

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In Re: Petition for approval of) DOCKET NO. 940913-EI
random sampling plans for new) ORDER NO. PSC-95-0141-FOF-EI
and in-service polyphase self-) ISSUED: January 30, 1995
contained watt-hour meters by)
FLORIDA POWER AND LIGHT COMPANY.)
_____)

The following Commissioners participated in the disposition of this matter:

SUSAN F. CLARK, Chairman
J. TERRY DEASON
JOE GARCIA
JULIA L. JOHNSON
DIANE K. KIESLING

NOTICE OF PROPOSED AGENCY ACTION
ORDER APPROVING SAMPLING PLAN FOR TESTING NEW AND
IN-SERVICE METERS FOR FLORIDA POWER & LIGHT COMPANY

BY THE COMMISSION:

NOTICE IS HEREBY GIVEN by the Florida Public Service Commission that the action discussed herein is preliminary in nature and will become final unless a person whose interests are substantially affected files a petition for a formal proceeding, pursuant to Rule 25-22.029, Florida Administrative Code.

On August 26, 1994, Florida Power & Light Company (FPL) filed a petition requesting that the Commission approve several sampling plans to use random sampling instead of a census for testing the accuracy of polyphase self-contained watt-hour meters. Rule 25-6.056, Florida Administrative Code, permits the sample testing of meter accuracy for single-phase and polyphase self-contained watt-hour meters, for both new meters and meters already in service. The rule requires Commission approval of the sampling plan.

Investor-owned utilities have used sample testing of meter accuracy since 1960 for single-phase meters. This is the first request by an investor-owned utility for Commission approval of random sampling plans for polyphase meters. FPL's petition requests approval of several procedures that are currently allowed by Rule 25-6.056 and approved by the American National Standards Institute, Inc.

Sampling plans are used to estimate fractions of mass-produced homogeneous items that perform according to required

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specifications. Estimates of these fractions represent product quality and are made for specified confidence levels. These statistics are used to decide whether to accept or reject shipments of products.

An incoming shipment is called a "lot". Meters already in service are divided into groups based on common features. For sample-testing purposes, groups of meters are treated as though they were lots. Either a lot of new meters or a group of similar meters already in service is tested as though it were a "population". The rationale for sample-testing products such as electric meters follows the reasoning used to test statistical hypotheses concerning population averages and proportions. Inferences about population parameters are based on information contained in a randomly selected sample.

The United States Department of Defense has established and published sampling procedures, called "military standards", for use in purchasing various products. Two of the military sampling procedures are among those currently used by FPL for single-phase meters: (1) Military Standard 105 - Sampling Procedures and Tables for Inspection by Attributes, and (2) Military Standard 414 - Sampling Procedures and Tables for Inspection by Variables for Percent Defective. Each procedure contains instructions for operating sampling plans for various desired quality levels and confidence levels.

Two considerations for sample testing are (1) the savings that may be realized from not testing 100 percent of the items in a population and (2) the possible quality lost by not testing 100 percent. The sampling of electric meters in Florida was initiated because of the following: (1) the numbers of meters being purchased and used by the larger utilities became large enough to effect large dollar savings; (2) statistical methods for guarding against probable losses in meter quality became widely accepted; and (3) improvements were made in the quality of the meters being manufactured. FPL is currently purchasing and using enough polyphase meters that savings can be attained by sample testing newly purchased meters and in-service meters.

In 1994, only six of the 7,419 polyphase meters purchased and tested through census testing by FPL were found to be operating outside the specification limits. The sum of the absolute values of the annual billing errors that would have resulted from putting those six meters in service would have been only \$52.

Presently, FPL uses approximately 83,600 polyphase meters. Each meter is tested every sixteenth year after installation.

Those meters not meeting accuracy specifications are either calibrated or replaced. If a sample-testing program is used, each meter or other meters of similar characteristics (manufacturer, model, type of construction, etc.) would be tested every year. Problems with meter accuracy would then likely be detected before the last year of the cycle. Accordingly, because of the savings to be realized, with very little if any loss of product quality, sample testing of both new and in-service polyphase meters is appropriate.

FPL has requested approval of the attributes sampling plan known as Military Standard 105 - Sampling Procedures and Tables for Inspection by Attributes, for the in-service testing of polyphase meters. An "attributes" sampling plan is used to test a sample of items to determine the number of items in the sample that perform according to certain specifications and to make an inference regarding the fraction of items in the entire population that perform according to those specifications. For each item, its "attribute" is whether it is defective. A shipment is accepted or rejected based on the number of defective items in the sample.

FPL proposes to use Military Standard 105 to test whether the fraction of its in-service meters that are within 98-percent and 102-percent accuracy, is greater than 97.5 percent. These are the specification limits in Rule 25-6.052. The acceptable quality level (AQL) is 2.5 percent. (This is the AQL used for attributes testing of in-service meters by the investor-owned utilities in Florida.) The standard is applied to groups of meters segregated by characteristics such as manufacturer, model, and methods of construction that are likely to affect the meters' performance. The proposed application of Military Standard 105 is currently being used for in-service testing of single-phase meters. Thus, because of the general industry-acceptance of the plan as proposed by FPL, we approve the sampling plan Military Standard 105 - Sampling Procedures and Tables for Inspection by Attributes with an AQL of 2.5 percent for testing in-service polyphase meters.

FPL has also proposed the use of the variables sampling plan known as Military Standard 414 - Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming for testing in-service polyphase meters. A "variables" sampling plan is used to estimate an average for a particular characteristic and then to estimate the fraction of items in the shipment which meet a particular specification. The estimate of the fraction is based on the estimated average and either a "known" measure of variability estimated from previous testing or an estimate of "unknown" variability calculated from the actual current sample meters. The "variable" is the characteristic measured to estimate the average

and possibly the standard deviation for the population. The proposed variables sampling plans are termed either "known standard deviation sampling plans" or "unknown standard deviation sampling plans".

The "variable" in a meter sampling plan is "percent accuracy". For meters in service, FPL proposes to use Military Standard 414 to test whether the fraction of the meters in service, within 98-percent and 102-percent accuracy, is greater than or equal to 96.0 percent. The acceptable quality level (AQL) is 4.0 percent. (This is the AQL used for variables testing of in-service meters by the investor-owned utilities in Florida.) Standard deviations are "known", that is, estimated from previously tested meters in each of the various groups. The proposed application of Military Standard 414 is the same as the present application for in-service testing single-phase meters. Because of the general industry-acceptance of the plan as proposed by the utility for such applications, we approve the sampling plan Military Standard 414 with an AQL of 4.0 percent for testing in-service polyphase meters.

With regard to new polyphase meters, FPL has proposed using its in-house attributes sampling plan. In FPL's application of the attributes procedure, one sample is drawn from each lot, and if the number of defective meters is zero, the lot is accepted. If the number of defective meters is greater than one, the lot is rejected. If the number of defective meters is exactly one, a second sample is drawn. If no meters in the second sample are defective, the lot is accepted. Otherwise, it is rejected. FPL thus uses a "double sampling plan", with an acceptance number of one. The sample sizes, which vary according to lot size, are listed in Exhibit (1) of the petition. The acceptance requirements for this sampling plan are more stringent than those of the Military Standard 105 for AQL equal to 2.5 percent. Because the standards for FPL's in-house plan compare favorably with other accepted procedures used for similar purposes, we approve FPL's in-house attributes sampling plan for testing new polyphase meters.

FPL has proposed use of its in-house variables sampling plan for new polyphase meters. We do not approve that plan. Rather, we approve the sampling plan Military Standard 414 - Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming with an AQL of .25 percent. The "known standard deviation" application of the plan should be used when the lot standard deviations are statistically equivalent to the measure provided by the manufacturer. Otherwise, the "unknown variance" procedure should be used.

The Military Standard 414 is preferable to FPL's proposed in-house variables sampling plan because it has two features that the in-house sampling plan lacks: (1) it uses larger sample sizes for larger lot sizes, and (2) it includes the criterion that the sample standard deviation for an acceptable lot should not exceed a maximum value.

A sampling plan is used to test the hypothesis that the fraction of meters that are of acceptable quality is greater than a specified high number. The hypothesis is tested "against the alternative hypothesis" that the fraction is smaller than the specified number. For larger lot sizes, a sampling plan uses percentages closer to the originally hypothesized percentage in its alternative hypothesis. The smaller the distance between the two hypothesized percentages, the greater the sample size required to perform the tests. Larger sample sizes therefore are required for sample-testing larger lots. The required sample sizes increase, but the increases are not proportional to the increases in the lot sizes.

Both the Military Standard 105 and FPL's in-house attributes sampling plans use larger sample sizes for larger-sized lots, however, FPL's proposed in-house variables sampling plan uses a sample size of 24 meters from each lot, regardless of the number of meters in the lot. The average accuracy of the lot and the standard deviation of the observations about the average are estimated from observations on the 24 meters. FPL uses its in-house variables sampling plan to test the hypothesis that 99.9 percent of the meters in a lot are within 99-percent and 101-percent accuracy. This hypothesis is tested against the alternative hypothesis that only 97 percent of the meters are in that accuracy range. Because the two hypothesized percentages are constant for all lot sizes, the required sample size reaches a maximum value for lot sizes of around 500.

The Military Standard is regarded as the "minimum standard" with respect to sample sizes and the ability of a sampling plan to accept "good" lots and to reject "bad" lots. For lots containing around 500 meters, FPL's in-house variables sampling plan is comparable to the Military Standard 414. For lots containing fewer than 500 meters, the Military Standard requires fewer than 24 sample meters. However, for lot sizes greater than 500, more than 24 sample meters are required.

The additional criterion that the sample standard deviation does not exceed a certain limit is imposed when the standard deviation is unknown. If the true standard deviation for a population is too large, it may not be possible for the quality

level of the lot to be as great as is desired, regardless of any other test result. Therefore, if the lot is to be accepted, the standard deviation estimate cannot exceed a specified critical value. This criterion is a part of the Military Standard, but it is not included in the plan proposed by FPL. Therefore, to keep the acceptance criteria of the plan comparable to those of other sampling plans used for accepting or rejecting new meters, the "known standard deviation" application of the Military Standard 414 - Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming with an AQL of .25 percent should be used as the variables sampling plan for testing new polyphase meters

FPL's in-house variables sampling plan for new single-phase meters was approved by the Commission staff in 1985. For the reasons previously discussed with regard to new polyphase meters, however, we find that use of the in-house plan should be discontinued. Instead, we approve the Military Standard 414 - Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming with an AQL of .25 percent as the variables sampling plan for testing new single-phase meters. This sampling plan should be applied in the same manner as is used for testing new polyphase meters.

In consideration of the foregoing, it is

ORDERED by the Florida Public Service Commission that Florida Power & Light Company shall use the sampling plans for testing new and in-service polyphase meters described in the body of this Order. It is further

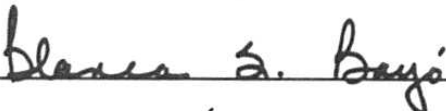
ORDERED that Florida Power & Light Company shall discontinue use of its in-house variables sampling plan for testing new single-phase meters and shall use the known variance application of the Military Standard 414 - Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming with an acceptable quality level of .25 percent as described in the body of this Order. It is further

ORDERED that the provisions of this Order, issued as proposed agency action, shall become final and effective unless an appropriate petition, in the form provided by Rule 25-22.036, Florida Administrative Code, is received by the Director, Division of Records and Reporting, 101 East Gaines Street, Tallahassee, Florida 32399-0870, by the close of business on the date set forth in the "Notice of Further Proceedings or Judicial Review" attached hereto. It is further

ORDER NO. PSC-95-0141-FOF-EI
DOCKET NO. 940913-EI
PAGE 7

ORDERED that in the event this Order becomes final, this docket should be closed.

By ORDER of the Florida Public Service Commission, this 30th day of January, 1995.



BLANCA S. BAYÓ, Director
Division of Records and Reporting

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NOTICE OF FURTHER PROCEEDINGS OR JUDICIAL REVIEW

The Florida Public Service Commission is required by Section 120.59(4), Florida Statutes, to notify parties of any administrative hearing or judicial review of Commission orders that is available under Sections 120.57 or 120.68, Florida Statutes, as well as the procedures and time limits that apply. This notice should not be construed to mean all requests for an administrative hearing or judicial review will be granted or result in the relief sought.

The action proposed herein is preliminary in nature and will not become effective or final, except as provided by Rule 25-22.029, Florida Administrative Code. Any person whose substantial interests are affected by the action proposed by this order may file a petition for a formal proceeding, as provided by Rule 25-22.029(4), Florida Administrative Code, in the form provided by Rule 25-22.036(7)(a) and (f), Florida Administrative Code. This petition must be received by the Director, Division of Records and Reporting, 101 East Gaines Street, Tallahassee, Florida 32399-0870, by the close of business on February 20, 1995.

In the absence of such a petition, this order shall become effective on the day subsequent to the above date as provided by Rule 25-22.029(6), Florida Administrative Code.

ORDER NO. PSC-95-0141-FOF-EI
DOCKET NO. 940913-EI
PAGE 8

Any objection or protest filed in this docket before the issuance date of this order is considered abandoned unless it satisfies the foregoing conditions and is renewed within the specified protest period.

If this order becomes final and effective on the date described above, any party substantially affected may request judicial review by the Florida Supreme Court in the case of an electric, gas or telephone utility or by the First District Court of Appeal in the case of a water or wastewater utility by filing a notice of appeal with the Director, Division of Records and Reporting and filing a copy of the notice of appeal and the filing fee with the appropriate court. This filing must be completed within thirty (30) days of the effective date of this order, pursuant to Rule 9.110, Florida Rules of Appellate Procedure. The notice of appeal must be in the form specified in Rule 9.900(a), Florida Rules of Appellate Procedure.