Exhibit No.:
Issue(s): *Meters*
Witness: *Claire M. Eubanks, PE*
Sponsoring Party: *MoPSC Staff*
Type of Exhibit: *Rebuttal Testimony*
Case No.: *GR-2022-0179*
Date Testimony Prepared: *October 7, 2022*

MISSOURI PUBLIC SERVICE COMMISSION

INDUSTRY ANALYSIS DIVISION

ENGINEERING ANALYSIS DEPARTMENT

REBUTTAL TESTIMONY

OF

CLAIRE M. EUBANKS, PE

SPIRE MISSOURI, INC., d/b/a SPIRE

CASE NO. GR-2022-0179

Jefferson City, Missouri
October 2022

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CASE NO. GR-2022-0179

EXECUTIVE SUMMARY

Q. Please state your name and business address.

A. My name is Claire M. Eubanks, and my business address is 200 Madison Street, Jefferson City, MO 65102.

Q. Are you the same Claire M. Eubanks, P E who provided Revenue Requirement Direct Testimony, filed August 31, 2022 in this case?

A. Yes.

Q. What areas will you be addressing in this testimony?

A. I will respond to the Direct Testimony of Office of the Public Counsel (OPC) witnesses Dr. Geoff Marke regarding his meter disallowance recommendation, and Mr. John Robinett's discussion of the increase in net plant related to mechanical meters and meter installations. Additionally, I make corrections to meter adjustments that were proposed by Staff in Direct Testimony.

Q. Are there multiple issues related to meters discussed in your testimony?

A. Yes. Meter issue 1 relates to the premature replacement of diaphragm meters with ultrasonic meters. Staff and OPC both recommended a disallowance in Direct Testimony regarding this issue. Meter issue 2 is Staff's perspective on why Mr. Robinett is observing an increase in net plant in the mechanical meters and meter installation accounts and

Staff's proposed disallowance recommendation to correct the issue. Meter issue 3 relates to concerns with Spire Missouri's compliance with periodic meter testing rules and related variances.

METER ISSUE 1 – PREMATURE METER REPLACEMENT

Q. Fundamentally, do Staff and OPC agree there is an issue related to Spire Missouri's premature replacement of diaphragm meters with ultrasonic meters?

A. Yes, however, Staff and OPC disagree on how to determine a disallowance amount. OPC's recommendation is to disallow the remaining balance and the return on the diaphragm meters based on the remaining service life of the meters. Dr. Marke presents three options for the Commission to base a disallowance on:

> (1) Disallow diaphragm meters that were replaced with less than 30 years in service,
>
> (2) Disallow diaphragm meters that were replaced with less than 18.8-22.2 years in service[1], or
>
> (3) Disallow diaphragm meters that were replaced with less than 10 years in service (consistent with the Commission's Report & Order in GR-2021-0108).[2]

Dr. Marke recommends that option 2 is a just and reasonable outcome for ratepayers and shareholders.[3] In contrast, Staff based its recommended disallowance with consideration of the Commission's decision in the last case which was to disallow recovery of 26% of the

[1] 18.8 years for Spire Missouri East and 22.2 years for Spire Missouri West.
[2] Direct Testimony of Dr. Geoff Marke, page 5, lines 9-15.
[3] Direct Testimony of Dr. Geoff Marke, page 5, lines 17-20.

ultrasonic meters due to Spire Missouri's failure to demonstrate the replacements were just and reasonable. The facts are the same here as they were in GR-2021-0108, Spire Missouri has still not applied for an ultrasonic meter replacement program. Spire Missouri has again not provided evidence whether replacement of meters less than 10 years old is justified in all instances. In this case, there are further concerns raised by Staff and OPC regarding property records and meter count discrepancies (i.e. Meter Issue 2 and Meter Issue 3).

Q. Does Staff agree that Dr. Marke's option 2 is a just and reasonable resolution to this issue?

A. Not necessarily. Dr. Marke is relying on Spire Missouri's testimony from the last rate case regarding the average service life of diaphragm meters.

Q. How did Spire Missouri calculate the average service life of meters in its last case?

A. In GR-2021-0108, Transcript Volume XI, page 230, James Rieske testified that diaphragm meters in Spire Missouri East have an average life of 18.8 years and for Spire Missouri West the average life is 22.1 years. Spire Missouri provided the calculation and data used to determine the average service lives in response to Staff Data Request No. 0366 in this case. The data provided in response to Data Request No. 0366 included only diaphragm meters less than 425 CFH[4] (vintage 1977-2009) for Spire Missouri East. The average service life for Spire Missouri West meters is reflective of meters sized less than 800 CFH (vintage 1971-2009).

Q. Does Spire Missouri's current meter population include pre-1970s era meters?

[4] Maximum flow in cubic feet per hour at 7-inches of water column.

A. Apparently. Spire Missouri East's continuing property record ("CPR") includes meters of vintages 1935 through 2022 and Spire Missouri West's CPR includes meters of vintages 1951 through 2022. However, Staff is aware there is a discrepancy between the number of meters on the books and records compared to the current meter population in service in the field. Further, Spire Missouri represents that it used the meter sampling groups to perform the average service life calculation. This would seemingly indicate Spire Missouri is not meter testing pre-1970s era meters. I will further discuss both of these issues later in this testimony.

Q. Does Spire Missouri's meter population include other types of meters besides diaphragm and ultrasonic meters?

A. Yes. Spire Missouri's meter population consists of diaphragm meters (5 different manufacturers), rotary meters (3 different manufacturers), turbine meters (unknown manufacturer), and the new ultrasonic meters (1 manufacturer). The meter population consists of various meter sizes and vintages of meters. Spire Missouri has recorded its ultrasonic meters to FERC subaccount 381.1 so these meters are easily separable from the other meter types in its continuing property record. However, all other meters (diaphragm, rotary, and turbine meters) are recorded in FERC account 381. For Spire Missouri East, account 381 also includes the meter installation costs. For Spire Missouri East, meter installations are recorded in FERC account 382.

Q. Did Dr. Marke provide a valuation for a specific disallowance related to the stranded meters?

A. No.

Q. Did Staff provide a valuation for a specific disallowance related to the stranded meters?

A. Yes. In Direct Testimony, Staff recommended that the Commission disallow the recovery of 7.5% of the smart meter account and 8.9% of the associated smart meter installations.[5] Resulting in the following adjustments:

	Spire Missouri East	Spire Missouri West
Account 381.1 – Smart Meters (Plant)	($1,509,161)	($445,823)
Account 382.1 – Smart Meter Installations (Plant)	($445,823	($509,910)
Account 381.1 – Smart Meters (Reserve)	($42,215)	($260,228)
Account 382.1 – Smart Meter Installations (Reserve)	($12,116)	($108,880)

Q. Do you have any corrections to your Direct Testimony?

A. Yes. In Direct Testimony, Staff recommended that the Commission disallow the recovery of 7.5% of the smart meter account and 8.9% of the associated smart meter installations.[6] This represents meter exchanges in two categories:

(1) Systematic meter exchanges where the existing meter is less than 10 years old; and

(2) Systematic meter exchanges where Spire Missouri did not provide the age of the meter.

In response to Staff Data Request No. 0289.1 Spire Missouri provided the approximate age for over half of the previously undocumented meters. Additionally, I found an error in my workpaper that pulled an incorrect value from the continuing property record. With this correction and update, Staff is recommending a 6.15% disallowance from FERC account 381.1 and an 8.3% disallowance from FERC account 382.1 for Spire Missouri East and Spire Missouri West. Staff witness Lisa M. Ferguson has included these specific adjustments in Staff's rebuttal accounting schedules.

[5] Eubanks RR Direct, page 3, lines 4-6.
[6] Eubanks RR Direct, page 3, lines 4-6.

METER ISSUE 2 – NET PLANT INCREASE CORRECTION

Q. What other issues related to meters do OPC witnesses raise?

A. Both Dr. Marke and Mr. Robinett discuss an issue related to the undepreciated meter balance which was raised in the last case. Specifically, the Commission's Report and Order in the last Spire Missouri rate case stated:

> Lastly, the Commission is presented in this case with evidence that the real-world life expectancy of Spire Missouri's diaphragm meters is falling short of the historical life expectancy of diaphragm meters assigned for depreciation purposes. Stranded assets result when a meter with expected life is replaced earlier than the expiration of its expected service life. Although it came to light during testimony regarding ultrasonic meters, this situation of stranded assets was not created by the introduction of ultrasonic meters. Because the stranded assets issue was discovered tangential to another issue in the case, it did not receive sufficient attention from the parties for the Commission to make an informed finding. Therefore, the Commission will allow the evidence on this issue to continue to develop and will look forward to Spire Missouri's proposed solution in its next rate case.[7]

Q. Did Staff raise the issue of the undepreciated meter balance in its Direct Testimony?

A. Yes. Staff Witness Lisa M. Ferguson discussed meters remaining on the books and records when those meters are no longer in-service.[8] Staff Witness Sarah L.K. Lange discussed the discrepancy between the number of meters recorded in Spire Missouri East's CPR and active customers.[9] I also noted the issue in my Direct Testimony.[10]

Q. On page 13, line 10 of his Direct Testimony Mr. Robinett discusses his observation that the net plant for the mechanical meter and installation accounts are increasing in a way that he would not expect, do you agree?

[7] GR-2021-0108, Amended Report and Order, page 63.
[8] Ferguson RR Direct, page 35, lines 3-6.
[9] Lange RR Direct, page 11.
[10] Eubanks RR Direct, page 8, lines 2-6.

A. Yes. Staff expects that part of the reason Mr. Robinett is observing an increase in net plant in the mechanical meter and installation accounts is related to the issue of meters remaining on the books and records when those meters are no longer in-service.

Q. Would a disallowance to net rate base in this case be appropriate to address the concerns Staff and OPC raised related to apparent excess meters and/or failure to adequately record retirements?

A. Yes. The long term solution is that Spire Missouri work diligently to correct its CPR and related account balances, and that it accurately record retirements and plant additions going forward. However, in this case it is reasonable for the Commission to order an adjustment so that Spire Missouri is not rewarded by continuing to earn a return on plant that has been retired, or that has been effectively retired in place.

Q. How would Staff quantify a disallowance for Spire Missouri East?

A. Spire Missouri East's CPR includes 811,890 meters sized less than 300 CFH[11] (primarily used to serve Residential and Small General Service customers). In response to Staff Data Request Nos. 0242 and 0296, Spire Missouri East reports 674,252 active meters sized less than 300 CFH (including recently replaced ultrasonic meters). Additionally, Spire Missouri East notes that it maintains on average 30,000 meters in inventory.[12] Therefore, it is reasonable to conclude that Spire Missouri East has approximately 107,638 excess meters that are reflected in its rate base, but have either been retired or effectively retired in place.

[11] Includes ultrasonic meters

[12] Response to Staff Data Request No. 0302. "The Ultrasonic meter requires no additional materials or supplies to install and operate that are different than what is required for the diaphragm meter it replaced. The inventory changes every day and is not recorded in a way that allows for a simple calculation of the outstanding inventory by month. Spire has established a regular delivery schedule that delivers meters virtually every month in each region. The goal has been to maintain 3 to 6 months of inventory in each region. Missouri East has averaged 30,000 meters in inventory and Missouri West has averaged approximately 25,000."

In reviewing Spire Missouri East's CPR, 3,132 meters, with a book value of $28,915, have a vintage of 1945 or earlier. To be conservative in valuing this disallowance, we will first remove these 3,132 meters at their book value, offset by a proportionate share of the reserve.

Q. Why is it reasonable to first remove the meters with a vintage of 1944 or earlier?

A. In Spire Missouri's most recent depreciation study, for account 381, the selected survivor curve indicates that by about 70 years there would be zero percent surviving. The survivor curve is attached as Schedule CME-r1.

Q. What is the next step in quantifying the disallowance?

A. To value the remaining 104,506 excess meters, Staff used a $/Meter value of approximately $146 for non-smart meters operating at less than 300 Ccf. This represents the average meter and installation cost since 1945. The product is also offset by a proportionate share of reserve.

Q. Please summarize the results of this estimate for Spire Missouri East.

A. The table below provides the resulting adjustment for Spire Missouri East for Account 381.000.

Summary of Excess Meters Adj. Spire East	Plant	Reserve	Net
Adjustment 1 (pre-1945 meters)	$ (28,915)	$ (7,308)	$ (21,607)
Adjustment 2 (Remaining Excess meters)	$ (15,293,840.43)	$ (3,865,292.82)	$ (11,428,547.61)
Total:	$ (15,322,755)	$ (3,872,601)	$ (11,450,155)

Q. How would Staff quantify a disallowance for Spire Missouri West?

A. Comparing the number of undepreciated meters less than 300 CFH reflected in the CPR to the number of meters reported in Data Request No. 0242 and Data Request No. 0296, results in 18,090 excess meters. For Spire Missouri West, there are no pre-1945 era meters. The average cost per meter (less than 300 CFH) for Spire Missouri West is $55.01.

However, the average installation cost is less clear because Spire Missouri West does not separate the installation cost by meter size except for rotary meters. Staff assumed an average installation cost of $196.33 based on the CPR activity related to non-rotary meters.

Q. Please summarize the results of this estimate for Spire Missouri West.

A. The table below provides the resulting adjustments for Spire Missouri West for Account 381.000 and Account 382.000.

Summary of Excess Meters Adj. Spire West	Plant	Reserve	Net
Adjustment 1 (Excess meters - 381)	$ (995,151.81)	$ (146,710.96)	$ (848,440.85)
Adjustment 2 (Installation cost - 382)	$ (3,551,644.75)	$ (1,656,691.67)	$ (1,894,953.08)
Total:	$ (4,546,797)	$ (1,803,403)	$ (2,743,394)

Q. Does Staff recommend that the Commission order Spire Missouri to improve the accuracy of plant and account records related to meters and meter installations?

A. Yes. In Direct Testimony, Staff Witness Sarah L.K. Lange recommended that Spire Missouri should improve the accuracy of plant and accounting records concerning meters for both utilities.[13] Staff recommends the Commission order Spire Missouri to improve the accuracy of plant and accounting records concerning meters and meter installations, specifically Spire Missouri should:

- Separate the meter and meter installation costs for Spire Missouri East currently recorded in account 382;
- Identify meter installation costs by meter type for Spire Missouri West and continue to identify meter installation costs by meter type for Spire Missouri East;
- Ensure that retirements, including retirements in place to the extent some meters may be effectively abandoned, are accurately reflected in the CPRs. Note Staff is not recommending a practice of retiring meters in place and

[13] CCOS Direct Testimony of Sarah L.K. Lange, page 2, lines 11-12.

recommends that Spire Missouri maintain records outside of the CPR of the location and status of any such meters and related infrastructure;

- Ensure consistency going forward on how installations such as fixtures or vaults are recorded; and
- Ensure consistency going forward on how the capitalized expense associated with the act of meter placement is recorded.

METER ISSUE 3 – METER TESTING COMPLIANCE

Q. Previously you mentioned that it appears Spire Missouri is not meter testing pre-1970s era meters. Please explain.

A. Spire Missouri provided the calculation and data used to determine the average meter service lives (18.8 and 22.2 years) in response to Staff Data Request No. 0366 in this case and explained the source as follows:

> At the conclusion of the 2018 sample programs, Spire conducted a comprehensive review of our meter populations. This was done as part of the overall study that was being performed on next generation metering and meter reading systems. Every region had their own version of a meter sampling and testing program. The purpose was to evaluate how the program affected the age of the population of meters in service, the accuracy of those meters when tested and the impact of the age on the work required to maintain and repair them. In the attached workbook, there are tabs that summarize the sample programs for all Spire regions and the accuracy testing for the 2018 programs that document the average age of the populations by region. I have added data from the end of the 2018 program year that was used to calculate the average age of the Missouri populations. This shows how the average age shown in the summary was calculated.

The data includes only diaphragm meters less than 425 CFH (vintage 1977-2009) for Spire Missouri East. The average service life for Spire Missouri West meters is reflective of meters sized less than 800 CFH (vintage 1971-2009). As discussed earlier in this testimony, Spire Missouri East's CPR includes meters of vintages 1935 through 2022 and

Spire Missouri West's CPR includes meters of vintages 1951 through 2022. Further, the existing diaphragm meter population consists of various meter sizes from 150 CFH to 43,000 CFH (response to Staff Data Request No. 0323 (Schedule CME-r2).

Q. Please explain the meter sampling programs.

A. Spire Missouri's predecessors were granted variances by the Commission in GO-91-353 (Spire Missouri West) and GO-95-320 (Spire Missouri East) to allow statistical meter sampling for diaphragm meters rather than test every meter every 120 months as required by Commission rules. The variances are also reflected in Spire Missouri's rules and regulations, Sheet R-8.[14]

The sampling programs presented in GO-91-353 and GO-95-320 (attached as Schedule CME-r3 and Schedule CME-r4) are similar in many ways but have some key differences. One major difference is that Spire Missouri East's program requires failed meter groups to be replaced over so many years based on the annual accuracy rate whereas Spire Missouri West would increase sample testing based on the annual accuracy rate.

The variance does not require sampling of meters with an age less than 10 years provided there is a manufacturer's proof test on file. The sampling programs as presented in the variance cases require all rotary meters, turbine meters, and other older meter types to be tested every 120 months.

Q. How many active meters does Spire Missouri have?

[14] "9. Meter Tests. Meters are the property of the Company and shall be subject to testing in accordance with the statistical sampling authorized by the Commission in Case No. GO-91-353 for Spire West and in Case No. GO-95-320 for Spire East in which the Commission granted a variance from the requirements of 20 CSR 4240-10.030(19) relating to the removal, testing and inspection of gas meters."

A. Spire Missouri East has 661,007 active meters in total and Spire Missouri West has 530,998.[15] Note the values used in the disallowance calculation discussed earlier in testimony are only meters sized less than 300 CFH.

Q. How many meters did Spire Missouri include in its total population used to determine its statistical samples?

A. For the 2021 sampling year, Spire Missouri East included 368,787 meters in its total population and Spire Missouri West included 296,518 meters. While not all meters are part of the statistical sampling program, it is not clear that Spire Missouri is accurately reflecting its total meter population in its sampling program.

Q. Can you provide an example?

A. Yes. Spire Missouri East reports 619,003 active meters sized less than 300 CFH in response to Data Request No. 0242 (excluding ultrasonic meters). Based on the CPR, 137,285 meters of this size are less than 10-years of age. Netting the 619,003 active meters with the meters that are excluded from the periodic meter testing requirement results in at least 481,718 meters that should be included in the total meter population used to determine the statistical sample. However, for the 2021 sampling year, Spire Missouri East included 358,804 meters less than 300 CFH in its total population (and then sampled a percentage of those meter groups per the variance sampling plan). In other words, 25% of the active meters that were eligible for periodic meter testing appear to be excluded from the total meter group populations used to determine the statistical sample.

Q. What is Staff's recommendation regarding periodic meter sampling?

[15] Response to Staff Data Request No. 0242.

A. Spire Missouri should reevaluate its meter testing policies and procedures to ensure that accurate records of its entire meter population are being maintained. These records should be used to determine which meters fall into its statistical meter sample plan or in the 120-month periodic sampling required by Commission rules. Additionally, to the extent Spire Missouri plans to deviate from the sampling programs in GO-91-353 and GO-95-320, it should first seek Commission approval.

Q. Does this conclude your rebuttal testimony?

A. Yes it does.

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of Spire Missouri, Inc. d/b/a Spire's Request for Authority to Implement a General Rate Increase for Natural Gas Service Provided in the Company's Missouri Service Areas	)))))	Case No. GR-2022-0179

AFFIDAVIT OF CLAIRE M. EUBANKS, PE

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW CLAIRE M. EUBANKS, PE and on her oath declares that she is of sound mind and lawful age; that she contributed to the foregoing *Rebuttal Testimony of Claire M. Eubanks, PE*; and that the same is true and correct according to her best knowledge and belief.

Further the Affiant sayeth not.

Claire M Eubanks
CLAIRE M. EUBANKS, PE

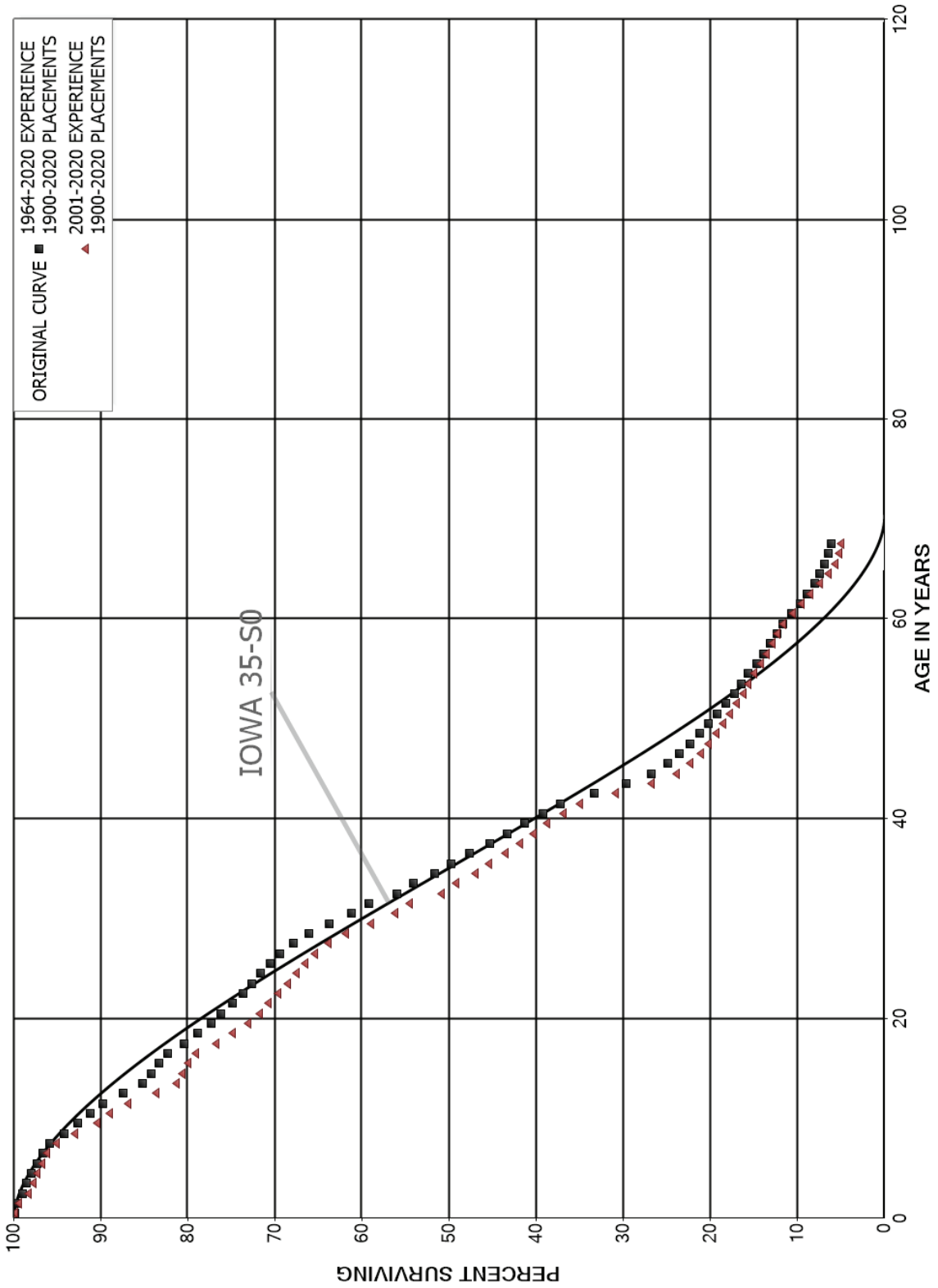
JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 5th day of October 2022.

D. SUZIE MANKIN
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: April 04, 2025
Commission Number: 12412070

D Suzie Mankin
Notary Public

SPIRE MISSOURI, INC.
ACCOUNT 381.00 METERS
ORIGINAL AND SMOOTH SURVIVOR CURVES



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Spire Missouri
GR-2022-0179

Response to Data Request 0323

Question:

Description: (1) Please provide a list of all meter types by meter model and manufacturer that are currently in use. (2) Provide all available specification sheets for each of the meter types identified in part 1. (3) Does Spire Missouri have an established meter standard for residential customers? Please provide a complete description. (4) Does Spire Missouri have an established meter standard for commercial and industrial customers? Please provide a complete description. Claire Eubanks (claire.eubanks@psc.mo.gov)

Response:

(1) Below is a list of meters currently in service in Spire Missouri. Many of these meter types have not been purchased in years. Each meter indicates the capacity, manufacturer, and type of meter. The meter types currently being purchased under the meter standards are bolded and shaded in Gray.

Meter Type	Max Flow @ 7-inches (CFH)	Meter Manufacturer	Meter Type
00EMCO-R	175	Rockwell	Diaphragm
0-R	150	Rockwell	Diaphragm
1.5M-A	1500	American	Diaphragm
1.5M-D	1500	Dresser	Rotary
10000-R	5000	Rockwell	Diaphragm
1000-A	1000	American	Diaphragm
1000-R	1000	Rockwell	Diaphragm
10100-A	5000	American	Diaphragm
102M-D	102000	Dresser	Rotary
10X30-V	8000		
11000-O	**11000**	**Romet**	**Rotary**
11C-A	1100	American	Diaphragm
11C-D	1100	Dresser	Rotary
11M-A	11000	American	
11M-D	11000	Dresser	Rotary
1200-A	1200	American	Diaphragm
1400-A	1400	American	Diaphragm
1500-O	**1500**	**Romet**	**Rotary**
15C-D	1500	Dresser	Rotary

16000-O	**16000**	**Romet**	**Rotary**
1600-R	800	Rockwell	Diaphragm
16M-A	16000	American	
16M-D	16000	Dresser	Rotary
16M-O	**16000**	**Romet**	**Rotary**
175-A	175	American	Diaphragm
175-N	175	National	Diaphragm
175-R	175	Rockwell	Diaphragm
175-S	175	Sprague	Diaphragm
2.5IC-R	950	Rockwell	Diaphragm
2000-O	**2000**	**Romet**	**Rotary**
200-R	200	Rockwell	Diaphragm
225-A	225	American	Diaphragm
225-R	225	Rockwell	Diaphragm
23000-O	**23000**	**Romet**	**Rotary**
2300-A	2300	American	Diaphragm
23M-D	23000	Dresser	Rotary
240-S	240	Sprague	Diaphragm
25000-O	**25000**	**Romet**	**Rotary**
250-A	250	American	Diaphragm
250IC-A	3000	American	Diaphragm
250-N	250	National	Diaphragm
250-R	250	Rockwell	Diaphragm
250-S	250	Sprague	Diaphragm
250-S	**250**	**Sprague (Itron)**	**Ultrasonic**
250T-A	250	American	Diaphragm
275-R	275	Rockwell	Diaphragm
2M-A	2000	American	Diaphragm
2M-D	2000	Dresser	Rotary
3.5M-A	3500	American	Diaphragm
3000-O	**3000**	**Romet**	**Rotary**
3000-R	3000	Rockwell	Diaphragm
3100-A	3100	American	Diaphragm
35BIC-A	650	American	Diaphragm
38000-O	**38000**	**Romet**	**Rotary**
38M-D	38000	Dresser	Rotary
3IC-R	2000	Rockwell	Diaphragm
3M-A	3000	American	Diaphragm
3M-D	3000	Dresser	Rotary
4.5IC-R	3500	Rockwell	Diaphragm

400-I	400	Sprague	Diaphragm
400-S	**400**	**Sprague**	**Diaphragm**
400T-S	400	Sprague	Diaphragm
415-R	415	Rockwell	Diaphragm
425-A	**425**	**American**	**Diaphragm**
4GTS-A	23000	American	
4IC-R	2500	Rockwell	Diaphragm
4X12-V	8800		Diaphragm
5.5M-A	5500	American	Diaphragm
5000-O	**5000**	**Romet**	**Diaphragm**
5000-R	5000	Rockwell	Diaphragm
500IC-A	4800	American	Diaphragm
56000-O	**56000**	**Romet**	**Rotary**
56M-D	56000	Dresser	Rotary
5A-S	1000	Sprague	Diaphragm
5B-A	150	American	Diaphragm
5EMCO-R	11000	Rockwell	Diaphragm
5M-A	5000	American	Rotary
5M-D	5000	Dresser	Rotary
5X15-V	16500		Diaphragm
6100-A	6100	American	Diaphragm
630-A	**630**	**American**	**Diaphragm**
6X18-V	23500		
7000-O	**7000**	**Romet**	**Rotary**
750-R	750	Rockwell	Diaphragm
7M-A	7000	American	
7M-D	7000	Dresser	Rotary
800-A	**800**	**American**	**Diaphragm**
80BIC-A	1200		Diaphragm
8C-D	800	Dresser	Rotary
8X24-V	43000		Diaphragm
T140-R	140000		Turbine
T60-R	60000		Turbine
(blank)			
Grand Total			

(2) The meters highlighted in Gray are meters currently being purchased for use under the Company Standard. The specification sheets for these meter types are attached.

(3) Attached is the Spire meter installation standard for meters with a capacity up to 800CFH. Meters with a capacity greater than 800 CFH fall under the large meter

standard provided in response to item 4. The attachment is confidential pursuant to 20 CSR 4240-2.135(2)(A)(7) as it relates to the security of company facilities.

(4) The formal standards are still regional. Spire has implemented a large meter standard for all newly installed meters, a description of which is attached. The final formal version of a Spire-wide large meter standard is still being developed.

Signed by: James Rieske

PROPOSED MISSOURI METER CHANGE PROGRAM

I. DEFINITIONS

A. **Accuracy Rate** (abbreviated as **AR**) - the percentage of a group of meters tested for accuracy and found to register within the accuracy limits of plus or minus 2% of 100% accuracy.

B. **Annual Test Rate** (abbreviated as **ATR**) - the percentage of a group of meters which shall be required to be tested for accuracy.

C. **Statistical Sample** - a random sample taken from a group of meters based on guidelines set forth in Military Standard MIL-STD 105 D Inspection by Attributes, General Inspection Level II, Single Sampling Plan for Normal Inspection.

D. **Meter** - a natural gas diaphragm type meter.

E. **Group** - meters of a particular type, make, and kind.

F. **Type** - tin case, iron and steel case, or aluminum case meter.

G. **Make** - the meter manufacturer.

H. **Kind** - the size of meter as identified by the manufacturer.

I. **Years in Service** - the number of years from the year the meter was set to the year the meter was removed.

J. **Slow** - greater than minus 2% accuracy.

K. **Fast** - greater than plus 2% accuracy.

L. **Check Flow** - a flow rate of 20% to 40% of the rated capacity of a meter.

M. **Open Flow** - a flow rate of 80% to 120% of the rated capacity of a meter.

N. **Proof** - The ratio comparison of the registered volume of a meter under test to the registered volume of a standard.

O. **Cap** - The maximum number of years a meter whose group is being statistically sampled can be continuously in service.

P. **Purchase Year** - The calendar year in which a meter was purchased from a manufacturer.

Q. **Rotary Meter** - a rotary type positive displacement meter.

R. **Turbine Meter** - an inferential type meter.

II. GENERAL

A. Except for meters removed from service specifically for known leakage, damage, tampering, or non registration, and meters that have been selected for retirement, all meters shall be tested for accuracy at both check flow and open flow "as found" prior to adjustment or repair. The meter accuracy shall be the sum of the open flow accuracy plus the check flow accuracy divided by two (2). This shall be referred to as the in-test accuracy. (Those meters which have been removed from service specifically for known leakage, damage, or non-registration shall be monitored annually using the existing Removal Reason Summarization Report, or equivalent, so that potential problems with certain meter types could be identified, even though the accuracy rate is acceptable.)

B. Prior to being placed in service, all meters shall be adjusted to an accuracy of

100%, within the limits of plus or minus 1%, at both check flow and open flow. The maximum allowable spread between the check flow and open flow accuracies shall be 1%.

C. Records shall be maintained for each group of meters and shall show the in-test accuracy of each group for the previous year. This in-test accuracy data shall be further divided into three (3) accuracy categories, with each expressed as a percentage of the group of meters, as follows: (1) greater than minus 2% accuracy (slow); (2) within plus or minus 2% accuracy (the **AR**); and (3) greater than plus 2% accuracy (fast). The in-test accuracy data shall be maintained per years in service, per purchase year, and per total meters tested in the group. When calculating the above accuracy categories, all fractions shall be rounded to the nearest whole number (0.5 and greater to be rounded up).

III. PERIODIC TEST REQUIREMENTS

A. Meters with a purchase year which indicates an age of ten (10) years or less are excluded from the Periodic Test Requirements provided they belong to a group having a history of excellent performance (**AR** = 90% or greater) and they have a manufacturer's proof test on file.

B. The previous years in-test accuracy data shall be examined for each group of meters each year. This examination and the subsequent calculation of the group's **AR** shall determine the following years change program for each

meter group. The previous one (1) year in-test accuracy data shall be compared as a reference to the previous three (3) years in-test results. Significant differences between the two accuracy rates will initiate further study of the data to ascertain the reason for the deviation. The previous one (1) year in-test accuracy will be used to drive the program.

C. An **AR** shall be calculated for each group of meters. Within each group, evaluation of the **AR**, the percentage slow, and the percentage fast shall be made for each year in service. Pursuant to this evaluation, Tables I & II shall be used to determine the quantity for meters to be brought in and examined during the following year for each group of meters.

D. Selecting a statistical sample from meter groups whose **AR** is at or above 90% will allow determination of the average accuracy of that entire group. When the **AR** of any group deteriorates to 89% or below, that group will be removed on a percentage basis as described in part E below. The meters required to be tested under the statistical sampling plan shall be selected by a random draw. A random number generator or like process shall be used to ensure that each meter in the group has an equal chance of selection. An additional 5% of the meters needed for a sample shall be selected to compensate for damaged, inaccessible, or for other reasons, invalid meters in the sample.

E. The number of meters required to be tested from meter groups whose **AR** is 89% or below (**ATR** times the number of meters in service) shall be satisfied

by:

1. Taking at least 80% of the number required from those meters longest in service without test, and
2. The remaining 20% may be made up of meters removed for other operating reasons (building torn down, in-active greater than 9 months, load change, etc.).

F. Meter groups with an **AR** of 59 or less will be removed and retired over a 5 year period.

G. If, within a group of meters, a particular purchase year group or lot can be identified from evaluation of test results which indicate an untimely performance degradation due to possible manufacturer's defect and is clearly not a condition brought on by age as compared to the other test years of the group the following action will be taken:

1. The particular purchase year group or lot will be further sampled as appropriate to verify above indications.
2. If confirmed, an accelerated removal program of this particular purchase year group or lot will be implemented.
3. In this instance the purchase year group or lot is not indicative of the overall meter group so the in-test data would be excluded so as to not unduly influence the overall meter group's **AR** rating.

H. As previously described, all meter groups whose accuracy has deteriorated to 89% or below will be removed on a percentage basis which will limit their

number of years in service. For each meter group whose AR is at or above 90% the maximum statistical sampling period shall be set at thirty (30) years. Previous years in-test accuracy data of the oldest meters for each of the past three (3) years shall be examined for each group of meters each year. This examination shall determine the need to adjust the cap of a meter group. The cap shall not be increased unless three (3) consecutive years of improved performance are observed and support that decision. Prior to raising the cap for a meter group, notification must be sent to the Missouri Public Service Commission Staff along with the supporting data for review. After forty five (45) days the increase shall be considered approved and KPL shall proceed unless the staff requests additional time or data for review.

I. Rotary meters shall be differential tested and turbine meters shall be spin tested to ensure proper operation, at least once every one hundred twenty (120) months.

TABLE I

PERFORMANCE DRIVEN PERCENTAGE TABLE

AR	ATR
90 - 100	Statistical Sample (See Table II)
85 - 89	7%
80 - 84	8%
75 - 79	9%
70 - 74	10%
60 - 69	15%
59 or less	20%

AR = Accuracy Rate
ATR = Annual Test Rate

TABLE II

STATISTICAL SAMPLING PLAN

Number of Meters Active in each Group	Sample Size
2 to 8	2
9 to 15	3
16 to 25	5
26 to 50	8
51 to 90	13
91 to 150	20
151 to 280	32
218 to 500	50
501 to 1200	80
1201 to 3200	125
3201 to 10000	200
10001 to 35000	315
35001 to 150000	500
150001 to 500000	800
500001 and over	1250

This table derived from Military Standard MIL-STD 105D, General Inspection Level II, Single Sampling Plan for Normal Inspection.

PROPOSED
LACLEDE GAS COMPANY
METER TESTING PROGRAM

I. DEFINITIONS:

A. Accuracy Rate (AR) - the percentage of a group of meters sampled for accuracy and found to register within the accuracy limits of plus or minus 2% of 100% accuracy, where test results are rounded to the nearest whole number (0.5 and greater to be rounded up).

B. Annual Sample - a random sample taken each year from a group of meters based on guidelines set forth in Military Standard MIL-STD 105D for inspection by attributes using General Inspection Level II (See Table II).

C. Check Flow - the flow rate at 20% to 40% of the meter's rated capacity.

D. Group - meters of a particular type, make, size, and years in service.

E. Intest Accuracy - the accuracy of a meter determined during its flow test following removal from operation and before repair or adjustment. It is the sum of the open flow accuracy plus the check flow accuracy divided by two (2).

F. Make - the manufacturer of the meter.

G. Meter - a positive displacement type gas meter.

H. Open Flow - the flow rate at 80% to 120% of the meter's rated capacity.

I. Percent Accuracy - the ratio comparison of the registered volume of a meter under test to the registered volume of a standard.

J. Random - a statistical method that ensures that any member of a population has the same probability of occurring (being selected) as any other member.

K. Set Year - the calendar year during which a meter was installed for a customer.

L. Size - the size of the meter as specified by the manufacturer.

M. Turbine Meter - a meter measuring mass flow rate by means of a vaned turbine.

N. Type - aluminum case, iron case, steel case, tin case, or other meter housing materials.

O. Year of Purchase - The calendar year in which a meter was purchased from a manufacturer.

P. Years In Service - the number of years between the year a meter was set and the year it was removed.

II. GENERAL:

A. With the exception of those meters removed from service specifically for known leakage, damage, tampering, noise, or non-registration, and meters that have been selected for retirement, all meters removed from service shall be tested for intest accuracy at check flow and at open flow prior to any adjustment or repair.

B. Meters passing intest accuracy within plus or minus 1% at both check flow and open flow rates and not requiring repair may be returned to service without further adjustment.

C. Meters requiring adjustment or repair shall be adjusted to within plus or minus 1% of 100% accuracy at the open flow and check flow rates before being returned to service.

D. Records shall be maintained for each group of meters, showing the overall intest accuracy of each group for each calendar year. This intest accuracy data should be organized into three (3) accuracy categories, with each expressed as a percentage of the group of meters, as follows:

1. More than 2% above 100% accuracy (fast).
2. From 2% above 100% accuracy to 2% below 100% accuracy.
3. More than 2% below 100% accuracy (slow).

The accuracy data shall be maintained by number of years in service, by year of purchase, and by total meters tested in the group. When calculating the above accuracy categories, all fractions shall be rounded to the nearest whole number (0.5 and greater to be rounded up).

III. PERIODIC TEST REQUIREMENTS:

A. Except for tin case, iron case, steel case, and certain older aluminum case meters, an annual sample will be selected each year for each meter group starting ten (10) years after the set year. The sample size will be determined in accordance with Table II. The sample will be selected at random. An additional 5% of the meters needed for an annual sample will be selected to compensate for meters that are damaged, inaccessible, leaking, or for other reasons should not be included in a sample.

B. The AR will be calculated for each sample. Pursuant to this evaluation, Table I shall be used to determine whether the group of meters will be subject to a changeout program the next year. When the AR for a group is 89% or below in the previous year, additional meters from the group will be removed so that the total meters removed for the year, including the statistical sample, will result in the changeout rates as determined in Table I.

C. The number of meters in a group that are required to be tested in any one year may be reduced by meters that have been brought in and intested for other reasons (building demolition, special request, size, etc.). The credit received for meters that have been removed for other reasons shall be limited to 20% of the meters that had been required to

be tested. The intest results of the meters credited as part of the sample will be included with the results from the random sample to determine the AR for the group of meters.

D. If, within a group of meters, a particular lot can be identified from evaluation of test results which indicates an untimely performance degradation due to possible manufacturer's defect and is clearly not a condition brought on by age as compared to the other members of the group, the following action will be taken:

1. The particular lot will be further sampled as appropriate to verify the above indications.

2. If confirmed, an accelerated removal program of this particular meter lot will be implemented.

3. In this instance the lot should not be included in the determination of the overall AR of the meter group, so the intest accuracy data will be excluded from the analysis.

E. For each group, the maximum statistical sampling period will be set at thirty (30) years.

F. Tin case, iron case, steel case, and certain older aluminum case meters are not included and will be removed, inspected, and tested at least once every one hundred twenty (120) months to ensure proper operation.

G. Turbine meters shall be tested at least once every one hundred twenty (120) months to ensure proper operation.

TABLE I

Performance Driven Changeout Table

Accuracy Rate	Rate of Changeout For a Meter Group
90 - 100	Annual Sample (See Table II)
80 - 89	Changeout Over 5 Years
70 - 79	Changeout Over 3 Years
60 - 69	Changeout Over 2 Years
59 or less	Changeout In 1 Year

TABLE II

Annual Sampling Plan

This table reflects the guidelines set forth by Military Standard MIL-STD 105D for Inspection by Attributes using:

General Inspection Level II
Single Sampling Plan for Normal Inspection

Size of Meter Group	Required Sample Size
2 - 8	2
9 - 15	3
16 - 25	5
26 - 50	8
51 - 90	13
91 - 150	20
151 - 280	32
281 - 500	50
501 - 1200	80
1201 - 3200	125
3201 - 10000	200
10001 - 35000	315
35001 - 150000	500