were significantly

1 below the annual customer gains of the preceding two years. Specific
2 conclusions are as follows:

3 -- Customer gains for the two years before recessions averaged about
4 99,000

5 -- Customer gains for the 1st year after recessions averaged about 66,000,
6 which is 33,000 customers per year below the previous two-year
7 average

8 -- Customer gains for the 2nd year after recessions averaged about
9 68,000, which is 31,000 customers per year below the previous two-
10 year average.

11

12 As these results indicate, there is a clearly established pattern of slower
13 customer growth in years following recessions relative to years preceding
14 recessions. These changes reflect a variety of factors that accompany
15 recession periods and the impacts that economic factors have on migration
16 rates (movement into and out of the territory), household formation rates (the
17 age at which people form households as well as the number of people per
18 household), and business formation cycles (the continuation of existing
19 businesses and the formation of new businesses). As seen above for past
20 recessions, the average reduction in the annual customer gain is a little over
21 30,000 for both the first and second year following a recession.

1 These results can be applied to the March 2001 recession, which began 9
2 months before the start of 2002. If a comparable slowdown occurs in 2002
3 and 2003 with the same timing as the numbers computed above, the results
4 will be as follows:

- 5 -- Customer growth for the two preceding years averaged about 87,000
- 6 -- Applying the factor for one year after, growth for 2002 would be
7 54,000
- 8 -- Applying the factor for 2nd year growth, the gain for 2003 would be
9 56,000.

10

11 Based on the impact of past recessions on customer growth, it appears that
12 FPL's updated customer growth forecast of 65,000 for 2002 and 74,000 in
13 2003 may be somewhat on the high side.

14 **Q. FPL also adjusted its forecast downward because of a reduction in the**
15 **forecast of real per capita income. What is your assessment of this**
16 **adjustment?**

17 A. Again it is my opinion that this downward adjustment was warranted.
18 However, based on information now available, it seems likely that a stronger
19 adjustment is appropriate. The change between the adjusted forecast
20 submitted by FPL and the original forecast is modest.

- 21 -- Over the five-year forecast horizon to 2006, the compound growth rate
22 was reduced from 2.9% in the original forecast to 2.2% in the revised
23 forecast. Most of this change comes from the first two years.

1 -- For 2002, the growth rate was cut in half (from 2.6% to 1.3%). Real
2 per capita income growth in comparable periods following past
3 recessions has averaged .2%.

4 -- For 2003, the growth rate was reduced by one third (from 3.3% to
5 2.2%). Real per capita income growth in comparable periods
6 following past recessions has averaged 1.7%.

7

8 Of course, no one can say for sure how long the current economic downturn
9 will last. It is also difficult to foretell whether the impact on domestic travel
10 and tourism and the disproportionate impact on international travel will be
11 short-lived or not. However, it is my feeling that the assumptions used in the
12 updated FPL forecast are relatively optimistic. They are in line with a
13 scenario in which the current recession is short lived and the dislocational
14 impacts of September 11 are minor.

15 **Q. Another factor FPL used to update its sales forecast was removal of an**
16 **adjustment for telecom load growth. What is your opinion of this**
17 **adjustment?**

18 A. In the initial filing, the forecast for Net Energy included an external
19 adjustment for Telecom load growth. This adjustment added .47% to the Net
20 Energy forecast in 2002. Issues related to telecom and computer loads have
21 been a hot issue in the electricity industry for the last several years, fueled by
22 the internet boom. This boom included aggressive expansion plans of
23 dot.com companies and internet server facilities and was fueled by significant

1 quantities of speculative investment money. Many utilities were concerned
2 about the load growth that would accompany this unprecedented expansion,
3 leading to inclusion of upward forecast adjustments. The practice of including
4 forecast adjustments was supported by some confusion about the current and
5 potential significance of computer loads in the U.S. economy. The popular
6 quote was that computer loads accounted for 13% of electricity use today and
7 was headed for 50% within our lifetime. I worked with scientists at Lawrence
8 Berkeley National Labs to analyze these claims. We have extensive data on
9 computer equipment inventories and energy usage based on our work in the
10 end-use area. We concluded that computer equipment accounts for 5% or less
11 of current electricity usage and that the claim that this will grow to 50% of
12 total use is not realistic.

13
14 Without a doubt, the rise in usage of computers and internet related equipment
15 has added to electricity usage in the U.S. over the last two decades. However,
16 there is no reason to believe that the loads added over the next two years will
17 be disproportionate relative to those added over the past decade. As a result,
18 there is no need to include an external adjustment, since a continuation of
19 existing trends and relationships is implicit in the econometric forecast.
20 (Specifically, this is one of the trends that is included in the relationship
21 between Net Energy and Real Per Capita Income). On this basis, I believe
22 that it is advisable to remove this external adjustment from the forecast. If
23 anything, over the next few years, there may be a reduction of load growth

1 associated with these activities, reflecting the collapse of the internet bubble
2 and a return to more reasonable levels of investment in the supporting telecom
3 infrastructure.

4 **Q. FPL's other adjustment to its sales forecast involved elimination of an**
5 **intercept adjustment. Please explain the purpose of an intercept**
6 **adjustment and whether you believe FPL's removal of this adjustment**
7 **was appropriate.**

8 A. Stated simply, a positive intercept adjustment increases the forecast and a
9 negative intercept adjustment decreases the forecast. The intercept in an
10 equation is the constant term (the "a" in the expression $a + b \cdot X$). A positive
11 intercept adjustment shifts an equation upward. A negative intercept
12 adjustment shifts an equation downward. Neither of these changes alters the
13 sensitivity of the equation to driving factors (the X's).

14
15 In the initial filing, the forecast for Net Energy included a positive intercept
16 adjustment to reflect an apparent tendency for the models to under forecast
17 energy toward the end of the sample period. This adjustment added .72% to
18 the Net Energy forecast in 2002. The practice of including an intercept
19 adjustment is common in forecasting. The relationships in the forecasting
20 model are estimated over a period of time and are intended to reflect the
21 average relationship over the estimation period. In some instances, however,
22 there are cycles or trends that are not captured, and these may lead to over or
23 under prediction toward the end of the historical period. By adding an

1 intercept adjustment, the forecast line is adjusted upward or downward to
2 agree more closely with the end-of-period data.

3

4 Toward the end of the 1990s and into 2000, it was often the case that
5 statistical models slightly under predicted sales. Part of this tendency to under
6 predict was related to the economic exuberance associated with the
7 technology sector and the speculative stock market bubble. Those days are
8 past. Under current conditions, utilities are now finding that models fitted
9 through this period are tending to over forecast. This is the case with the FPL
10 model, which is tracking high through the middle of 2001, before September
11 11, and is expected to predict significantly above actual levels through the end
12 of 2001. This situation is common. Even in short-term (day ahead)
13 forecasting models, some utilities are finding that their existing equations are
14 forecasting 3% to 4% above observed levels after accounting for actual daily
15 weather. In light of these developments, it is certainly not advisable to
16 include a positive intercept adjustment, and, if anything, a negative adjustment
17 would appear to be appropriate at this time.

18 **Q. Why do you believe a negative intercept adjustment is appropriate at this**
19 **time?**

20 A. As a positive adjustment is appropriate when models are tracking low, a
21 negative adjustment is appropriate when models are tracking high. The
22 principle is the same in both cases. So, if we were to apply this principle
23 today, we would include a negative intercept adjustment.

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

2 A. I have examined the data and forecasting models used by FPL. I have focused
3 on the customer forecast, which was adjusted downward, and the Net Energy
4 equation, which reflects weaker economic assumptions and removal of
5 adjustments that were included in the original forecast but which are no longer
6 appropriate. I believe that these changes are both reasonable and advisable. If
7 anything, I believe that FPL has not gone far enough in adjusting the forecast
8 downward to reflect the current recession and the continued long- run impacts
9 associated with September 11.