BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company d/b/a Ameren Missouri's Request for a Waiver of Meter Testing Requirements in Anticipation of Automated Metering Infrastructure Deployment Beginning in 2020.	)))))	File No. EE-2019-0383

APPLICATION AND REQUEST FOR VARIANCE

COMES NOW Union Electric Company d/b/a Ameren Missouri ("Ameren Missouri" or "Company"), a Missouri corporation, and pursuant to 4 CSR 240-2.060, submits this *Application and Request for Variance* ("*Application*") from 4 CSR 240-10.030(28) to give the Company authority to revise its Sample Meter Testing Plan in light of the scheduled deployment of Advanced Metering Infrastructure ("AMI") beginning in 2020 and scheduled for completion in 2025. In support of its request, Ameren Missouri states as follows:

INTRODUCTION

1. As part of its Smart Energy Plan, Ameren Missouri is implementing various "smart" technologies, including AMI. Ameren Missouri will replace its current electric meters and gas modules with AMI meters/modules over a five-year time period, from 2020-2025. AMI meters will provide the utility with more timely and granular data regarding customer usage patterns, and will allow two-way communications between the Company and the meter. These capabilities provide advantages to both the Company and the Customer such as the ability to offer and analyze more complex rates and rate structures, and provide insights in customer usage in different and dynamic new ways, and enable greater utilization of smart devices (thermostats, electric vehicle chargers, appliances, etc.) within the home. AMI will also improve, among other things, outage detection and notification, voltage monitoring capabilities, remote connections and disconnections, meter data integrity, revenue protection through detection of theft of service.

2. While Ameren Missouri is not requesting expedited treatment of this request, a decision by October 31, 2019 will enable the Company to make timely adjustments to, and thereafter appropriately and efficiently comply with, both 4 CSR 240-10.030(18) generally and the Company's "Technical Description of Proposed Method for the Sample Testing of In-service Meters" ("Sample Meter Testing Plan") previously approved by the Commission.

3. On August 26, 1974, in Case No. 18,172, Union Electric Company[1] filed a request for a variance from the Commission's rules regarding the testing of electric service watt-hour meters.[2] At that time, the rules required testing induction type watt-hour meters not exceeding 50 amperes be tested either every 96 months (if manufactured after 1927 but before 1937) or every 240 months (if manufactured after 1937). The Commission approved that variance request, which included a Sample Meter Testing Plan, on March 27, 1975. That order is attached hereto as Schedule 1.[3]

4. On March 30, 2001, Union Electric Company d/b/a AmerenUE[4] requested approval to change its Sample Meter Testing Plan.[5] Specifically, the Company requested that its Sample Meter Testing Plan reflect the American National Standard Institute Sampling Procedures and Tables for Inspection by Attributes and by Variables ("ANSI Standards"), a modernization of the previously adopted standards. The Commission granted this variance on September 11, 2001, which is attached hereto as Schedule 2.[6]

5. On July 3, 2012, in File No. EE-2013-0009, Ameren Missouri requested an extension of its variance from 4 CSR 240-10.030(28) to include two-phase, three-wire, 120/208V

[1] As Ameren Missouri was formerly known.
[2] At that time, the requirements were set forth in Rule 32 of the Commission's General Order No. 20.
[3] The Company is providing a copy of the order since it is old enough, it is not directly accessible via EFIS.
[4] As Ameren Missouri was formerly known.
[5] At that time, the required testing schedules had been incorporated into 4 CSR 240-10.030(28), where they reside today.
[6] The Company is providing a copy of the order since it is old enough, it is not directly accessible via EFIS.

meters ("network meters") used primarily for apartment complexes and similar buildings in order to provide single phase service for residential customers. The Commission granted this request on August 15, 2012.

6. In light of AMI deployment, continued testing of meters that are scheduled for retirement and replacement by 2025 represents an inefficient use of both time and resources. Accordingly, Ameren Missouri submits this *Application* and requests a variance to the extent necessary to suspend testing under the Sample Meter Testing Plan, which has been authorized via Commission orders granting variances from certain requirements of 4 CSR 240-10.030(28), from 2020 through 2025, when AMI deployment is complete.[7]

7. This Application has been divided into the following sections:

I. 4 CSR 240-2.060(1), (A) through (M)

II. 4 CSR 240-2.060(4)

I. 4 CSR 240-2.060(1), (A) through (M)

Paragraph (A) – Applicant

8. The Company is a Missouri corporation doing business under the fictitious name of Ameren Missouri, organized and existing under the laws of the State of Missouri, in good standing in all respects, with its principal office and place of business located at One Ameren Plaza, 1901 Chouteau Avenue, St. Louis, Missouri 63103. The Company is engaged in providing electric and gas utility services in portions of Missouri as a public utility under the jurisdiction of the Commission. The Company is a subsidiary of Ameren Corporation.

[7] Ameren Missouri is *only* asking to suspend activities under the Sample Meter Testing Plan from 2020 to 2025; the Company will continue to perform periodic testing required at 240 month intervals.

Paragraph (B) – Articles of Incorporation; Paragraph (E) – Fictitious Name; Paragraph (G) – Information Previously Submitted; Paragraph (H) – Character of Business[8]

9. Company previously submitted to the Commission a certified copy of its Articles of Incorporation (See Case No. EA-87-105). Company previously submitted its Fictitious Name Registrations as filed with the Missouri Secretary of State's Office in File No. EA-2019-0181. Company attached a copy of its Certificate of Corporate Good Standing as Schedule 3 to this pleading. These documents are incorporated by reference and made a part of this *Application* for all purposes.

Paragraph I – Correspondence and Communication

10. Correspondence and Communication -- Correspondence, communications, orders and decisions in regard to this *Application* should be directed to the undersigned and to:

Thomas M. Byrne
Senior Director, Regulatory Affairs
1901 Chouteau Avenue, MC-1450
P.O. Box 66149, MC-1450
St. Louis, Missouri 63101-6149
(314) 554-2514 (Telephone)
tbyrne@ameren.com

Paragraph (K) – Actions, Judgments, and Decisions; Paragraph (L) – Fees[9]

11. Ameren Missouri has no final unsatisfied judgments or decisions against it from any state or federal agency or court that involve customer service or rates that have occurred within three years of the date of this *Application*. By the nature of its business, the Company has, from time-to-time, pending actions in state and federal agencies and courts involving customer service or rates. Company has no annual report or assessment fees overdue to this Commission.

[8] Paragraphs (C), (D), and (F) do not apply to Ameren Missouri.
[9] Paragraph (J) does not apply to Ameren Missouri.

Paragraph (M) – Affidavit

12. An affidavit in support of this *Application* by an authorized individual is included as Schedule 4.

II. 4 CSR 240-2.060(4)

13. 4 CSR 240-2.060(4) states that, in addition to other application requirements:

> [A]pplications for variances or waivers from commission rules and tariff provisions, as well as those statutory provisions which may be waived, shall contain information as follows:
>
> (A) Specific indication of the statute, rule, or tariff from which the variance or waiver is sought;
>
> (B) The reasons for the proposed variance or waiver and a complete justification setting out the good cause for granting the variance or waiver; and
>
> (C) The name of any public utility affected by the variance or waiver.

14. Ameren Missouri is requesting a variance, for the time period of 2020 through 2025, from its Sample Meter Testing Program, which has been authorized and refined via the Commission orders issued in Case No. 18,172, Case No. EO-2001-0521, and File No. 2013-0009, which are referenced and described above.

15. Ameren Missouri will deploy AMI metering for electric customers from 2020 through 2025,[10] beginning in July 2020, and continuing until AMI metering has been installed for all of the Company's electric customers, except for those choosing to decline AMI metering. Specifically, the Company anticipates AMI deployment consistent with the following timetable:

Meter Deployment Schedule (% Complete)	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
	10%	**29%**	**47%**	**65%**	**83%**	**100%**

16. Ameren Missouri has over 1 million electric meters that it plans to replace between 2020 and 2025. Rather than continue the sample testing, Ameren Missouri requests a

[10] Beginning in 2024, Ameren Missouri will begin changing the automatic meter reading ("AMR") modules attached to gas meters with AMI gas modules.

variance in order to suspend testing under the Sample Meter Testing Plan from 2020 until AMI deployment is completed in 2025. Regardless of the requested variance from the Sample Meter Testing Plan, Ameren Missouri will continue to:

- Ensure no meter goes beyond 20 years (240 months) before removal and replacement with an AMI meter; and,
- Test large customer periodic meters for the largest customers (i.e., those in Ameren Missouri's periodic testing groups 3 and 5).

17. Even with the requested variance, any sample that would possibly fail in 2020 or any year up to and including 2025 would have the meter population changed out within four years. Without the grant of a variance, the Company will continue to test sample meter sets on the schedule required by the Sample Meter Testing Plan. Granting the requested variance will result in the following number of meters tested per year:

Sample and Periodic Meter Estimates if Requested Variance Granted						
Year	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Group 3, 5 Periodics	336	230	198	225	275	320
Other Periodics	436	167	0	0	0	0
Samples	1300	0	0	0	0	0
Total	**2,072**	**397**	**198**	**225**	**275**	**320**

18. Ameren Missouri can conserve resources that can be dedicated to other purposes if it suspends sample meter testing pending the full deployment of AMI metering. At that point, implementation of the Sample Meter Testing Plan can be reinstated. Accordingly, Ameren Missouri requests permission to suspend testing as required under the Sample Meter Testing Plan until AMI has been fully deployed to avoid unnecessary and redundant testing of assets scheduled

for replacement.[11] Good cause exists for granting this variance because doing so will allow Ameren Missouri to conserve and/or reallocate money and resources that would otherwise be expended on assets that will be replaced within the next six years; this measure will benefit both the utility and its customers.[12] No other public utility will be affected by this requested variance.[13]

WHEREFORE, Ameren Missouri respectfully requests that the Commission grant the requested variance, which would allow the Company to suspend sample meter set testing pursuant to its Sample Meter Testing Plan from 2020 through 2025, until AMI metering has been fully deployed, at which point testing pursuant to the Sample Meter Testing Plan can recommence.

Respectfully submitted,

/s/ Paula N. Johnson
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ATTORNEY FOR UNION ELECTRIC COMPANY, d/b/a AMEREN MISSOURI

[11] 4 CSR 240-2.060(4)(B).
[12] 4 CSR 240-2.060(4)(B).
[13] 4 CSR 240-2.060(4)(C).

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and correct copy of the foregoing was served on the Staff of the Commission and the Office of the Public Counsel on this via electronic mail (e-mail) on this 21st day of August, 2019.

/s/ Paula N. Johnson
Paula Johnson

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

CASE NO. 18,172

In the matter of the application of Union Electric Company for relief from certain of the requirements of Rule 32 of General Order No. 20.

APPEARANCES: WILLIAM E. JAUDES, Attorney at Law, and THOMAS C. PALMER, Attorney at Law, 1901 Gratiot Street, St. Louis, Missouri 63103, for Applicant, Union Electric Company.

ROBERT C. McNICHOLAS, Associate City Counselor, 314 City Hall, St. Louis, Missouri 63103, for the City of St. Louis, Missouri.

MICHAEL K. McCABE, First Assistant Commission Counsel, Missouri Public Service Commission, Jefferson State Office Building, 100 East Capitol Avenue, Jefferson City, Missouri 65101, for the Staff of the Missouri Public Service Commission.

REPORT AND ORDER

By application filed with the Commission on August 26, 1974, Union Electric Company (Applicant) seeks permission to depart from certain of the requirements of Rule 32 of the Commission's General Order No. 20, such Rule pertaining to the testing of

electric service watt-hour meters. This matter was set for hearing and was heard on October 7, 1974 in the Commission's hearing room, Jefferson State Office Building, Jefferson City, Missouri. Applications to Intervene were timely filed by the City of St. Louis, by the International Brotherhood of Electrical Workers, Local Union 1439, and by certain named consumers who reside in the service area of the Applicant.

Findings of Fact

The Missouri Public Service Commission having considered all of the competent and substantial evidence upon the whole record makes the following findings of fact.

The Applicant. The Applicant is a corporation organized and existing under the laws of the State of Missouri. It engages in providing both electric and steam heating in Missouri. Its principal offices are located at 1901 Gratiot Street, St. Louis, Missouri.

Present Requirements Pertaining to the Testing of Electric Service Watt-hour Meters in Missouri. Rule 32 of General Order No. 20 requires that each electric service watt-hour meter in Missouri be periodically tested by the electric corporation furnishing the same. The schedule of testing a meter is based upon the year that it was manufactured and the rated current capacity of that meter. As examples, an induction type meter which was manufactured during the period 1927 through 1936 and which has a rated current capacity less than or equal to 50 amperes is to be tested every 96 months (8 years). An induction type meter which was manufactured during or since 1937 is to be tested every 240 months (20 years).

As of December 15, 1972, the Applicant had 673,330 installed watt-hour meters of various types and ratings. In order to comply with Rule 32 of General Order No. 20, the Applicant has

to test approximately 33,000 meters annually. The annual cost of such testing, based upon the wages paid to field meter testers, is approximately $190,000.

Applicant's Proposed Plan of Testing Its Electric Service Watt-hour Meters. A technical description of the Applicant's proposed plan is set forth in Exhibit A attached hereto and incorporated into this Report and Order. The Applicant proposes to classify its in-service meters into two groups--those with a manufactured date prior to 1937 will be classed as "obsolete" and those with a manufactured date during or since 1937 will be classed as "modern". Of the 673,330 in-service meters furnished by Applicant in Missouri, 657,650 are "modern" meters and the remainder are "obsolete" meters. These "obsolete" meters will remain on the testing schedule as outlined in Rule 32 of General Order No. 20 and will be replaced with "modern" meters as soon as it is economical and feasible to do so.

The quality, or accuracy of registration, of the "modern" meters, under the Applicant's proposed plan, will be established by a standardized statistical sampling procedure which utilizes the mathematical principles of Statistical Quality Control as set forth in published standards of the United States Military establishments and other government agencies. The Applicant seeks to implement this sampling technique because of the significant improvement in meters with regards to temperature compensation and overload characteristics, such improvements being made since 1934.

The Applicant proposes to classify the "modern" meters by manufacturer and type into nineteen groups. Each of these groups will further be divided into ten lots. A breakdown of the meters, according to groups and lots, is shown in Exhibit B, attached hereto and incorporated into this Report and Order. Each year, the Applicant will draw a representative sample from the lot with the oldest

previous test date in each of the groups and test that sample. Under this plan, the Applicant will be operating on a ten-year test program. If the required amount of meters in a sample pass the tests conducted by the Applicant, no further testing will be done on the meters in that group until the following year when the next lot with the oldest previous test date in that group will be sample tested. If, however, the tests conducted on the sample prove that the lot fails, all of the meters in that lot will be divided into four sections and tested over the next four years. If a particular group of meters fails continuously under the testing program proposed by the Applicant, that group will either be replaced with new meters or will be tested and, if necessary, adjusted.

This sample plan proposed by the Applicant insures with a confidence level of 95 percent that not more than 2.5 percent of the meters in service will deviate from 100 percent accuracy of registration by more than plus or minus 2.0 percent.

The Applicant sets forth three reasons why the proposed plan would be beneficial to its customers:

a) A review of the Applicant's entire meter system under the proposed plan will occur every ten years, compared to twenty years under the present system.

b) The proposed plan will allow the Applicant to concentrate on testing known defective meters rather than testing thousands of meters that are in good condition and need no adjustment.

c) A savings of approximately 1.5 million dollars over a twenty-year period will be brought about as a result of using the sample testing plan instead of the 100 percent testing program now required by Rule 32 of General Order No. 20.

If the sampling technique proposed by the Applicant is approved by this Commission, the Applicant will continue to test

the meters of specific customers when requested to do so by this Commission or by the customer. At present, if a customer complaint is lodged with the Applicant, the first contact with that customer is made by a person employed in the Applicant's business office, either by phone or in person. If the complaint of the customer cannot be resolved by such contact, and the customer requests it, a meter test is conducted at the residence of the complainant by a tester employed in the meter laboratory and shop of the Applicant. During 1972 and 1973, approximately 11,300 meters were tested as a result of customer complaints. Of this amount, approximately one percent failed the meter test conducted by the meter testers.

Conclusions

The Missouri Public Service Commission has arrived at the following conclusions:

The Applicant is a corporation engaged as a public utility in electric and steam heating businesses in Missouri, and is subject to the jurisdiction of this Commission pursuant to Section 386.010(14), RSMo 1969.

The Commission, pursuant to Section 393.160(6), RSMo 1969, enacted General Order No. 20, which is designed to prescribe rules pertaining to the inspection of gas, water, and electric meters. Rule 32 of this General Order sets forth a procedure for testing the accuracy of electric meters. This procedure is to be followed by all electric corporations operating in Missouri "unless otherwise ordered by the Commission". In the present application, the Applicant seeks to have the Commission authorize a testing procedure different from that set forth in Rule 32.

The Commission is of the opinion and concludes that the testing procedure proposed by the Applicant, hereinbefore described, is in the public interest, both from an economic and a practical standpoint. This conclusion is based upon the following reasons:

a) Under the present testing procedure, the annual cost to the Applicant is approximately $190,000, such figure based on the wages paid to the personnel who inspect the meters. By authorizing the testing method proposed by the Applicant, the estimated savings over a twenty-year period is 1.5 million dollars. The savings will be brought about because of the decrease in the number of meter testers needed under the sampling method. The Applicant has no intention of dismissing the testers no longer needed, but rather intends to transfer them to some other department or have them perform different duties within the meter laboratory. The savings will occur because no new personnel will need to be added in order to perform the function and duties which existing personnel will assume.

b) By implementing the statistical sampling technique, the Applicant can focus its attention on the lots or group of meters that are known to need adjustment or replacement rather than testing each and every meter in its operation, most of which will ultimately be found to be accurate.

c) It is admitted by the Applicant that the present method of testing electric meters is behind schedule. As an example, the Applicant only field tested approximately 16,000 meters in 1973, while under the present method it should be testing 33,000 meters annually. The Commission is aware that field testing 33,000 meters a year takes a great deal of time and expense, and if a more feasible method can be used to achieve the same result, then that method should be implemented.

d) The testing procedure proposed by the Applicant will not affect that situation where a customer in the Applicant's service area complains about the amount of his electric bill. In a complaint situation, the Applicant will continue to follow the method presently in effect, i.e., personal contact by the Applicant's

business office with a follow-up field meter test if the customer remains unsatisfied.

It is, therefore,

ORDERED: 1. That Union Electric Company be, and is, hereby authorized to depart from the requirements of Rule 32 of General Order No. 20 and to implement its method for the sample testing of in-service electric watt-hour meters, such method described both in the body of this Report and Order and in Exhibit A attached hereto and made a part of this Report and Order.

ORDERED: 2. That this Report and Order shall become effective on the 27th day of March, 1975, and the Secretary of the Commission shall serve a certified copy of same upon each party of record and a copy on all other interested parties.

BY THE COMMISSION

Robert L. Gilmore
Secretary

(S E A L)

Mauzé, Chm., Fain, Reine,
and Pierce, CC., Concur.

Dated at Jefferson City, Missouri,
on this 12th day of March, 1975.

Exhibit A

Technical Description of Proposed Method For the Sample Testing of In-Service Meters

1. During World War II the application of mathematical techniques and laws of probability to problems of testing and inspection resulted in the wide adoption of sample testing methods as an economical substitute for and which would produce equivalent results of 100 per cent testing. The proposal of Petitioner herein is an adaptation of these sample testing methods to meter testing problems using fully developed and widely recognized mathematical standards, principles and rules which can be found in standard texts and statistical sampling tables. Details of its application and its expected operation are taken from Military Standards MIL-STD-414 which describes plans utilizing the variables sampling technique and MIL-STD-105D which describes plans utilizing the attributes sampling technique.

2. The purpose of using the sample meter testing method is:

A. To determine the quality level of each specific meter class by providing a reliable estimate of the percentage of meters in each meter class lying outside the specified control limits of acceptable accuracy of registration.

B. To provide information relating to the performance of those meters of various types where the meter accuracy is not up to the specified quality level and thus provide for a basis of periodic testing or planned retirement of those meters which do

not conform to an acceptable quality level.

3. The sample meter testing plan herein described shall be used with those single-phase watthour meters manufactured during and since 1937, not exceeding 12 KVA rating, which are presently being used in the Company's Missouri operations. This cut-off date is chosen because beginning in 1934 the manufacturers of electric watthour meters incorporated into their meters significant improvements directed towards attaining more stable operating and accuracy characteristics, such as improved temperature compensation and overload characteristics. However, 1937 is simply more convenient for Union Electric to make a meter division. Therefore, the meters that were manufactured prior to 1937, herein referred to as "old meters", will remain on their present test schedule until such time as they are replaced by "modern meters". Those meters which were manufactured during and since 1937, hereinafter referred to as "modern meters", are the greater proportion of the Company's meters in service in Missouri (as of December 15, 1972, some 657,650 of the Company's 673,330 meters of this type were "modern meters").

4. The Company will classify its "modern meters" according to manufacturer and type. As of December 15, 1972, there were nineteen groups varying in size from 7,865 to 77,387 meters. (See Appendix 8 to Exhibit B for a detailed breakdown of size of meter groups as of December 15, 1972.) These meter groups are further divided into ten lots according to their previous test date so that one-tenth of each group will be sampled for testing

each year, where at the end of ten years the entire single phase meter system described in the main body will have been reviewed; the cycle is then repeated.

5. Each year a representative random sample will be selected from the lot with the oldest previous test date in each of the groups in accordance with standard sampling plans utilizing the mathematical principles of Statistical Quality Control as set forth in published standards of the United States Military establishment and other governmental agencies. The size of the sample will depend on the size of the lot it will represent (the sample sizes of the lot of the nineteen groups as of December 16, 1972, vary from 30 to 50 meters). All the meters in the sample groups will be tested for accuracy of registration. Such tests will be made at 10 per cent and 100 per cent of the meter nameplate rating. The "as found accuracy" will be calculated as the weighted arithmetic mean of the two readings. That is the meter registration at 100 per cent will be multiplied by four and added to the meter registration at 10 per cent. This value is then divided by five to determine the weighted mean value.

6. The sampling plan selected is one that will insure that not more than 2.5 per cent of the meters in service will deviate from 100 per cent accuracy of registration by more than plus or minus 2 per cent. The field data will be analyzed by application of the "chi-square" test to determine whether or not the distribution of accuracies is statistically normal. The data from a sampling showing a normal distribution will permit the determina-

tion of the percentage of meters in the group sampled that are outside of the control limits of plus or minus 2 per cent. Reference to Table B-3 of MIL-STD-414 (Appendix 1 to Exhibit A) shows that for a sample size of 50, the number of distorted units in the sample must not exceed 5.2 per cent to maintain a lot quality level of 2.5 per cent. Meter lots in a group that meet the quality level specifications will have no further tests made on them during the next ten years, but the next lot with the oldest previous test date in that group will be sampled in the following year. Meter lots that are shown to be distorted will either be placed on a 100 per cent accelerated test program or retired and replaced with modern meters on an accelerated replacement program.

7. The accelerated program consists of dividing the meters in the lots into four segments; whereby, one segment of meters will be tested in each of the following four years. If all the lots fail from a particular group, the number of meters to be tested per year will increase with an accelerated rate equal to a fourth lot per year. After four years a plateau is reached because new additions of meters to be tested are offset by exhausted supplies of meters from lots that were being tested five years previous. This method will also be utilized when meter groups are replaced with new meters.

8. Probability factors which enter into the above calculations and predictions related to the over-all performance of the plan, can be illustrated by an operating characteristic curve for a sample size of 50 and an Acceptable Quality Level (AQL) of 2.5 per cent. Such a curve is shown in Appen-

dix 2 to Exhibit A and gives the probability of accepting a lot as a function of the actual quality level characteristic of the lot being sampled. From this can be determined the per cent of distorted units expected to result in the total number of meters considered for a specified period, after continued operation of the plan, and based on the premise that distorted lots, as they are found, will be 100% tested and adjusted or replaced. From such a curve it can be seen that the maximum percentage of the sub-standard meters in the lots considered in a period cannot exceed 3.0 per cent and that would only occur in the extremely unlikely case where all lots sampled contained exactly 4 per cent distorted items. The data from which these curves are constructed is as tabulated in the following:

% Distorted In Submitted Lots	Probability Of Accepting the Lot	% of Distorted Units Expected to Result in Lots Considered
1	100	1.00
2	98	1.96
3	90	2.70
4	75	3.00
5	58	2.90
6	41	2.46
7	28	1.96
8	18	1.44
9	11	.99
10	7	.70

9. If analysis of a specified sample does not meet the requirements of the "chi-square" test in that the distribution of meter accuracies is not normal, testing by the sampling technique can still be effected by using the

principle of "attributes" testing. A sample procedure utilizing the principles of attributes is one wherein the accuracy of registration of each individual meter is classified as either being within or beyond the control limits as specified by the sampling plan. A decision to accept or reject a lot is then based upon the number of meters in the sample having registration percentages beyond these control limits, which in this case means outside of the 98 to 102 per cent accuracy range. By contrast, in the variables method the meter accuracy is measured along a continuous numerical scale and is described in terms of its position along that scale. Variables method takes account of the degree to which the accuracy of the meter conforms to the specific quality requirements of the sampling plan and in most cases a decision to accept or reject the lot can be made with a much smaller sample than is necessary with the method of attributes. Sampling by attributes can be made, in one of several ways, usually classified as "single-sampling", "double-sampling", or "multiple-sampling". The plan selected for testing of meters in Missouri is the "multiple-sampling" technique, in which the initial sample drawn is almost the same in size as that drawn for the "variables" testing. Its particular advantage is that there is minimum discrepancy in the sample size required for the "attributes" technique compared to the sample size required for the "variables" technique. The sampling size chosen for any group of meters will be the largest sample size between the two techniques; thereby insuring the quantity of meters needed to utilize either sampling technique and avoiding the necessity of

drawi: g additional samples. Thus, for those meter lots where accuracies are not normally distributed, but having a high quality level with very few or no distorted units, the original sample will be sufficient to provide a decision. Additional samples need only be drawn in those instances where the percentage of distorted units is beyond the specified acceptance number. A portion of the master fable for the multiple-sampling plan reproduced from Military Standards MIL-STD-105D (Table IV A) as shown in Appendix 3 to Exhibit A includes sample sizes which will be used in the Union Electric system in Missouri. To illustrate, inspection of this table shows that for an initial sample of 50 meters (code letter L) the lot is judged acceptable if there are no distorted units in the sample. The lot would be rejected for 4 or more distorted units and for any number of distorted units from 1 to 4, additional samples would need be drawn before a decision could be reached. If a decision to reject is arrived at, then all meters in the lot would be placed on a 100 per cent accelerated test program or retired and replaced with modern meters on an accelerated test program. For a sample of 50 units, the operating curve for multiple sampling is shown in Appendix 4 to Exhibit A along with the per cent of distorted meters expected to result in the total meter population after continued operation of the plan. The data from which these curves are constructed is a tabulated in the following:

Percentage of Meters In Submitted Lots Operating Beyond Acceptable Control Limits	Per Cent Probability Of Accepting A Lot	Percent of Distorted Units Expected to Result Lots Considered
1	100	1.00
2	99	1.98
3	95.5	2.86
4	80	3.20
5	57	2.85
6	33.5	2.01
7	18	1.26
8	8.5	.68
9	4.0	.36
10	1.0	.10

It is apparent from this data that the maximum percentage of meters having errors of registration beyond the control limits of plus or minus 2 percent is 3.2 percent and only occurs for the unlikely case wherein all lots were exactly 4 percent distorted.

To determine the size of a sample of meters, Table A-2 is used from Military Standards 414 when a Variables test is given and Table I from Military Standards 105D is used when an Attributes test is given. The code letters listed in Table A-2 are utilized in Table B-3 in Appendix 1 to Exhibit "A" and the letters listed in Table I are utilized in Table IV-A in Appendix 3 to Exhibit "A" to determine the required sample size. The largest sample size will always be drawn between the two methods so as to insure a sufficient number of meters for either test; furthermore, the chi-square test will be conducted utilizing the largest sample size between the two methods.

VARIABLES TEST

MIL-STD-414
11 June 1957

TABLE A-1

AQL Conversion Table

For specified AQL values falling within these ranges	Use this AQL value
—— to 0.049	0.04
0.050 to 0.069	0.065
0.070 to 0.109	0.10
0.110 to 0.164	0.15
0.165 to 0.279	0.25
0.280 to 0.439	0.40
0.440 to 0.699	0.65
0.700 to 1.09	1.0
1.10 to 1.64	1.5
1.65 to 2.79	2.5
2.80 to 4.39	4.0
4.40 to 6.99	6.5
7.00 to 10.9	10.0
11.00 to 16.4	15.0

TABLE A-2

Sample Size Code Letters[1]

Lot Size	Inspection Levels				
	I	II	III	IV	V
3 to 8	B	B	B	B	C
9 to 15	B	B	B	B	D
16 to 25	B	B	B	C	E
26 to 40	B	B	B	D	F
41 to 65	B	B	C	E	G
66 to 110	B	B	D	F	H
111 to 180	B	C	E	G	I
181 to 300	B	D	F	H	J
301 to 500	C	E	G	I	K
501 to 800	D	F	H	J	L
801 to 1,300	E	G	I	K	L
1,301 to 3,200	F	H	J	L	M
3,201 to 8,000	G	I	L	M	N
8,001 to 22,000	H	J	M	N	O
22,001 to 110,000	I	K	N	O	P
110,001 to 550,000	I	K	O	P	Q
550,001 and over	I	K	P	Q	Q

[1] Sample size code letters given in body of table are applicable when the indicated inspection levels are to be used.

Section A7.1 in Military Std. 414 suggests that unless otherwise specified Inspection Level IV shall be used.

For this table, Mil. Std. 105D suggests th General inspection level II be used unl otherwise specified.

TABLE I—Sample size code letters

ATTRIBUTES TEST

(See 9.2 and 9.3)

Lot or batch size	Special inspection levels				General inspection levels		
	S-1	S-2	S-3	S-4	I	II	III
2 to 8	A	A	A	A	A	A	B
9 to 15	A	A	A	A	A	B	C
16 to 25	A	A	B	B	B	C	D
26 to 50	A	B	B	C	C	D	E
51 to 90	B	B	C	C	C	E	F
91 to 150	B	B	C	D	D	F	G
151 to 280	B	C	D	E	E	G	H
281 to 500	B	C	D	E	F	H	J
501 to 1200	C	C	E	F	G	J	K
1201 to 3200	C	D	E	G	H	K	L
3201 to 10000	C	D	F	G	J	L	M
10001 to 35000	C	D	F	H	K	M	N
35001 to 150000	D	E	G	J	L	N	P
150001 to 500000	D	E	G	J	M	P	Q
500001 and over	D	E	H	K	N	Q	R

Note. Small Sample inspection Levels of MIL-STD-105C Convert to these special inspection levels

CODE LETTERS

L-1 L-2 ..... S-1

L-3 L-4 ..... S-2

L-5 L-6 ..... S-3

L-7 L-8 ..... S-4

Schedule 1

APPENDIX 1 TO EXHIBIT "A"

TABLE B-3

Standard Deviation Method

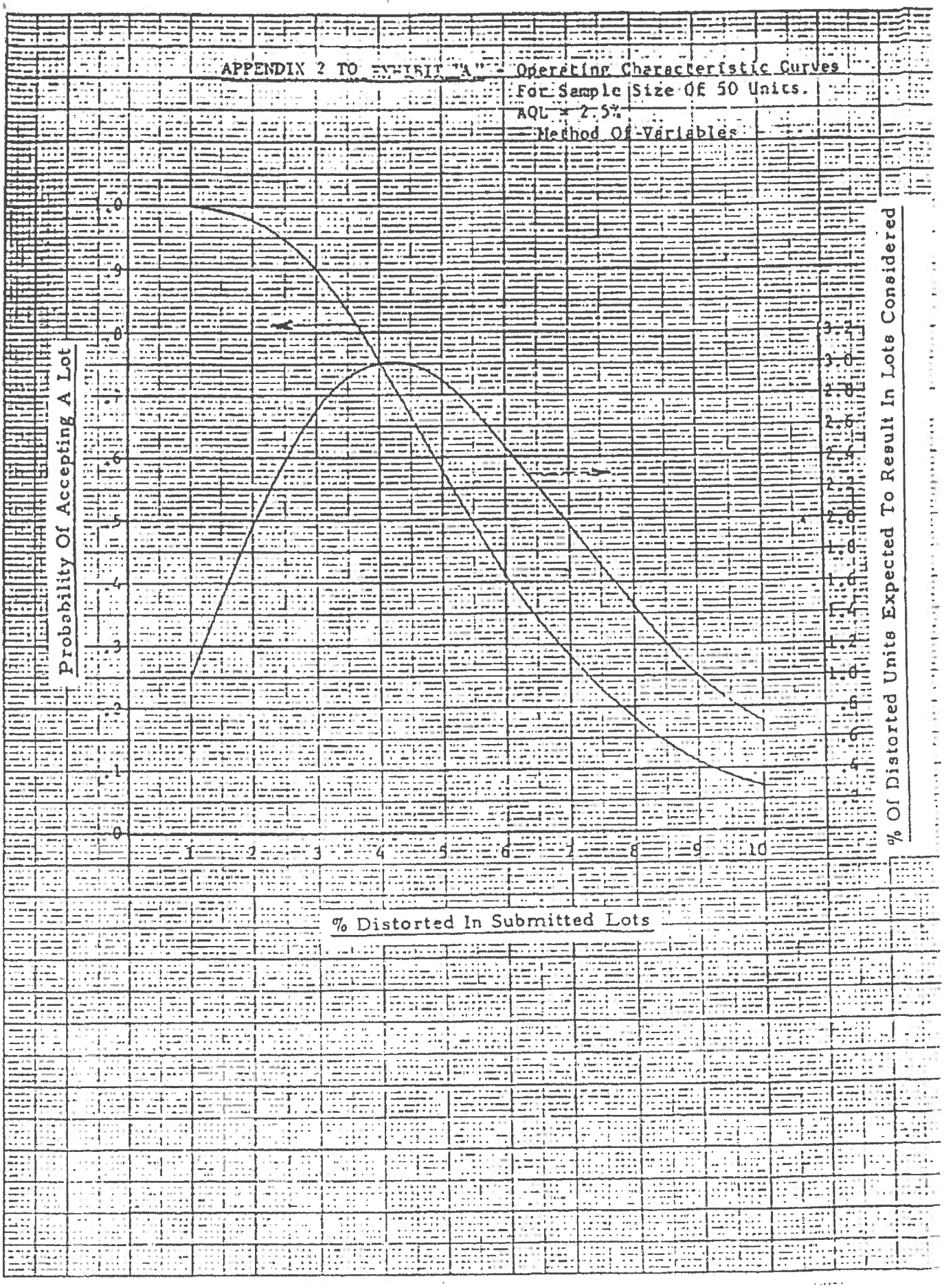
Master Table for Normal and Tightened Inspection for Plans Based on Variability Unknown
(Double Specification Limit and Form 2—Single Specification Limit)

Sample size code letter	Sample size	Acceptable Quality Levels (normal inspection)													
		.04	.065	.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50	10.00	15.00
		M	M	M	M	M	M	M	M	M	M	M	M	M	M
B	3	↓	↓	↓	↓	↓	↓	↓	▽	▽	7.59	18.86	26.94	33.69	40.47
C	4	↓	↓	↓	↓	↓	↓	↓	1.53	5.50	10.92	16.45	22.86	29.45	36.90
D	5	↓	↓	↓	↓	▽	▽	1.33	3.32	5.83	9.80	14.39	20.19	26.56	33.99
E	7	↓	↓	↓	↓	0.422	1.06	2.14	3.55	5.35	8.40	12.20	17.35	23.29	30.50
F	10	▽	▽	▽	0.349	0.716	1.30	2.17	3.26	4.77	7.29	10.54	15.17	20.74	27.57
G	15	0.099	0.186	0.312	0.503	0.818	1.31	2.11	3.05	4.31	6.56	9.46	13.71	18.94	25.61
H	20	0.135	0.228	0.365	0.544	0.846	1.29	2.05	2.95	4.09	6.17	8.92	12.99	18.03	24.53
I	25	0.155	0.250	0.380	0.551	0.877	1.29	2.00	2.86	3.97	5.97	8.63	12.57	17.51	23.97
J	30	0.179	0.280	0.413	0.581	0.879	1.29	1.98	2.83	3.91	5.86	8.47	12.36	17.24	23.58
K	35	0.170	0.264	0.388	0.535	0.847	1.23	1.87	2.68	3.70	5.57	8.10	11.87	16.65	22.91
L	40	0.179	0.275	0.401	0.566	0.873	1.26	1.88	2.71	3.72	5.58	8.09	11.85	16.61	22.86
M	50	0.163	0.250	0.363	0.503	0.789	1.17	1.71	2.49	3.45	5.20	7.61	11.23	15.87	22.00
N	75	0.147	0.228	0.330	0.467	0.720	1.07	1.60	2.29	3.20	4.87	7.15	10.63	15.13	21.11
O	100	0.145	0.220	0.317	0.447	0.689	1.02	1.53	2.20	3.07	4.69	6.91	10.32	14.75	20.66
P	150	0.134	0.203	0.293	0.413	0.638	0.949	1.43	2.05	2.89	4.43	6.57	9.88	14.20	20.02
Q	200	0.135	0.204	0.294	0.414	0.637	0.945	1.42	2.04	2.87	4.40	6.53	9.81	14.12	19.92
		.065	.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50	10.00	15.00	
		Acceptability Quality Levels (tightened inspection)													

All AQL and table values are in percent defective.

↓ Use first sampling plan below arrow, that is, both sample size as well as M value. When sample size equals or exceeds lot size, every item in the lot must be inspected.

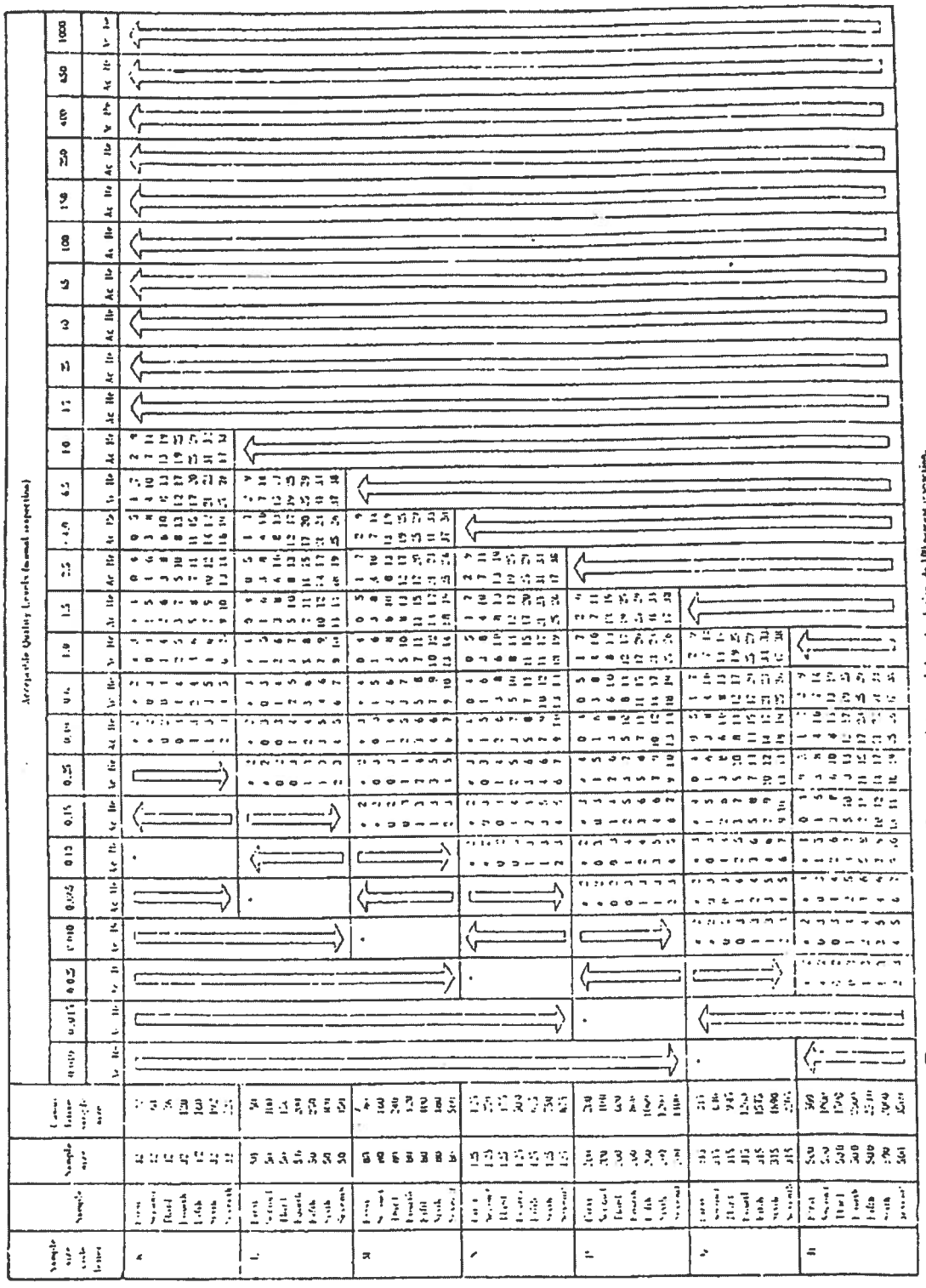
Schedule 1


APPENDIX 2 TO EXHIBIT "A" - Operating Characteristic Curves
For Sample Size Of 50 Units.
AQL = 2.5%
Method Of Variables
Probability Of Accepting A Lot
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
1
2
3
4
5
6
7
8
9
10
% Distorted In Submitted Lots
% Of Distorted Units Expected To Result In Lots Considered

APPENDIX 3 TO EXHIBIT "A"

TABLE IV-A — Multiple sampling plans for normal inspection (Master table)
(Continued)

(See 9.4 and 9.5



MULTIPLE
NORMAL

Probability Of Accepting A Lot
% Distorted In Submitted Lots
% Of Distorted Units Expected To Result In Lots Considered

Schedule 1

Exhibit B

MISSOURI SYSTEM METER BREAKDOWN

1973

MFG. & TYPE	GROUP	TOTAL NO.	SAMPLE LOT	SAMPLE SIZE
Sangamo HF	1	13	This group has been retired.	
Sangamo J	2	54050	5405	50
Sangamo J2	3	45283	4528	50
Sangamo J3	4	42873	4287	50
West. CA & CS	5	26675	2668	40
West. DS	6	77387	7739	50
West. D2S	7	22745	2274	40
West. D3S	8	32725	3272	50
Duncan MF	9	25736	2754	40
Duncan MK	10	25302	2530	40
Duncan MQ	11	39950	3995	50
GE I30	12	11045	1104	35
GE I50	13	32310	3231	50
GE I55	14	26267	2627	40
GE I60	15	57496	5750	50
West. CA & CS	16	62952	6295	50
Duncan MS	17	13936	1394	40
GE I70	18	27017	2702	40
Sangamo J4S	19	7865	786	30
Duncan D4S	20	24223	2422	40
Total		657,650	65,763	835

STATE OF MISSOURI

OFFICE OF THE PUBLIC SERVICE COMMISSION

I have compared the preceding copy with the original on file in this office and I do hereby certify the same to be a correct transcript therefrom and the whole thereof.

WITNESS my hand and seal of the Public Service Commission, at Jefferson City, this 12th day of March 1975.

Robert L Blanco

Secretary

STATE OF MISSOURI
PUBLIC SERVICE COMMISSION

At a session of the Public Service Commission held at its office in Jefferson City on the 11th day of September, 2001.

In the Matter of the Application of Union Electric Company, d/b/a AmerenUE, for an Order to Approve a Change to the Single-Phase Meter Testing Standard Under Which AmerenUE Currently Performs Its Single-Phase Meter Testing.	)))))	**Case No. EO-2001-521**

ORDER GRANTING VARIANCE

This order grants Union Electric Company d/b/a AmerenUE a variance of Commission Rule 4 CSR 240-10.030(28), to continue its sampled meter testing program, and granting AmerenUE permission to adopt the ANSI Standards as a basis for its sample meter testing procedure. AmerenUE filed an application for variance with the Missouri Public Service Commission requesting approval to change its statistical-sample-meter-testing standard on March 30, 2001.

In its application for variance, AmerenUE reported that it had previously sought and was given permission to depart from certain requirements of Rule 32 of the Commission's General Order No. 20 (a variance) regarding the testing of electric service watt-hour meters on March 12, 1975. That rule required that every electrical service watt-hour meter in Missouri be periodically tested by the electric corporation furnishing the meter. AmerenUE was authorized to utilize a standardized statistical sampling technique that incorporated the mathematical principles of Statistical Quality Control as set forth in published standards of the United States Military establishments and other governmental agencies

(MIL Standards). AmerenUE stated that the testing schedules required previously under Rule 32 are now codified in Commission Rule 4 CSR 240-10.030(28).[1]

On March 30, 2001, AmerenUE filed its request for variance to change its single-phase watt-hour meter statistical-sample-testing standard. AmerenUE requested approval to change from the MIL Standards currently used by AmerenUE as a means of testing the company's single-phase watt-hour meters to the American National Standard Institute *Sampling Procedures and Tables for Inspection by Attributes and by Variables* (ANSI Standards). AmerenUE stated that the ANSI Standards are essentially a modernization of the MIL Standards. AmerenUE further stated that the company's testing procedure will remain the same in all other aspects as approved by the Commission in its March 12, 1975 order. AmerenUE further stated that the change from the MIL Standards to the ANSI Standards will not result in any additional cost to its electric customers, will not result in the reduction of meters tested and will not change the accuracy of the meter testing procedures.

AmerenUE stated that, in connection with the Illinois restructuring legislation, it was required to update its electric meter testing procedures in Illinois to incorporate the ANSI Standards. AmerenUE stated that employing the same testing procedures in both of the company's jurisdictions will reduce the administrative burdens of having to maintain and track two separate, but statistically identical, meter testing programs.

AmerenUE noted that the Commission had approved use of the ANSI Standards by other companies. AmerenUE also stated that the Commission approved its request to use

[1] Code of State Regulations, Effective May 16, 1968.

the ANSI Standards as a basis for its natural gas meter testing program on November 12, 1997, in Case No. GO-98-25. AmerenUE indicated that the change from MIL Standards to the ANSI Standards will not have any impact on the procedure used by the company for testing meters upon the receipt of a customer complaint.

On August 29, 2001, the Staff of the Commission filed its response recommending that the Commission grant AmerenUE's request to continue sampled meter testing but to adopt the ANSI Sampling Procedures and Tables for Inspection by Attributes and by Variables[2] for selecting the number of meters to be tested in lieu of the Commission-authorized sampling criteria that AmerenUE is presently using.

Staff stated that sampled testing of meters is utilized to ensure the accuracy of the meters as a whole. Staff noted that AmerenUE recently converted to automatic meter reading, which required the placement of modules in meters and the testing and replacement of many of AmerenUE's existing meters. As a result, Staff indicated that AmerenUE now has a more homogenous group of meters in service across its system, which have recently been tested for accuracy. Staff also confirmed that each customer is allowed to verify the accuracy of their own meter by requesting the meter be tested at no charge, provided that the meter has not been tested within the last 12 months.[3] Staff stated that it has reviewed both the statistical sampling and testing procedures to test the accuracy of the electrical meters that AmerenUE now uses and the new proposed testing procedures. Staff recommended the Commission approve AmerenUE's request to continue sample meter testing and to change its sampling method to the ANSI Standards.

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[2] ANSI/American Society for Quality Control (ASQC) Z1.4 and ANSI/ASCQ Z1.9.

[3] Commission Rule 4 CSR 240-10.030(29).

The Commission has reviewed the application and Staff's recommendation. The Commission finds that, for good cause shown, AmerenUE's application to amend its variance, which is now a variance from Commission Rule 4 CSR 240-10.030(28), should be granted. Therefore, AmerenUE will be granted a variance to continue using sample meter testing, and to adopt the ANSI Standards as a basis for its single-phase, watt-hour meter testing procedure.

IT IS THEREFORE ORDERED:

1. That the application filed by Union Electric Company d/b/a AmerenUE on March 30, 2001, is granted.

2. That this order shall become effective on September 21, 2001.

3. That this case may be closed after September 22, 2001.

BY THE COMMISSION

Dale Hardy Roberts

Dale Hardy Roberts
Secretary/Chief Regulatory Law Judge

(S E A L)

Simmons, Ch., Murray, Lumpe,
and Gaw, CC., concur.

Register, Regulatory Law Judge

ALJ/Secretary: Register Hoper

Date Circulated: 9-6

CASE NO.: EO-2001-521

Simmons, Chair: KS

Murray, Commissioner

Lumpe, Commissioner

Gaw, Commissioner

Commissioner

Agenda Date: 9-11

Action taken: 4-0 AS

Must Vote Not Later Than

STATE OF MISSOURI

OFFICE OF THE PUBLIC SERVICE COMMISSION

I have compared the preceding copy with the original on file in this office and I do hereby certify the same to be a true copy therefrom and the whole thereof.

WITNESS my hand and seal of the Public Service Commission, at Jefferson City, Missouri, this 11th day of Sept. 2001.

Dale Hardy Roberts

Dale Hardy Roberts
Secretary/Chief Regulatory Law Judge

STATE OF MISSOURI

John R. Ashcroft
Secretary of State

CORPORATION DIVISION
CERTIFICATE OF GOOD STANDING

I, JOHN R. ASHCROFT, Secretary of State of the State of Missouri, do hereby certify that the records in my office and in my care and custody reveal that

AMEREN CORPORATION
00414845

was created under the laws of this State on the 7th day of August, 1995, and is in good standing, having fully complied with all requirements of this office.

IN TESTIMONY WHEREOF, I hereunto set my hand and cause to be affixed the GREAT SEAL of the State of Missouri. Done at the City of Jefferson, this 19th day of August, 2019.

Secretary of State

Certification Number: CERT-08192019-0115

VERIFICATION

STATE OF MISSOURI)
) SS
CITY OF ST. LOUIS)

Mark C. Birk, being duly sworn on oath, deposes and says that he is Senior Vice President, Customer and Power Operations for Union Electric Company d/b/a Ameren Missouri, that he has read the foregoing *Application and Request for Variance*, knows the contents thereof, and that the information contained in that *Application and Request for Variance* is true and correct to the best of his knowledge and belief.

UNION ELECTRIC COMPANY
D/B/A AMEREN MISSOURI

BY: _____
Mark C. Birk

Subscribed and sworn to before me, the undersigned Notary Public in and for the county and state aforesaid, on the 21st day of August, 2019.

_____
Notary Public

My Commission expires:

GERI A. BEST
Notary Public - Notary Seal
State of Missouri
Commissioned for St. Louis County
My Commission Expires: February 15, 2022
Commission Number: 14839811