ORIGINAL

MEMORANDUM

AUGUST 2, 2004

TO: DIVISION OF THE COMMISSION CLERK AND ADMINISTRATIVE SERVICES

FROM: OFFICE OF THE GENERAL COUNSEL (KEATING) WCK

RE: DOCKET NO. 030623-EI – COMPLAINTS OF SOUTHEASTERN UTILITY SERVICES, INC., ON BEHALF OF VARIOUS CUSTOMERS, AGAINST FLORIDA POWER & LIGHT COMPANY CONCERNING THERMAL DEMAND METER ERROR.

Attached is THE DIRECT TESTIMONY OF SIDNEY W. MATLOCK on behalf of Commission Staff to be filed in the above-referenced docket.

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DOCKET NO.: 030623-EI – Complaints by Southeastern Utility Services, Inc., on behalf of various customers, against Florida Power & Light Company concerning thermal demand meter error.

WITNESS: **Direct Testimony of Sidney W. Matlock,** Appearing on Behalf of the Staff of the Florida Public Service Commission.

DATE FILED: August 2, 2004

DIRECT TESTIMONY OF SIDNEY W. MATLOCK

Q. Please state your name and business address.

A. My name is Sidney W. Matlock. My business address is 2540 Shumard Oak Boulevard, Tallahassee, Florida, 32399.

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

A. I am employed by the Florida Public Service Commission as a Regulatory Analyst in the Division of Economic Regulation.

Q. Please give a brief description of your educational background and professional experience.

A. I graduated from the Florida State University in August of 1975 with a B.S. degree in economics. I was employed by the Florida Department of Commerce (later the Department of Labor and Employment Security) from February of 1976 to February of 1985. I have been employed by the Florida Public Service Commission since February of 1985. In August of 1992, I obtained a B.S. degree in statistics from Florida State University.

Q. What are your present responsibilities with the Commission?

A. My responsibilities include analysis of utility regulatory filings in the Fuel Cost Recovery docket and other dockets and activities relating to electric distribution reliability and electric meter accuracy.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to explain the Commission's rules governing meter testing, meter accuracy, refunds for inaccurate meters, and refund periods. I also recommend a method for identifying inaccurate thermal demand meters and calculating related refunds. The relevant rules are set forth in Chapter 25-6, Florida Administrative Code, and are cited and discussed in detail below.

Q. Generally, what do these rules require?

A. These rules require that investor-owned electric utilities subject to our jurisdiction make accurate readings of actual customer usage so that fair and reasonable billings can be made. These rules require that investor-owned electric utilities maintain metering equipment in such a way that meters giving erroneous readings can be detected, and when detected, that those meters be adjusted to make accurate readings or be replaced. These rules also require that customer bills based on the readings of inaccurate metering equipment be adjusted fairly and reasonably.

Q. What meters are the subject of your testimony?

A. The meters I am addressing are the type TMT, form 6S thermal demand meters (referred to by Florida Power & Light Company, FPL, as "1V" meters) for which the Commission received complaints on or before July 16, 2003, the date this docket was opened, and for which the respective customers protested the Commission's proposed agency action addressing these complaints. FPL tested a total of 19 1V thermal meters that were the subject of these complaints. Of these, 13 were found to have inaccurate demand (demand is measured in kilowatts, kW) readings that were high, and one was found to have an inaccurate kilowatt-hour (kWh) registration that was high (Meter Number 1V7166D). The 14 meters that were found to be inaccurate are identified in Exhibit SWM-1

Q. What are the rule requirements for meter testing?

A. Rule 25-6.052(3)(a) requires that a meter test consist of a comparison of the accuracy of the equipment being tested with the accuracy of a standard.

Q. What is a "standard"?

A. A "standard meter," or a "basic reference standard," is a meter that has been certified to be accurate to within certain limits by the National Institute of Standards and Technology.

Q. What are the error limits for the laboratory standards used to test the accuracy of the meters in this docket?

A. Rule 25-6.054 establishes error limits for laboratory standards and applies those limits to standard meters used to test the kWh components of meters like the ones in this docket. (The 1V meters measure kilowatt-hours as well as kilowatts.) The rule requires that standard meters must be accurate to within plus or minus .05 percent at 1.00 power factor and within plus or minus .10 percent at .50 power factor.

Q. **Generally, what accuracy tests are required to be performed on the 1V thermal meters** that are the subject of this docket?

A. Prior to 1997, each of these meters was required to be tested when it was installed and once every eight years thereafter. In 1997, the rules were changed to allow the utilities to test these meters through an annual random sampling program. Under this program, samples of each type of meter are randomly selected and tested. Inferences regarding each meter type's accuracy are made based on the results of the tests. A specific meter may or may not be included in an annual sample. In addition, FPL is required to test any of its meters whenever a customer requests a meter test or any time the utility suspects that there is a problem with a meter's accuracy.

Q. What are the Commission's rules governing the accuracy of the 1V thermal meters in this docket?

A. Rule 25-6.052(1) requires that the average percent registration of watt-hour meters be between 98 percent and 102 percent and that the meter not "creep," or that the disk not turn when no watt-hours are measured. Rule 25-6.052(2)(a) requires that lagged demand meters, which include thermal demand meters, must be accurate to within four percent of full-scale value when tested at any point between 25 percent and 100 percent of full-scale value.

Q. Please explain the differences between measuring accuracy tolerances for kWh meters and demand meters.

A. While expressed in the rules in terms of percentages, the accuracy requirements for watt-hour meters and those for thermal demand meters are not directly comparable. In Rule 25-6.052(1), concerning watt-hour meter accuracy, accuracy requirements are stated in terms of percentage registration. That is, if a certain number of kWh are actually flowing through a meter being tested, but that meter registers a different number of kWh, the two kWh values are used to calculate the percentage registration, or percent error.

For example, if a watt-hour meter is tested and registers 105 kWh, but the actual number of kWh is known to be 100 kWh, the two numbers, 105 kWh and 100 kWh, are divided and the result is multiplied by 100 to calculate the percent registration, which is 105 percent (or positive 5 percent error). A kWh meter does not have a maximum number of kWh that it can measure.

In Rule 25-6.052(2)(a) concerning demand meter accuracy, error limits for lagged demand meters are stated in terms of percent of full-scale error. The "full-scale value" of a lagged demand meter is the maximum kW demand value that the meter can measure. If a demand meter with a full-scale value of 200 kW is tested and registers 105 kW, but the actual number of kilowatts flowing through the meter is known to be 100 kW, the full-scale error is calculated using the difference between 105 kW (measured number) and 100 kW (known number), and dividing by the full-scale value of 200 kW. Here, the full-scale error is 5 kW divided by 200 kW, or positive two and one-half percent (2 ½%).

The four-percent accuracy criterion in Rule 25-6.052(2)(a) for lagged demand meters is a constant percent for all such meters, regardless of their full-scale values. For a particular meter, the "full-scale value" is a constant number of kilowatts. Four percent of a constant number of kilowatts is also a constant number of kilowatts. So, accuracy rules for watt-hour meters are stated in percent terms and accuracy rules for lagged demand meters are actually stated in terms of kilowatts.

All of the 1V thermal meters in this docket have demand full-scale values of either 840 kW or 1,680 kW. As such, the rules require that the kilowatt measurements of the meters with full-scale values of 840 kW be accurate to within 33.6 kW, or four percent of 840 kW, and that the kilowatt measurements of the meters with full-scale values of 1,680 kW be accurate to within 67.2 kW, or four percent of 1,680 kW.

Q. Why is the percent of full-scale value at which a meter is tested important here?

A. When the 14 meters in this docket were first tested by FPL, only four meters were shown to be in error by more than four percent of their full-scale values. Three of the meters with errors greater than four percent of their full-scale values were tested at 80% of full scale in the initial tests. The other was tested at 61.4%. The remaining 10 were tested at 40%. Mr. George Brown of Southeast Utility Services, Inc. (SUSI), acting on behalf of the customers in this docket, insisted that the meters with errors less than four percent of their full-scale values be retested at higher test points. FPL agreed to retest the meters with positive errors at 80% of their full-scale values. In the retests, seven additional meters showed errors greater than 4% of their full-scale values.

In the accuracy tests performed on the meters in this docket, the magnitudes of the full-scale errors were somewhat proportional, although not exactly proportional, to the points at which the meters were tested. For these full-scale errors to be higher at higher test points, the errors expressed in kilowatts are also somewhat proportional to the test-point kilowatts.

The following is an illustration using the test results for Meter 1V5216D, as shown in Exhibit SWM-2. This meter had a full-scale value of 840 kW. It was tested at 40% of its full-scale value, and the error was 20.5 kW (or 2.44 percent of 840 kW). When tested at 80%, its error was 40.66 kW (or 4.84 percent of 840 kW). The test-point kilowatts for the two tests were 336 kW and 672 kW, respectively.

These test results lead me to conclude that the selection of the test point is critically important. The magnitude of the test point appears to directly affect whether the meter is determined to be within the accuracy limits established by the Commission rules. In turn, the determination whether a meter is registering within prescribed tolerances directly affects whether a customer refund is due.

Q. What test point would you recommend?

A. Ideally, I would recommend that a test point be selected for each meter based on the peak kW usage experienced on that meter in the preceding 12 months. The selection of a usage-based test point is consistent with the intent of the Commission rules that a customer's consumption be measured, and the customer billed, only for actual usage. Further, I believe the Commission may select a reasonable test point on a case-by-case basis pursuant to Rule 25-6.052(2)(a) which states:

> The performance of a mechanical or lagged demand meter or register shall be acceptable when the meter does not creep or registration does not exceed four percent in terms of full-scale value, <u>when tested at any point between 25 percent and 100 percent of full-scale value</u> .

(Emphasis added).

Q. **Is it possible to estimate meter error for the 1V thermal meters in this docket without having to physically retest them at each customer's 12 month historic peak load point?**

A. Yes. It appears that, based on the actual test data we have, the relationship of kW error to the test point for the 1V thermal meters in this docket is relatively linear. Therefore, it is possible to reasonably approximate test results that would occur measuring the accuracy of each meter at each meter's historic peak load level. I have calculated approximate results for the nine meters that were tested at two different points. I have summarized the approximations in Exhibit SWM-2.

Column (l) of this exhibit shows that only three meters are calculated to have errors in excess of 4% of full scale at their peak monthly demand reading. These interpolated results point out the importance of test-point selection for determining whether a meter is in compliance with the Commission rules, as the selection can affect whether a meter is accurate according to the rules.

Q. For the meters in this docket, are the test points of 80% of the full-scale values, selected by the parties, adequate for determining whether a meter is in error?

A. Eighty percent of full-scale value is the test point at which FPL agreed with SUSI to test the meters. Testing at 80% of full-scale value generally resulted in greater errors as a percent of full-scale values. That is, as the number of test-point kilowatts increased, so did the errors expressed in kilowatts, and thus so did the errors expressed as a percentage of their full-scale values. Consequently, testing at 80% of full-scale value tended to show more meters registering beyond the Commission's error limits, thereby qualifying more customers for refunds.

Based on the customers' billing data provided by SUSI, none of the customers' typical monthly maximum demand readings exceeded 75% in the last twelve months that demand was measured using a thermal meter. Of the 14 meters, only one meter registered a demand level of 80% in its last twelve months of service, and none registered more that 80% in any month. None of the errors appear to be understated in the range at which the customers' demand readings were made. For this reason, the selection of an 80% test point appears to be to each customer's advantage for determining whether a meter is in compliance with Rule 25-6.052(2)(a).

Q. What are the Commission's rule requirements regarding refunds for demand meters found to exhibit unacceptable error?

A. The Commission's rules provide a method for determining refunds to customers for whom kWh have been erroneously measured by more than two percent. The rules do not provide a specific method for determining refunds to customers for whom kilowatts (demand) have been erroneously measured by more than four percent of full-scale value.

Rule 25-6.103(1), subtitled "Fast Meters," states that whenever a meter is found to have an error in excess of the plus tolerance allowed in Rule 25-6.052, the utility shall refund to the customer the amount billed in error as determined by Rule 25-6.058. However, Rule 25-6.058 does not clearly provide an appropriate method for determining the amount billed in error for the demand meters in question in this case. Rule 25-6.058(3) states that for a polyphase meter used to measure a varying load, the average error shall be determined in one of the following ways:

> (a) The weighted algebraic average of its error at light load (approximately 10 percent rated test amperes) given a weight of one, its error at heavy load (approximately 100 percent rated test amperes) and 100 percent power factor given a weight of four, and at heavy load (approximately 100 percent rated test amperes) and 50 percent lagging power factor given a weight of two; or
>
> (b) A single point, when calculating the error of a totally solid state meter, and the single point is an accurate representation of the error over the load range of the meter.

While thermal demand meters are polyphase meters, neither (a) nor (b) above are relevant to determining average error for demand meters. Part (b) is not applicable to this case because the thermal demand meters in question are not solid state meters. Part (a) is relevant to calculating average error in energy (kWh) readings from watt-hour meters, but not demand (kW) readings from demand meters. Part (a) calls for measuring the error at light load (approximately 10 percent of rated test amperes). Because customers with demand meters are billed at the maximum demand for the billing period, a test at light load would not be relevant in calculating average error in demand readings. Further, the accuracy specifications for these meters are only applicable for readings between 25 percent and 100 percent full-scale. Finally, Rule 25-6.052, which provides test procedures for measuring the accuracy of both energy and demand readings on meters, refers to Rule 25-6.058 to calculate error in energy readings from watt-hour meters, but it does not make a similar reference for demand readings from lagged demand meters.

Q. What method do you propose for determining the percent error to be used in calculating customer refunds or back bills?

A. I believe that a fair and reasonable methodology would be:

Step 1: Calculate the average billing demand from the complete billing cycles contained in the refund/back bill period.

Step 2: Retest the meter at this average billing demand, noting the correct (true) reading from the reference (standard) meter.

Step 3: Determine the number of kilowatts in error by subtracting the reading of the standard (or reference) meter from the value calculated in Step 2. A positive number means that the customer's meter is reading high. A negative number means that the customer's meter is reading low.

Step 4: Divide the value calculated in Step 3 by the correct (true) value from the reference meter as noted in Step 2 and multiply by 100. This gives the percentage error of the meter being tested.

Q. How would the percentage calculated in Step 4 above be used in calculating refunds or back bills?

A. The percentage calculated in Step 4 would be converted to a "correction factor" that would be applied to the billing demands for each month during the refund period to determine the corrected billing demand. The correction factor is determined by the following formula:

Correction Factor = 1/(1 plus the percentage error determined in Step 4/100)

For example, if the error calculated in Step 4 is 10%, then

Correction Factor = 1/(1.10), or approximately 0.909.

The customer's adjusted kW demand would be determined by the following formula:

Adjusted kW demand = Original kW demand*Correction Factor

Q. Why do you not calculate a percentage error based on the full-scale reading of the meter?

A. For purposes of making refunds, the calculation of a percentage error based on the full-scale reading would not be fair to the customer. For illustration, assume that the customer's meter is tested at the customer's average billing demand level and reads 55 kW, when the reference (standard) meter reads 50 kW. This yields an error of plus 5 kW. The percentage error as calculated in Step 4 would be 10%. However, assuming a full-scale value of 100 kW, the percentage error based on full-scale would be only 5%. Calculating a refund based on an error of 5% would not make the customer whole.

Q. Do you support this method in light of the wording of Rule 25-6.103(3)?

A. Yes. Rule 25-6.103(3) says that "when a meter is found to be in error in excess of the prescribed limits, the amount of the refund or charge … shall be that percentage of error as determined by the test." As demonstrated above, if the refund is determined by applying the full-scale percent error rather than the test-point percent error, the refund could understate the amount by which the customer was overcharged during the refund period.

Q. Do you support using the greater percentage for calculating back bills for meters that are inaccurate and low?

A. Yes. The test-point percent error would also be fair and reasonable for purposes of calculating back bills.

Q. Over what period should any refunds be made for the meters in this docket?

A. Rule 25-6.103(1) does address refund periods. This rule does not provide a means for making refunds for periods greater than 12 months unless a meter's inaccuracy can be traced to a specific cause and a specific time.

Q. Would you summarize your recommendation to implement the rules in this case?

A. I would recommend that the Commission determine which customers are due refunds by retesting the meters at the customers' historic 12-month peak demand as the test point. Customers for whom demand-meter error exceeded four percent of full scale value would qualify for refunds. I would recommend calculating refunds by testing those customers' meters at the average billing demands from the complete billing cycles contained in the refund period, and applying the test-point percent errors to the bills for the refund period. For the one customer who has been overcharged due to high kWh measurements, I would recommend basing the refund on the method contained in Rule 25-6.058.

Q. Does that conclude your testimony?

A. Yes.

Thermal Demand Meters Tested by FPL as of July 16, 2003 and
Included in the Protest to Order PSC-03-1320-PAA-EI

Meter	Customer	City
1V52093	Ocean Properties Holiday Inn	Bradenton
1V5216D	Dillards Store Services, Inc.	Coral Springs
1V7166D	Dillards Store Services, Inc.	Port Charlotte
1V5871D	Target Corporation	Sarasota
1V5025D	Target Corporation	Delray Beach
1V5159D	Target Corporation	Venice
1V5192D	Target Corporation	Bradenton
1V5885D	Target Corporation	Boca Raton
1V5887D	Target Corporation	Port Charlotte
1V7001D	Target Corporation	Boynton Beach
1V7019D	Target Corporation	Ft. Myers
1V7032D	Target Corporation	Hollywood
1V7179D	JC Penny Stores	Bradenton
1V52475	JC Penny Stores	Naples

-13-

Demand Meter Test Data and Interpolations for Docket Number 030623

Meter (a)	Customer (b)	City (c)	Maximum KW (d)	First Test, at 40%: Test-Point KW (e)	Presumed KW Error (f)	Full-Scale % Error (g)	Test-Point % Error (h)	Interpolations Between First and Second Tests Using Maximum Monthly Demand: Annual Demand (i)	Maximum Monthly Demand (j)	Interpolated KW Error {[(j)-(e)/(n)-(e)]* [(o)-(f)]}+(f) (k)	Interpolated Full-Scale % Error [(k)/(d)] (l)	Interpolated Test-Point % Error [(k)/(j)] (m)	Second Test, at 80%: Test-Point KW (n)	Presumed KW Error (o)	Full-Scale % Error (p)	Test-Point % Error (q)
1V52093	Holiday Inn	Bradenton	840	336.0	48.55	5.78	14.45	5,256	480	49.34	5.87	10.28	672.0	50.40	6.00	7.50
1V5216D	Dillards	Coral Springs	840	336.0	20.58	2.45	6.13	5,928	540	32.77	3.90	6.07	672.0	40.66	4.84	6.05
1V7166D	Dillards	Port Charlotte	--	--	--	--	--	--	--	--	--		--	--	--	--
1V5871D	Target	Sarasota	--	--	--	--	--	--	--	--	--		--	--	--	--
1V5025D	Target	Delray Beach	840	336.0	14.53	1.73	4.33	5,472	480	23.14	2.75	4.82	672.0	34.61	4.12	5.15
1V5159D	Target	Venice	840	336.0	26.12	3.11	7.78	6,678	600	34.37	4.09	5.73	672.0	36.62	4.36	5.45
1V5192D	Target	Bradenton	840	336.0	22.51	2.68	6.70	6,336	600	33.60	4.00	5.60	672.0	36.62	4.36	5.45
1V5885D	Target	Boca Raton	840	336.0	22.93	2.73	6.83	6,084	564	34.96	4.16	6.20	672.0	40.66	4.84	6.05
1V5887D	Target	Port Charlotte	840	336.0	27.30	3.25	8.13	6,420	564	33.63	4.00	5.96	672.0	36.62	4.36	5.45
1V7001D	Target	Boynton Beach	--	--	--	--		--	--	--	--	--	--	--	--	--
1V7019D	Target	Ft. Myers	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1V7032D	Target	Hollywood	1,680	672.0	33.94	2.02	5.05	6,636	600	28.86	1.72	4.81	1,344.0	81.31	4.84	6.05
1V7179D	Penny's	Bradenton	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1V52475	Penny's	Naples	840	336.0	25.28	3.01	7.53	5,580	504	29.95	3.57	5.94	672.0	34.61	4.12	5.15
	Total		8,400	3,360.0	241.75	2.88	7.20	48,810	4,428	270.67	3.22	6.11	6,048.0	357.50	4.26	5.91

Exhibit SWM-2 (Page 1 of 1)