

Exhibit No.:
Issue(s): Reliability Metrics
Witness: Claire M. Eubanks
Sponsoring Party: MoPSC Staff
Type of Exhibit: Rebuttal Testimony
Case No.: ER-2019-0374
Date Testimony Prepared: March 3, 2020

MISSOURI PUBLIC SERVICE COMMISSION

INDUSTRY ANALYSIS DIVISION

ENGINEERING ANALYSIS DEPARTMENT

REBUTTAL TESTIMONY

OF

CLAIRE M. EUBANKS, PE

THE EMPIRE DISTRICT ELECTRIC COMPANY

CASE NO. ER-2019-0374

Jefferson City, Missouri
March 2020

1 **REBUTTAL TESTIMONY OF**

2 **CLAIRE M. EUBANKS, PE**

3 **THE EMPIRE DISTRICT ELECTRIC COMPANY**

4 **CASE NO. ER-2019-0374**

5 Q. Please state your name and business address.

6 A. Claire M. Eubanks and my business address is Missouri Public Service
7 Commission, P.O. Box 360, Jefferson City, Missouri, 65102.

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

9 A. I am employed by the Missouri Public Service Commission (“Commission”) as a
10 Utility Regulatory Engineer II in the Engineering Analysis Department, Industry
11 Analysis Division.

12 Q. What is the purpose of your testimony?

13 A. My testimony is to present additional information to the Commission regarding
14 Empire District Electric’s reliability metrics.

15 Q. What is reliability?

16 A. Reliability is the ability of the electric system to supply power at all times and
17 withstand sudden disturbances. Commission rule 20 CSR 4240-23.010 establishes reliability
18 monitoring and reporting requirements for the investor owned electric utilities, often referred to as
19 reliability metrics. Reliability metrics are used to assess the operational performance of the
20 distribution system in terms of reliability. These indices are affected by customer density, tree
21 density, geography, observed weather, and other factors that may be beyond the control of the
22 utilities. The reliability metrics¹ required by Commission Rule 23 are:

¹ The listed Reliability metrics are calculated with and without major storm events included per IEEE 1366-2003. IEEE is the Institute of Electrical and Electronic Engineers which develops industry standards.

1 SAIFI (System Average Interruption Frequency Index)

- 2 • A gauge for outage frequency
3 • $SAIFI = \frac{\text{Total number of customer interruptions for the period covered}}{\text{Total number of customers served}}$

4 CAIFI (Customer Average Interruption Frequency Index)

- 5 • A gauge for frequency of customer interruptions
6 • $CAIFI = \frac{\text{Total number of customer interruptions for the period covered}}{\text{Total number of customers affected}}$

7 SAIDI (System Average Interruption Duration Index)

- 8 • A gauge for outage duration
9 • $SAIDI = \frac{\sum \text{All customer interruption durations}}{\text{Total number of customers served}}$

10 CAIDI (Customer Average Interruption Duration Index)

- 11 • A gauge for average time to restore service
12 • $CAIDI = \frac{\sum \text{All customer interruption durations}}{\text{Total number of customers interrupted}}$

13 The investor-owned utilities are required to perform a worst performing circuit analysis per
14 20 CSR 4240-23.010(6). This analysis identifies the utility's top five percent (5%) worst
15 performing circuits by ranking the SAIFI values computed for each circuit. The annual reporting
16 requirements include reporting on actions taken or planned to improve the worst performing
17 circuits.

18 Q. Empire Witness Jeffrey Westfall discusses only two reliability metrics SAIFI and
19 SAIDI, are the other metrics required by Chapter 23 informative?

20 A. Yes. CAIFI and CAIDI are both commonly used reliability metrics. CAIDI is a
21 gauge for the average time to restore service and CAIFI is a gauge for the frequency of customer
22 interruptions for those customers who experienced at least one interruption.

23 Q. Can you explain the difference between SAIFI and CAIFI?

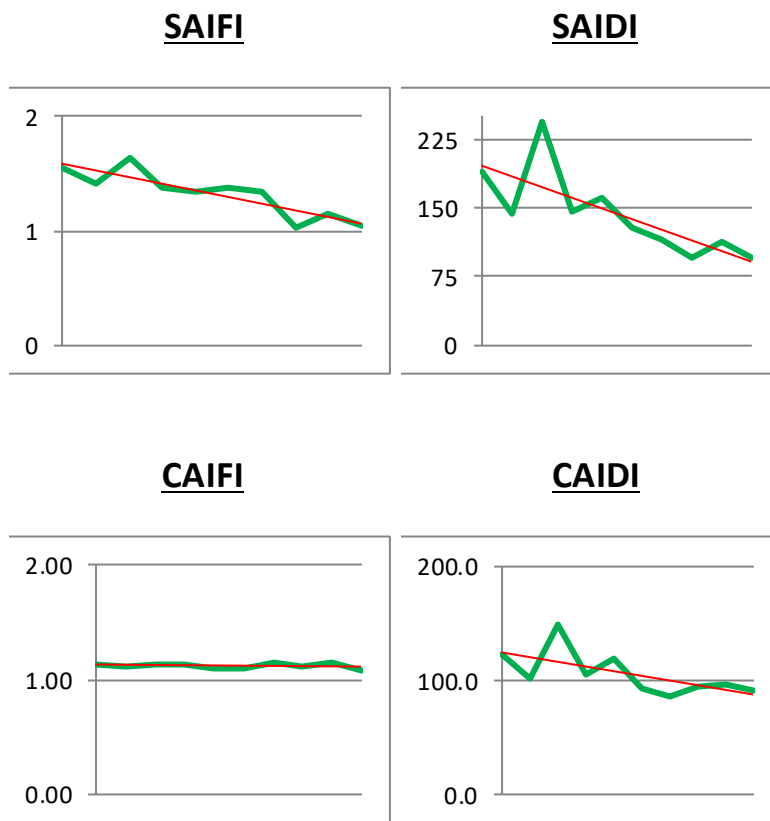
24 A. The metric SAIFI is a gauge for the frequency of outages on the entire system while
25 CAIFI considers only the customers who experienced one outage or more. For example, SAIFI

1 may state there were 1.3 interruptions per customer yet half of the total customers experienced no
2 outage. This means the remaining customers had an average of 2.6 outages per customer.²

3 Q. Please summarize Empire's reported reliability metrics over time.

4 A. The following graphs show the downward trend of the reported reliability metrics³
5 SAIFI, SAIDI, and CAIDI from 2008 through 2018. Additionally, Empire reports monthly CAIFI,⁴
6 which averages approximately 1.11 interruptions per customer.

7



8

9

10 Q. Are there other reliability metrics commonly used in the industry?

² Willis, H.L. (2004). *Power Distribution Planning Reference Book*, Second Edition. Boca Raton, FL: CRC Press.

³ Adjusted to exclude major storm events.

⁴ It is Staff's understanding that Empire estimates CAIFI.

1 A. Yes. Other common reliability metrics are MAIFI (Momentary Average
2 Interruption Event Frequency Index), CEMI (Customers Experiencing Multiple Interruptions), and
3 CELID (Customers Experiencing Long Interruption Duration).

4 MAIFI provides an indication of the frequency of momentary outages at the system
5 level. Momentary interruptions are typically considered to be less than 5 minutes in duration. At
6 the time of Chapter 23 rulemaking, 2008, reporting of MAIFI would have been difficult for some
7 of the electric utilities to meet due to the lack of automated meter readings.

8 CEMI₅ and CELID₃ examine the performance at the customer level and are useful
9 for identifying projects which will most improve customer satisfaction. CEMI₅ measures the
10 percentage of customers experiencing five or more sustained interruptions in a year. CELID₃
11 measures the percentage of customers experiencing one or more interruptions of three hours or
12 more in a year.

13 Q. Were reliability issues discussed during the local public hearings?

14 A. Although, I did not personally attend the local public hearings in this case; it is my
15 understanding from the transcripts a few customers at the local public hearings expressed concerns
16 regarding the number of outages they have experienced or regarding vegetation maintenance.
17 Those concerns are being investigated as a part of this case. ** _____
18 _____

19 ** Additionally, two public comments in this case were related to the number
20 of power outages experienced.

21 Q. How many informal complaints have been filed over the past year regarding
22 reliability?

1 A. ** _____

2 _____ **

3 Q. Can you draw any conclusions based on the reliability data and the concerns raised
4 during the Local Public Hearings and public comments in this case?

5 A. Empire’s reliability metrics from 2008 through 2018 indicate that its system
6 reliability has improved over time. Despite improved system reliability, the customers
7 expressing reliability concerns may be experiencing more outages than the system average SAIFI
8 of 1.12 per year.⁵ Additionally, some customers may be experiencing momentary outages that
9 Empire is unable to track. Although interruptions, momentary or sustained, are upsetting to
10 customers, ** _____

11 _____ ** and Empire’s overall system reliability has continued to improve, therefore it
12 is unlikely there are widespread reliability issues.

13 Q. Does this conclude your testimony?

14 A. Yes.

⁵ Jeffrey Westfall Direct Testimony reported SAIFI of 1.12 for 2018.

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of The Empire District Electric)
Company's Request for Authority to File) Case No. ER-2019-0374
Tariffs Increasing Rates for Electric Service)
Provided to Customers in its Missouri)
Service Area)

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*; and that the same is true and correct according to her best knowledge and belief.

Further the Affiant sayeth not.

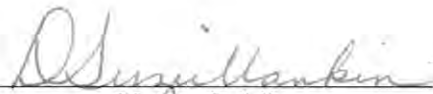


CLAIRE M. EUBANKS, PE

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 2nd day of March 2020.

D. SUZIE MANKIN Notary Public - Notary Seal State of Missouri Commissioned for Cole County My Commission Expires December 12, 2020 Commission Number: 12412070



Notary Public