



OKLAHOMA CORPORATION COMMISSION
REGULATED ELECTRIC UTILITIES
2021 RELIABILITY SCORECARD

May 1, 2021

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1.0 Introduction

The Reliability Scorecard (“Scorecard”) is being presented in accordance with Oklahoma Corporation Commission (“OCC” or “Commission”) Electric Utility Rules as provided in OAC 165:35-25, Part 3, Reliability of Service and Reliability Program. The reliability of regulated electric utilities cannot be assessed without generally understanding how their dependability is measured. The OCC primarily relies upon two basic gauges of electric service reliability – System Average Interruption Frequency Index (“SAIFI”) and System Average Interruption Duration Index (“SAIDI”) – to gain insights regarding how consistently the State’s regulated electric utility systems are providing uninterrupted energy. SAIFI is the average number of sustained interruptions (five minutes or more of zero voltage per incident) per consumer during a year. It is the ratio of the annual number of interruptions to the number of consumers (total number of sustained interruptions in a year / total number of consumers). SAIDI is the average duration of interruptions per consumers during the year. It is the ratio of the annual duration of sustained interruptions to the number of consumers (total duration of sustained interruptions in a year / total number of consumers). If duration is specified in minutes, as it is in this Report, SAIDI is given as consumer minutes.

2.0 Summary

There are six electric utilities regulated by this Commission that reported reliability information contained in this report.¹ These six utilities are Arkansas Valley Electric Cooperative Corp. (“Arkansas Valley”), Canadian Valley Electric Cooperative, Inc. (“Canadian Valley”), Empire District Electric Co. (“Empire”), Northeast Oklahoma Electric Cooperative, Inc. (“NOEC” or Northeast Oklahoma), Oklahoma Gas and Electric Co. (“OG&E”), and Public Service Company of Oklahoma (“PSO”). The SAIFI measure indicates that an Oklahoma customer being served by a regulated electric utility experienced an average of approximately 1.546 outages in 2020. The SAIDI measure indicates that customers served by Oklahoma’s regulated electric utilities were without power during 2020 for an average of approximately 226.96 minutes or 3.78 hours.

3.0 Purpose

The purpose of this Scorecard, pursuant to OCC rule OAC 165:35-25-24, is to present results of calculations that measure reliability of electric utility systems regulated by the Commission in the State of Oklahoma to allow for a comparison of service reliability performance measurements for those utilities. These calculations are based upon customer counts, SAIFI, and SAIDI data. Pursuant to Commission rules, the six utilities provided data for circuits that had the most outages during 2020 and preceding years. This Scorecard enables the Commission and others to monitor the performance/improvements of Oklahoma’s Commission-regulated power utilities and trends in electric system reliability over time.

¹ Rich Mountain Electric Cooperative and Southwest Arkansas Electric Cooperative are regulated by the Commission. However, both companies have a small number of Oklahoma customers and Southwest Arkansas does not have reliability statistics separated for Oklahoma-only customers, so the data for both companies has been excluded.

The following companies provided data pursuant to OAC 165:35-25:

Oklahoma Customers at Year-End					
Company	2016	2017	2018	2019	2020
Arkansas Valley	-	-	5,303	5,440	4,619
Canadian Valley	24,547	-	25,458	25,458	26,197
Empire	6,687	6,810	6,825	6,661	6,810
NOEC	39,209	38,242	37,415	40,655	213
OGE	751,568	760,955	775,945	781,764	790,142
PSO	540,140	542,836	550,649	553,971	559,804

4.0 Definitions²

Distribution system: The network of electric wires and equipment that carries electric energy from substation to the customer’s premises.³

Duration of interruption: The period (measured in seconds, minutes, hours, or days) from initiation of an interruption of service to a customer or other facility until service has been restored to that customer or facility. An interruption may require step-restoration tracking to provide reliable index calculation.

Major event: A disastrous event exceeding design limits of the electric power system and generally characterized, depending upon the utility, by:

- a) Extensive damage to the electric power system,
- b) More than a specified percentage of customers simultaneously out of service, and
- c) Service restoration times longer than specified.

Causes of major events can include such things as extreme weather, for example, a severe ice storm or tornado, or even an earthquake. As defined in Commission rules at OAC 165:35-25-13, a “major event” includes “situations where there is a loss of service to 10 percent or more of the customers in a region, and where full restoration of all affected customers requires more than 24 hours from the beginning of the event.”

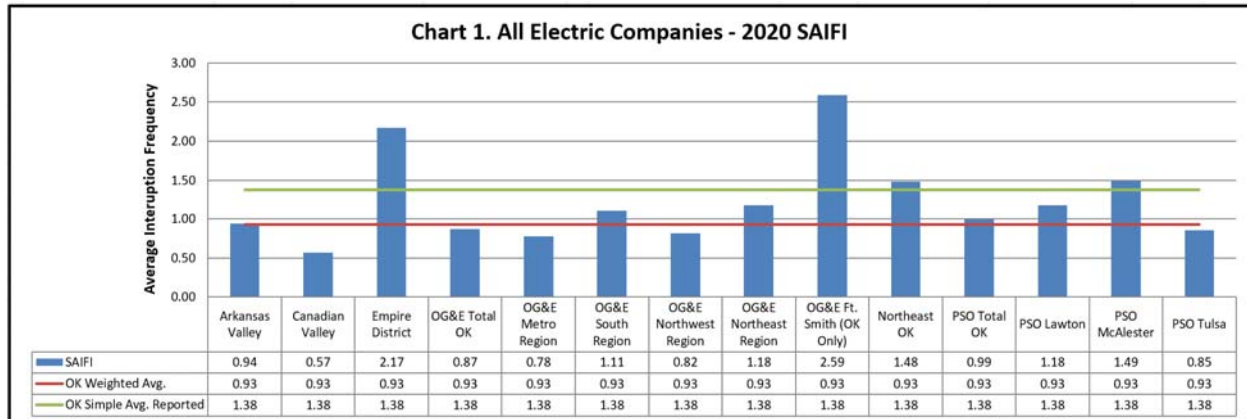
² Definitions are given to help readers better understand the information that goes into the calculations that are used in this document. The basis of many of these definitions is included in IEEE Standard 100-2000; however, PUD has presented the definitions in a more user-friendly format for explanation purposes.

³ The distribution system is considered anything from the distribution substation fence to the customer meter. Often the initial over-current protection and voltage regulator are within the substation fence.

5.0 Analysis

5.1 SAIFI Trends and Patterns

The following graph shows the Oklahoma outage or SAIFI data for the year 2020 by utility and region:⁴



The chart suggests that Empire customers experienced an average of 2.17 power outages or interruptions in 2020. Northeast Oklahoma customers were without power on average 1.48 times last year. The customers of OG&E and PSO, the state’s largest electric companies, were without power in 2020 for an average of 0.87 and 0.99 times, respectively. Overall, during 2020, Oklahoma electric customers served by a regulated utility were without power on average, approximately 1.38 times.⁵

Historically, NOEC customers, experiencing an average of 1.945 outages per year, lost power more often than customers of any other regulated electric utility in Oklahoma during the past five years. The customers of Canadian Valley lost power the least, experiencing an average of only about 0.437 outages per year over the past five years.⁶

⁴ The SAIFI and SAIDI reliability indices are based upon 12 months of system performance data ending December 31, 2020, and exclude “Major Events” as defined by OAC 165:35-25-13. The Oklahoma Average SAIFI and SAIDI were estimated by first computing a weighted average of the combined data for each statistic and then computing a simple (unweighted) average in a similar manner.

⁵ The simple SAIFI average for all of Oklahoma’s regulated utilities is 1.38 and the metric’s weighted average is 0.93.

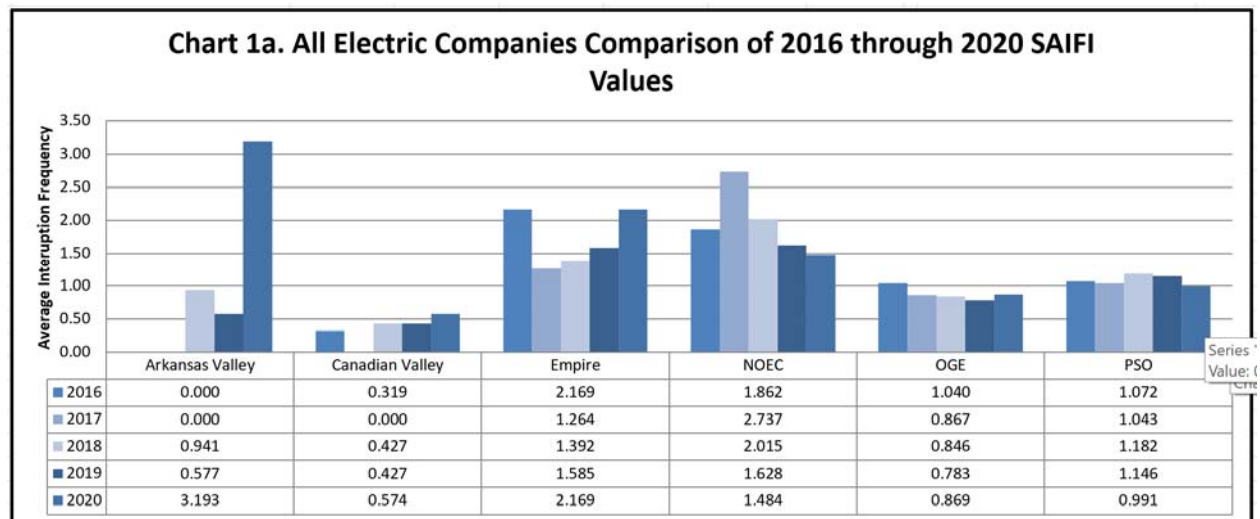
⁶ Canadian Valley did not have reported numbers in the year 2017.

Oklahoma customers served by a regulated electric utility experienced 1.325 outages per year on average over the past five years. Average historical outage data for Oklahoma’s regulated power utilities is shown in the following chart:

SAIFI VALUES						
Company	2016	2017	2018	2019	2020	Mean
Arkansas Valley	-	-	0.941	0.577	3.193	1.885
Canadian Valley	0.319	-	0.427	0.427	0.574	0.437
Empire	2.169	1.264	1.392	1.585	2.169	1.716
NOEC	1.862	2.737	2.015	1.628	1.484	1.945
OGE	1.040	0.867	0.846	0.783	0.869	0.881
PSO	1.072	1.043	1.182	1.146	0.991	1.087
Average	1.293	1.478	1.134	1.024	1.546	1.325

Electrical outages can be caused by severe weather, engineering problems, or other company-specific causes, as well as by external actions, such as a vehicle striking a power pole and causing it and potentially other poles to fall and disconnect power lines. The OCC monitors customer outage data required to be reported by all Commission-regulated Oklahoma electric utilities and investigates any unusual occurrences.

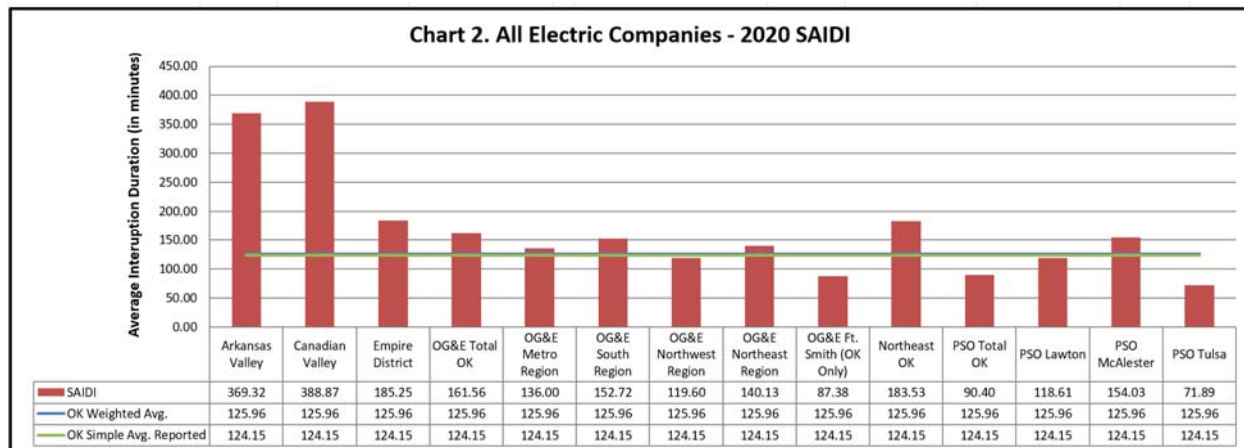
The bar charts and table below show SAIFI outage data for each of Oklahoma’s regulated electric utilities for the years 2016 through 2020:⁷



⁷ Data points for each regulated Oklahoma electric utility that provided SAIFI indices for year 2020 and the four prior years were plotted to present a visual comparison among the utilities. SAIFI averages were calculated using data provided by each of the six Commission-regulated utilities.

5.2 SAIDI Trends and Patterns

The following bar chart and table show SAIDI data from Oklahoma’s regulated electric utilities regarding the average duration in minutes of power outages during 2020 by utility and region of the State.⁸



Of Oklahoma’s six electricity providers regulated by the Commission that are included in this report, Canadian Valley customers averaged the most time without power in 2020, that being 388.87 minutes, or 6.48 hours. Arkansas Valley had the second most time without power at 369.32 minutes, or 6.15 hours. PSO customers were without power for the shortest time in 2020, an average of 90.4 minutes. OG&E and Empire customers were without power for an average of 136.00 and 185.25 minutes, respectively, during 2020. Altogether, customers of Oklahoma’s regulated electric utilities were without power for an average of 124.15 minutes last year.

Over the past five years, NOEC and Empire customers, on average, were without power the longest, while PSO customers averaged the least amount of power outage time during the period.⁹

⁸ The weighted SAIDI mean for 2020 was approximately 125.96 minutes, while the simple SAIDI average was 124.15 consumer minutes. Therefore, customers consuming power from Oklahoma’s regulated electric utilities in 2020 were probably without electricity for 2.09 hours to 2.06 hours during the year.

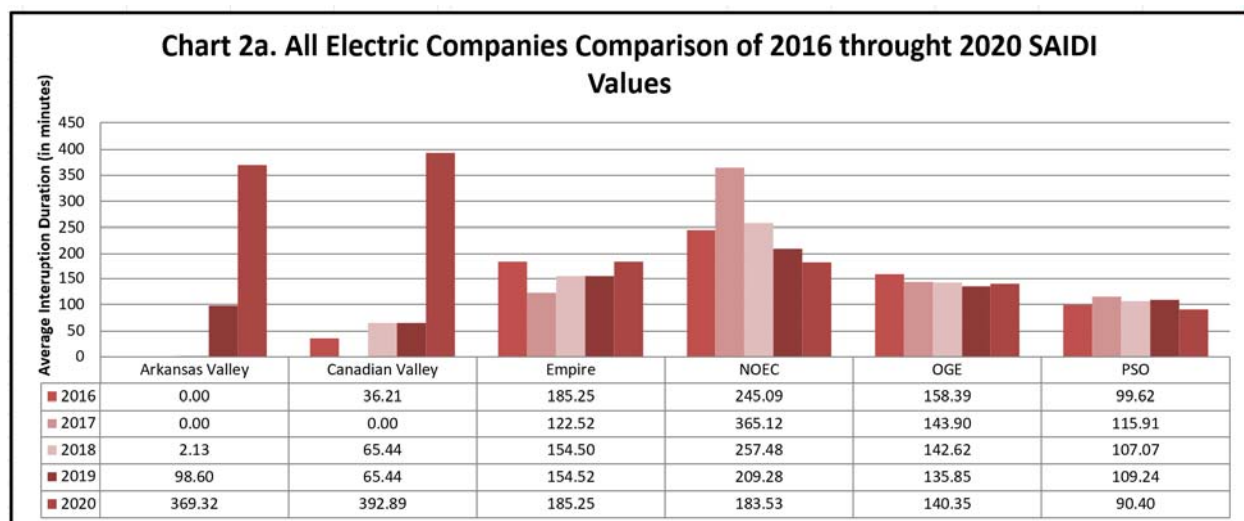
⁹ Arkansas Valley only has information for the years 2018 through 2020. Canadian Valley does not have information for 2017.

The table below shows the average time in minutes that a customer of the six subject utilities was without power in the past five years:

SAIDI VALUES						
Company	2016	2017	2018	2019	2020	Mean
Arkansas Valley	-	-	2.13	98.60	369.32	155.98
Canadian Valley	36.21	-	65.44	65.44	392.89	140.00
Empire	185.25	122.52	154.50	154.52	185.25	160.41
NOEC	245.09	365.12	257.48	209.28	183.53	252.10
OGE	158.39	143.90	142.62	135.85	140.35	144.22
PSO	99.62	115.91	107.07	109.24	90.40	104.45
Average	144.91	186.86	121.54	128.82	226.96	159.53

On average, a customer served by a regulated electric utility was without power for 159.53 minutes or 2.65 hours over the five-year period. Customers being served by the State’s largest electric utilities, OG&E and PSO, were without power on average for 144.22 minutes or 2.4 hours, and for 104.45 minutes or 1.74 hours, respectively, over the five-year period. Overall, the average time that a customer of Oklahoma’s regulated electric utility sector was without power during 2020 has increased since 2019.

Chart 2a below displays the 2016-2020 SAIDI outage results for Oklahoma’s six regulated electric utilities in a more visual form:



An inspection of the graph reveals that PSO and OG&E over the past five years experienced relatively slight changes in the duration of outages; suggesting service was more consistent during that period than the service of the other four regulated electric utilities in the State. Differences in the length of outages were principally due to irregular or locally variable weather, although company-specific factors, such as the availability of linemen to more quickly restore power, also affected the length of power losses.

The results cited above show that some of Oklahoma's regulated electric utilities have succeeded in improving their service reliability and reducing the number and duration of power outages. Others of these electric utilities have more work to do to achieve the levels of progress achieved by the most reliable service providers, but all must continue their efforts to minimize the frequency and duration of power outages. In all cases, the OCC is committed to working with each regulated utility to try to facilitate improvements in delivery of safe and reliable electricity in a way that minimizes costs to ratepayers while ensuring a quality service.

6.0 Commission Rules Summary

OAC 165:35-25-14. Reliability Program

Each utility, to the maximum extent practicable, shall design and maintain a program to minimize the frequency and duration of electric service interruptions in Oklahoma. This reliability program should include inspection, maintenance, repair, and replacement standards that ensure the most timely service restoration as well as preventive and emergency maintenance as needed to minimize outages, and should prioritize efforts to give special emphasis first to the improvement of the worst performing circuits in each region. The program should include, at a minimum, efforts to address:

- 1) The age, distribution, and location of equipment on each circuit.
- 2) The number, density, and location of customers on each circuit.
- 3) The location and density of trees on the system.
- 4) An annual vegetation management plan.
- 5) The impacts of animals, wind, storms, ice, and auto accidents on electric distribution system reliability.

OAC 165:35-25-20. Annual Reliability Report

Each electric utility shall submit an annual reliability report to the Commission by March 1 of each year. The Commission may request additional data, but the report shall include the following:

- 1) A description of all vegetation management performed by the utility in the previous calendar year and plans to perform for the current year.
- 2) SAIDI and SAIFI values computed for the utility's entire service territory and displayed in tabular form.
- 3) SAIDI and SAIFI values computed for each of the utility's regions and displayed in tabular form.

- 4) A detailed report for each major event not included in calculation of the reliability indices. The major event report shall include the interruption cause or causes, date, regional location, percentages of customers without service in that region as a result of the event, the time at which service was lost to 10 percent or more of customers in that region, the time when the last customer's service was restored in that region, and any other details that the utility or the Commission believes will further justify the exclusion of the event from the calculation of reliability indices.
- 5) A description of the program the utility is using to analyze and improve its worst performing circuits and a summary of the results of that program for the reporting year.
- 6) A description and map identifying the utility's service regions or operating divisions, as well as documentation and illustration of any changes during the reporting year in region boundaries, as defined by the utility, and justification for such changes.
- 7) For each utility with less than 100,000 customers, the utility must show the data used to calculate service reliability as well as the rural adjusted minimum performance level.

7.0 System Average Interruption Indices

SAIFI: *System Average Interruption Frequency Index* (sustained interruptions). This is a measure of the average number of sustained interruptions (five minutes or more of zero voltage per incident) per consumer during a year. It is the ratio of the annual number of interruptions to the number of consumers (total number of sustained interruptions in a year / total number of consumers).

SAIDI: *System Average Interruption Duration Index*. This is a measure of the average duration of interruptions per consumers during the year. It is the ratio of the annual duration of interruptions (sustained) to the number of consumers (total duration of sustained interruptions in a year / total number of consumers). In other words, when power is lost, SAIDI is the average length of time customers were without power.

CAIDI: *Customer Average Interruption Duration Index*. This measure represents the average time required to restore service. CAIDI is calculated by dividing SAIDI by SAIFI (SAIDI / SAIFI).

8.0 Sample Calculations

$$\text{SAIFI} = \frac{200 + 600 + 25 + 90 + 700 + 1,500 + 100}{2,000} = \mathbf{1.6075}$$

$$\text{SAIDI} = \frac{(8.17*200)+(71.3*600)+(30.3*25)+(267.2*90)+(120*700)+(10*1,500)+(40*100)}{2,000} = \mathbf{86.11 \text{ min}}$$

$$\text{CAIDI} = \frac{\text{SAIDI}}{\text{SAIFI}} = \frac{86.110}{1.6075} = \mathbf{53.567 \text{ min}}$$

The value of these standards in assessing an electric utility's performance can help point to specific areas where more attention by the utility is necessary to improve reliability. From analysis of these calculations and correlation with actual events, causes of outages can be identified on a systemic basis and reliability improvement plans can be developed. For example, to the extent that an electric utility routinely inspects utility poles to determine those most susceptible to deterioration and collapse, conclusions can be drawn and plans to mitigate such deterioration and collapse can be developed to achieve more favorable results from reliability indices. A common finding, for instance, is that a lack of "vegetation management," or lack of tree trimming, is responsible for outages along specific circuits. There may be a number of reasons why plant life has grown too close to power lines, but the fix is often relatively simple.

Other reasons for interruptions may be more difficult to detect, such as animals on poles or along wires, resulting in shorts and subsequent interruptions. Whatever the reason for an interruption or series of interruptions, these reliability calculations can assist the utility to determine primary causes of outages and develop a plan to try to avoid as many future outages as possible and to restore reliable flow of electricity to customers as quickly as possible.