Investigation into Recent Outages on the PSCo (Xcel Energy) Electric System

Proceeding No. 24I-0394E

04/30/2025

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The observations, findings and recommendations included in this report are those of the Staff of the Commission participating in this investigation and are not to be construed as being the observations, finding or recommendations of the Colorado Public Utilities Commission or of any individual Commissioners.

Summary Conclusions of Staff of the Colorado Public Utilities Commission

Overview

I. Background, context, conclusions, recommendations
II. Analytical approach
III. High-level geographic look at the PSCo electric distribution system
IV. Overview of historic outage trends and comparison to 2024
    A. Systemwide
    B. Regional
V. Impacts of Major Events on outages
    A. Trends in outages resulting from Major Events
    B. Historic trends and 2024 outages excluding Major Events
VI. Planned outages
VII. Outage causation analysis
VIII. Feeder-level analysis
    A. 15 most problematic feeders in 2024
    B. Single feeder case study from South Broadway in Denver
IX. Summary of conclusions and recommendations

I. Background and Context

The Commission initiated this investigation through Decision C24-0668, noting the following:

- The Consumer Affairs office of the Commission received numerous phone calls, complaints, and comments from the public regarding a series of outages on PSCo's (Xcel Energy) system in 2024
- Denver City Councilwoman Flor Alvidrez filed a comment on behalf of 178 businesses and residents in Denver between Lincoln Street and Broadway detailing adverse impacts resulting from electric outages in that area
- A Consumer Affairs analysis reported pockets of complaints which describe outages across the entire state, extending from the Sterling Ranch area in Littleton to Grand Junction and Palisade, and from Boulder to Central Denver along South Broadway, as well as Platteville
- Media outlets in Grand Junction, Summit County, and several TV news outlets in Denver also reported on the outages
- It is apparent that PSCo customers are well-aware of the continuing outage situation, as is the company itself

I. Background and Context

- Decision C24-0668 ordered Staff to conduct an investigation into:
  a. **The overall trend in PSCo outages for the last 5-10 years**
  b. **Recent outage areas**
  c. **Impact of wildfire mitigation activities and operations on frequency and length of outages**
  d. **Adequacy of current event logs and reporting requirements**
  e. Impact of Advanced Metering Infrastructure ("AMI")
  f. Procedures for restoring service
  g. Impact of overall customer growth and the number of customers by region on outage trends
- This presentation emphasizes Staff's investigation into items (a) through (d) above. Although Staff understands the Commission's interest in the remaining items, data limitations prevented Staff from analyzing them in-depth within this investigation. Staff suggests that a Commissioners' Information Meeting may be a more fruitful opportunity for the Commission to inquire about these topics with PSCo personnel directly

I. Conclusions of Staff's Investigation

1. From 2015 through 2023, PSCo's system shows an overall trend of increasing outage minutes and outage incidents
   - The average customer experienced ~5 more minutes of outage each year, 45 minutes in total over this period
2. Systemwide outage minutes in 2024 were much higher than the 2015-2023 trend would have predicted
   - The average customer experienced 350 minutes of outage in 2024, compared to ~166 minutes per customer suggested by the 2015-2023 trend.
3. Outages were widespread across PSCo's service territory
   - 2024 outage minutes per customer were above the historical trend in 6 of 9 PSCo regions
   - 2024 outage minutes per customer were greater than 2023 in all 9 PSCo regions
4. Wildfire Safety Operations (WSO) appear to account for some, but not all, of the increase in outages in 2024

I. Conclusions of Staff's Investigation

5. A small number of the worst performing feeders account for a substantial portion of 2024 outage minutes
   - Customers on the 15 worst performing feeders of more than 800 (<2% of feeders) experienced ~18% of outage minutes in 2024
   - Customers on 14 of 15 of the worst performing 2024 feeders reached their highest rates of outage minutes per customer since at least 2015
   - 2024 outage rates on these feeders remain historically high after excluding outages associated with Major Events (*i.e.* outages likely related to WSO and major weather events)

6. The outages on South Broadway in Denver appear to be associated with a particularly problematic section of a single feeder. Although this feeder as a whole was not among the 15 worst performing feeders in 2024, customers on this section of this feeder experienced 2024 outage minutes comparable to the worst feeders in PSCo's distribution system

I. Conclusions of Staff's Investigation

7. Under PSCo's existing Quality of Service Plan (QSP), the Company paid ~$6.5 Million in penalties based on 2024 performance:
   - $4.9 Million based on reliability performance
   - $1.7 Million based on customer service performance
   - If the penalties had remained constant, Staff estimates PSCo's QSP penalties would have increased 182% from 2023 to 2024, from $1.5 million to $4.2 million
   - The new QSP that applies to 2024 includes steeper penalties for poor reliability in Disproportionately Impacted Communities (DICs) and new penalties based on customer service performance

I. Conclusions of Staff's Investigation

8. PSCo maintains out "outage log" pursuant to Commission Rule 3203. However, the outage log provides only limited insight into outage causes
   - Outages are frequently logged as having "unknown" cause
   - The outage log itself does not incorporate Major Events and WSO information. Staff encountered difficulties reconciling the outage log with a separate WSO log provided by PSCo
   - Although "Clear for Public Safety" and "Public Safety Power Shutoff" (PSPS) are both used for WSO-related outages, it is unclear what criteria the Company uses to apply "Clear for Public Safety."
   - Labels for causes are not consistent over time.
   - The outage log provides data down to the feeder level only, not allowing for more granular analysis

I. Recommendations

- Staff offers the following recommendations for the Commission's consideration in ongoing and future proceedings and/or rulemakings

- Recommendations for future Commission action:
  - The Commission should require the Company to include additional information in its outage log, as detailed further below
  - The Commission should require the Company to record outages with greater geographic precision, at a minimum incorporating affected census blocks into the current outage log
  - The Commission should promulgate QSP rules
  - The Commission should encourage and require, as appropriate, more proactive communication around all types of planned and Company-controlled outages

II. Analytical Approach

Metrics Used in Staff's Analysis

Staff used common electric industry reliability metrics to assess the impacts of grid outages on customer experience. These include the following specific metrics (these are explained in greater detail below):

- SAIDI – System Average Interruption Duration Index
- SAIFI – System Average Interruption Frequency Index
- CAIDI – Customer Average Interruption Duration Index
- CAIFI – Customer Average Interruption Frequency Index
- CEMI6 – Customer Experiencing Multiple (6) Interruptions
- CELI12 – Customers Experiencing Long Interruption Duration (12 hours)
- CELI24 – Customers Experiencing Long Interruption Duration (24 hours)

These metrics overlap with the metrics used in PSCo's Quality of Service Plan (QSP) but are not the same. A goal of this investigation is to evaluate PSCo's 2024 outages through the lens of the customer experience. This is a distinct goal of the Company's QSP reports, which evaluate the Company's performance (and enforce penalties) based on Commission-approved performance metrics that make reasonable exclusions for certain factors that are outside of the Company's control (such as severe weather events).

While there are certainly factors outside of PSCo's control, these factors nonetheless affect customer experience and perception and are therefore relevant to this investigation. This analysis does not contradict or contest the Company's QSP reporting, but rather provides a different, more customer-facing perspective. QSP penalties are assessed in the 2024 QSP Report, which PSCo filed on April 1, 2025 in Proceeding No. 23A-0356E.

Metrics Used in Staff's Analysis

- **Average Outage Minutes/Customer (SAIDI)**
  - The average number of outage minutes experienced by a customer in a given geographic area (Whole service area, region, or feeder)
  - Accounts for changes in population of a given geographic area over time
  - Reflects the average number of outage minutes for ALL customers, not any specific customer that experienced an outage
- **Outages/Customer (SAIFI)**
  - Total number of interruptions, normalized to the to number of customers in that geographic area.
  - Accounts for each individual customer that experienced an outage
  - Does not account for whether an individual customer experienced multiple outages in a year
- **Average Duration (CAIDI)**
  - Average duration of an outage
- **Average Number Outages for Customers who Experienced and Outage (CAIFI)**
- **Customers that Experience 6 or more Outages (CEMI6)**
- **Outages Longer than 12 hours (CELI12)**
- **Outages Longer than 24 hours (CELI24)**

PSCo Paid Penalties in its 2024 Quality of Service Report

- PSCo files annual QSP reports to assess penalties that must be paid by the Company for not hitting Commission-approved metrics for:
  - Customer service (calls and response time)
  - Reliability (SAIDI by census block group, CEMI6, CELI18)
- The most recent performance metrics, which went into effect in 2024, include separate penalties for Disproportionately Impacted Communities (DICs) and Non-DICs to track disparate impacts to these distinct groups of customers
- PSCo paid higher penalties in 2024 than in the past three years combined

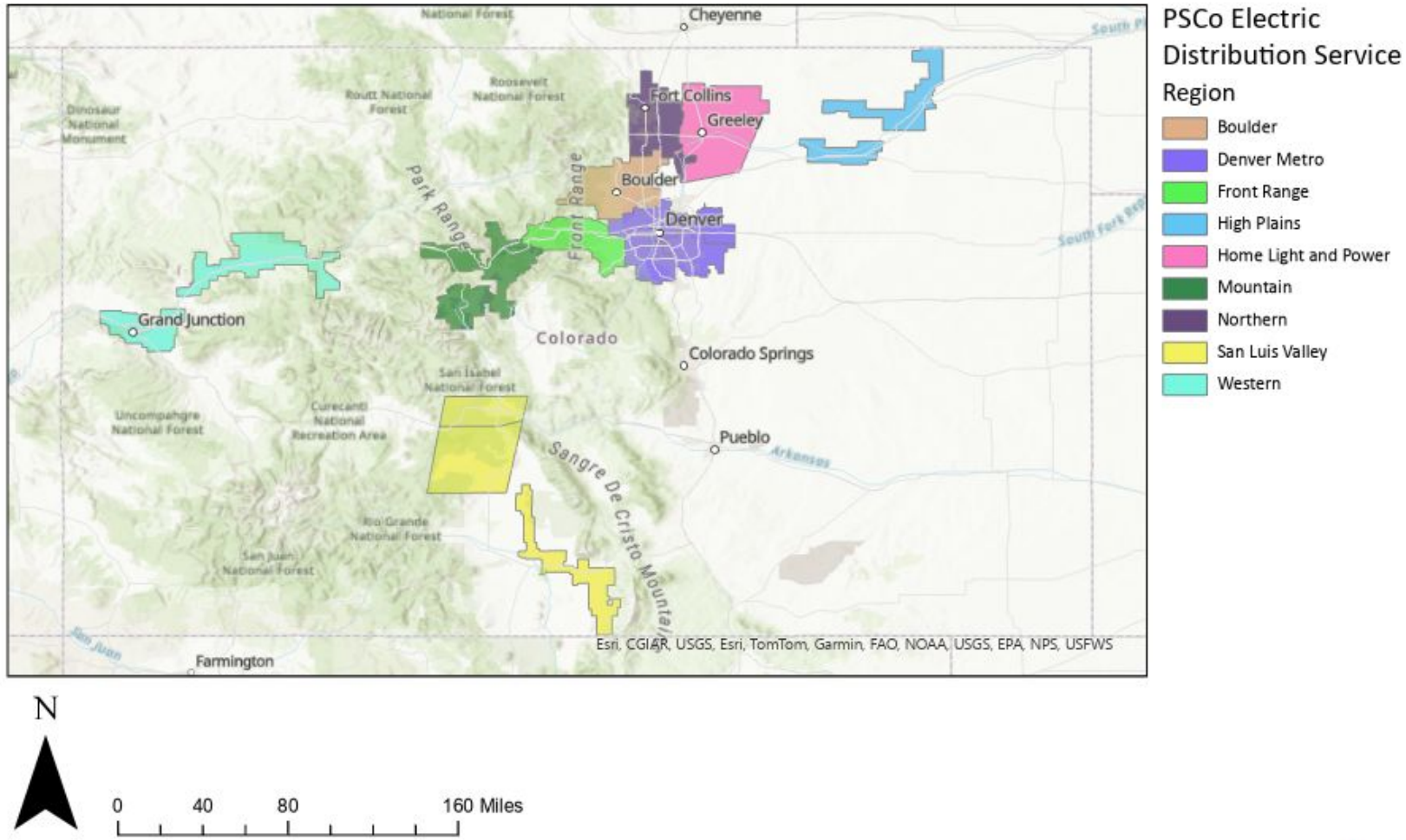
Penalties				
	Total Non-DI	Total DI	Customer Service	Total
2021			$0	**$1,423,692**
2022			$0	**$1,441,682**
2023			$0	**$1,485,784**
2024	$3,008,250	$1,874,790	$1,670,000	**$6,553,040**

III. High -Level Overview of the Company's System

General Regional Descriptions

PSCo's system is broken up into 9 geographic regions.

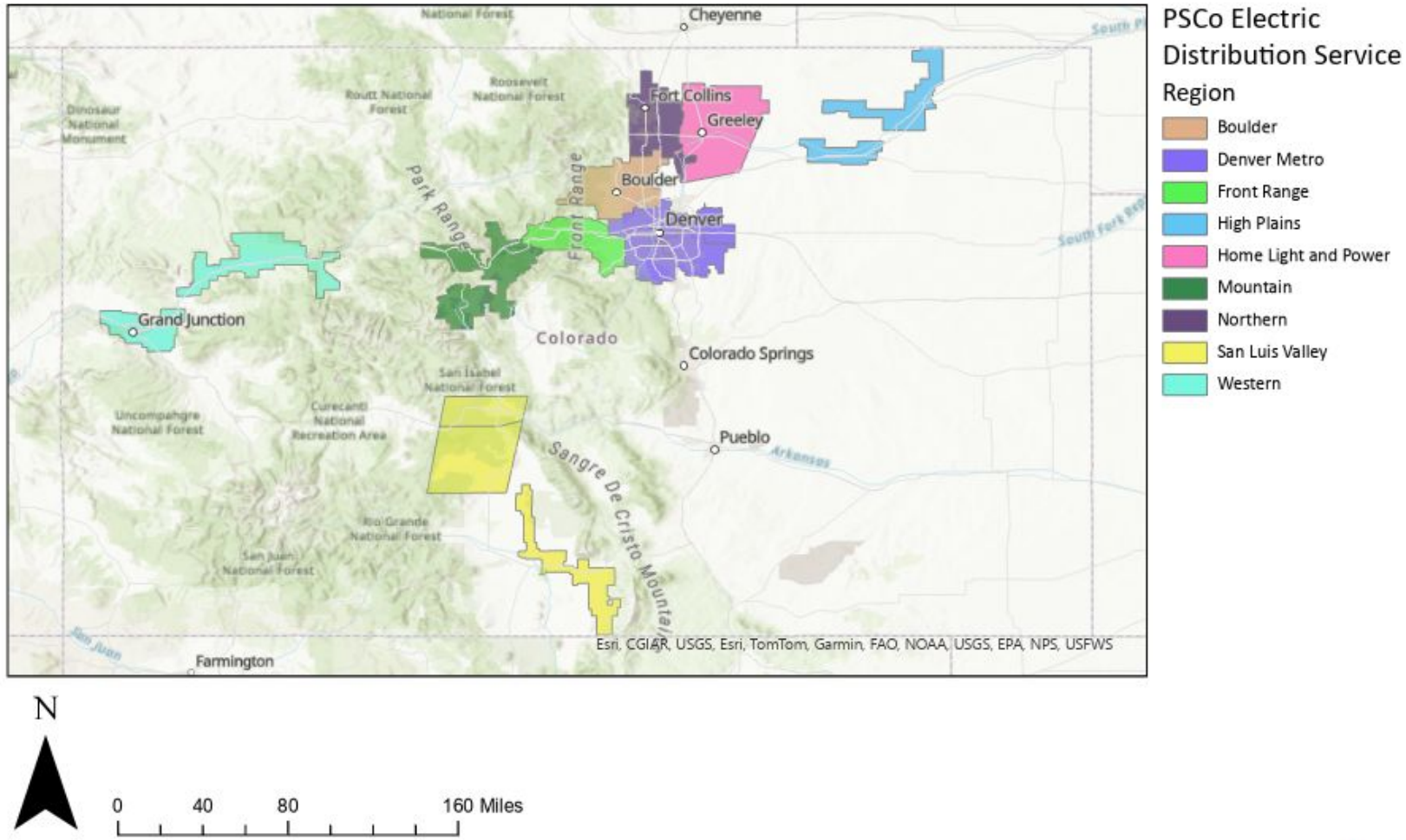
Region	Description
Boulder	Boulder County
Denver Metro	Denver County, surrounding suburbs that make up the metro area
Front Range	Foothills and near mountains in Jefferson County (Evergreen)
High Plains	Northeast near Sterling
Home Light and Power	Northeast around Greeley
Mountain	Parts of Lake and Summit Counties
Northern	Fort Collins
San Luis Valley	Alamosa and Salida
Western	Mesa and Garfield Counties



III. High -Level Overview of the Company's System

Regional Customers

Region	Customers in 2024
Boulder	138,775
Denver Metro	1,102,568
Front Range	18,980
High Plains	12,184
Home Light and Power	68,481
Mountain	40,839
Northern	42,407
San Luis Valley	26,872
Western	76,720
Total	**1,527,826**



IV. Overview of Historical Trends Compared to 2024:

- PSCo maintains a log of all system outages, including causation, outage level, feeder, and other information
- The motivation behind this investigation was driven by the customer reports of more and longer outages in 2024, so Staff first analyzed the raw outage log.
  - No exclusions were made for specific causes or other criteria in this phase of the analysis to explore and compare customer experience with the documented outages
- This analysis allowed Staff to verify customer experience in the data and start to build a picture of what areas of PSCo's system were most affected and why.
- Staff analyzed outages on the system at three levels:
  - Whole system
  - By region
  - By feeder (Section VIII of this report)

Outage History Compared to 2024: No Exclusions

Whole System	Overall system trends without exclusions for specific kinds of outages or circumstances
Regional	Regional trends without without exclusions for specific kinds of outages or circumstances

Outage History Compared to 2024: No Exclusions

Whole Service Area Level

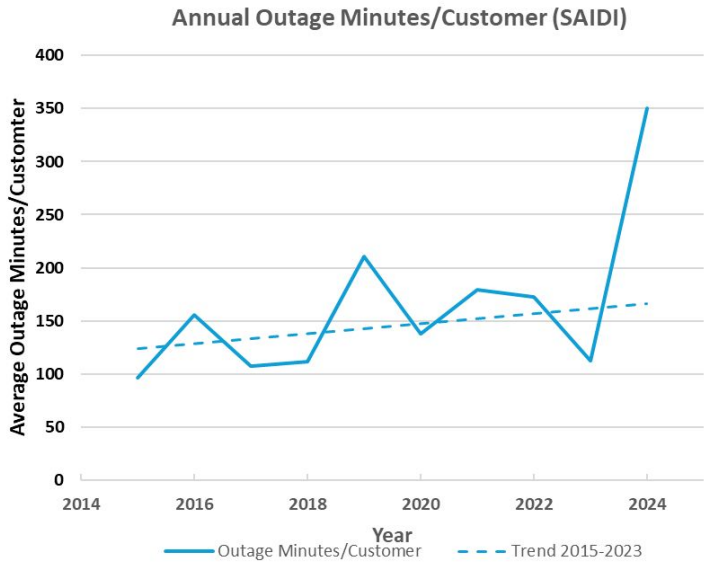
Historic Outage Analysis of the Whole System Without Exclusions

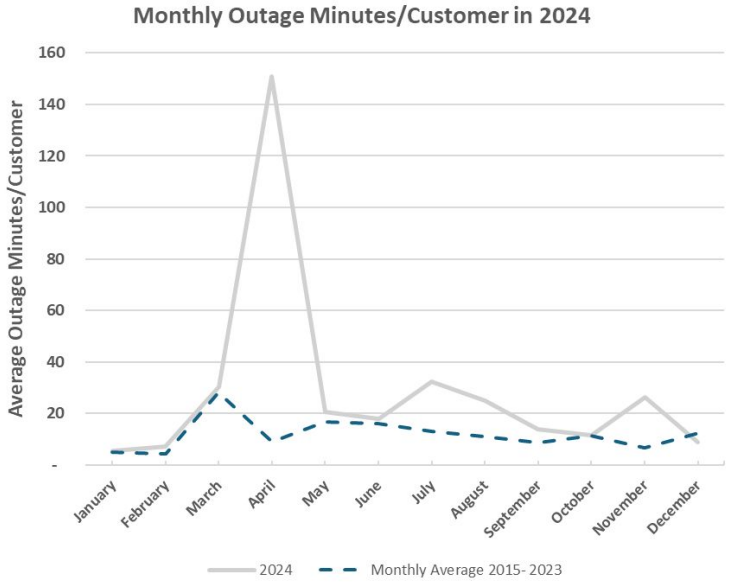
Summary of Whole Service Area

At a whole service area level:

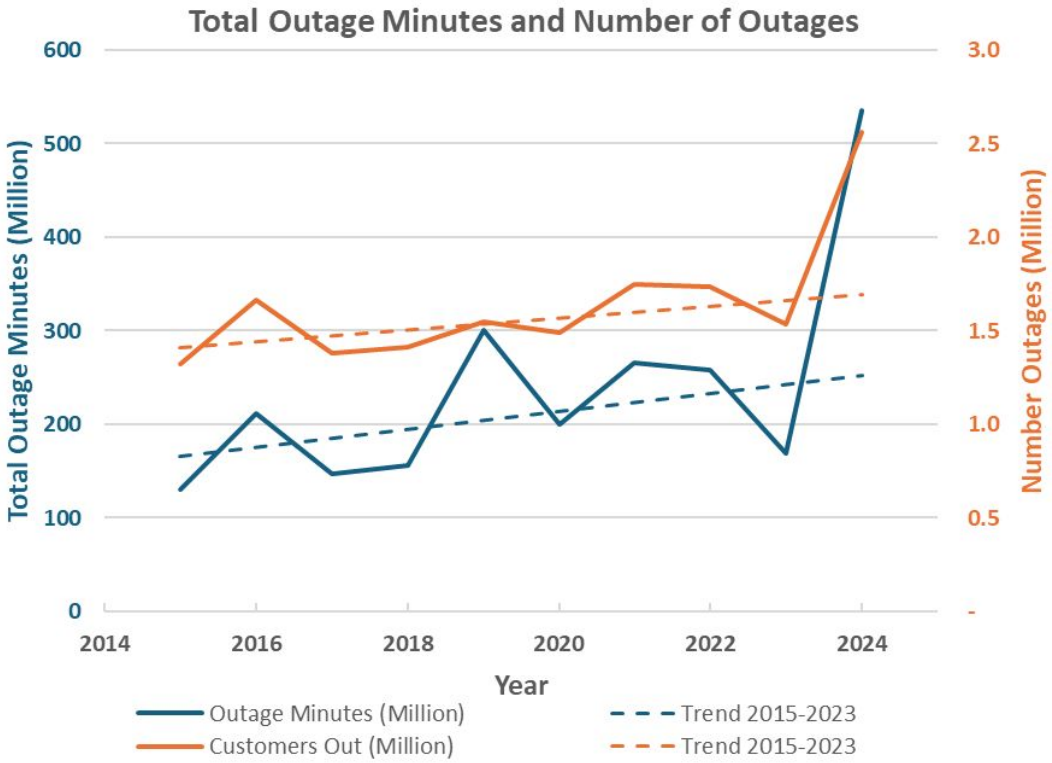
1) Customer are experiencing more outages year-over-year
2) In 2024, customers experienced more outages on average than previous years
3) In 2024, customers experienced longer outages on average than previous years
4) In 2024, many more customers experienced multiple outages than in previous years, which is not explained by a single significant weather event
5) In 2024, many more customers experienced very long outages than in previous years
6) The April windstorm was a significant component of that increase

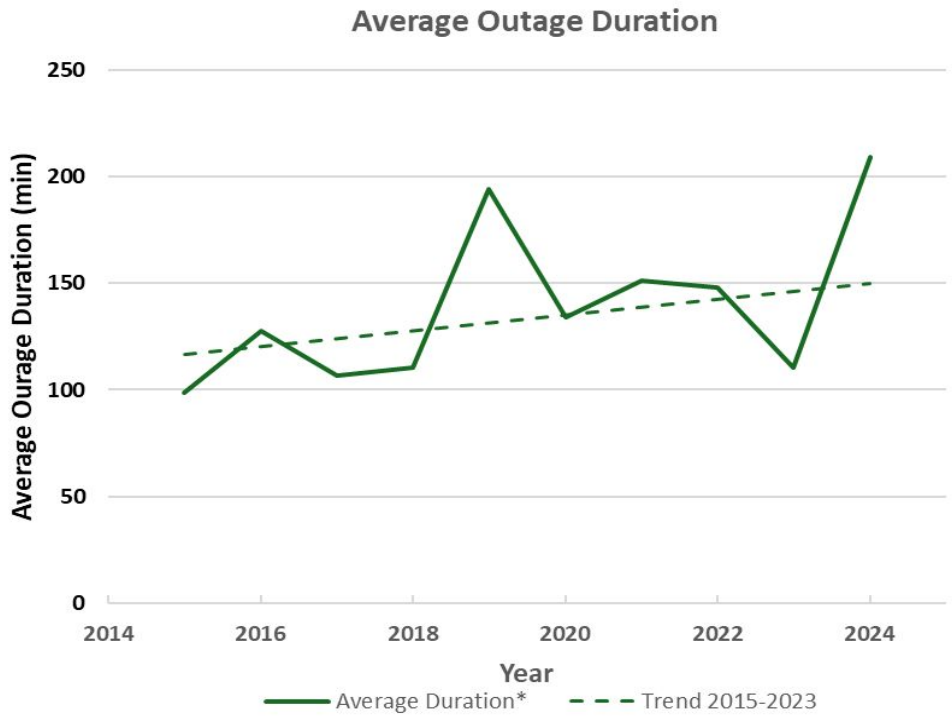
Taken together, the average customer experienced more time without service and a larger number of customers experienced more and/or longer outages than in previous years. Much of that increase was due to the April windstorm, but this singular storm does not explain 100% of the increase in outage minutes in 2024, nor the increase in outage minutes over time.





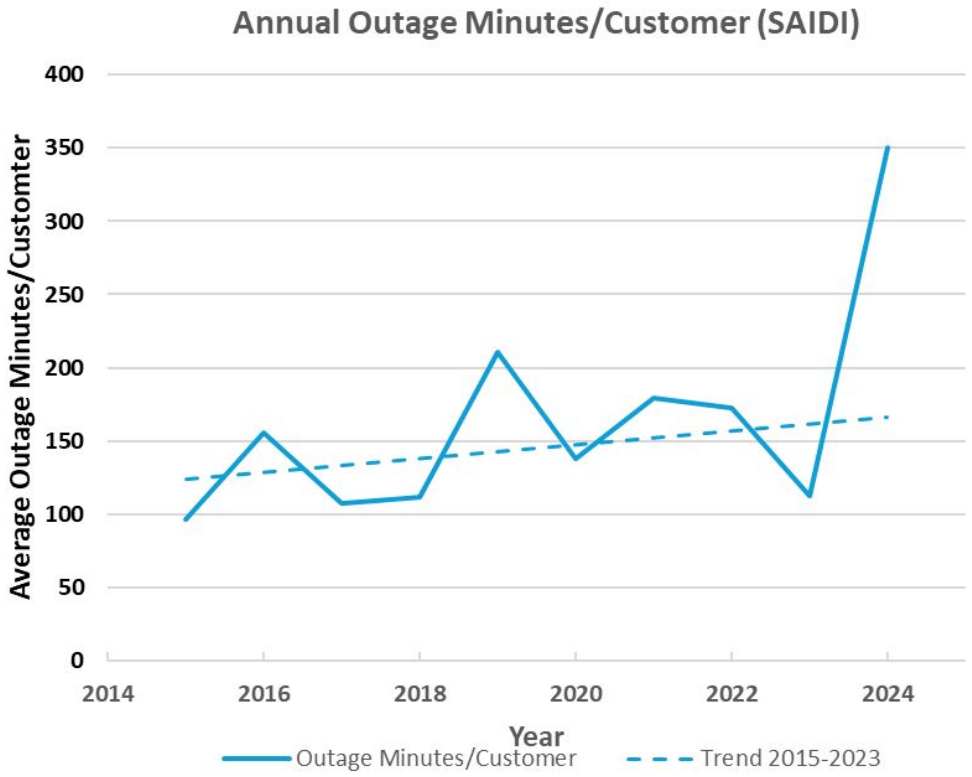
Whole System - History of Outages, No Exclusions





There was a clear increase in the number outage minutes in 2024 at a system-wide level compared to historical trends. The increase was driven by both an increase in the number of individual outages and longer outage durations.

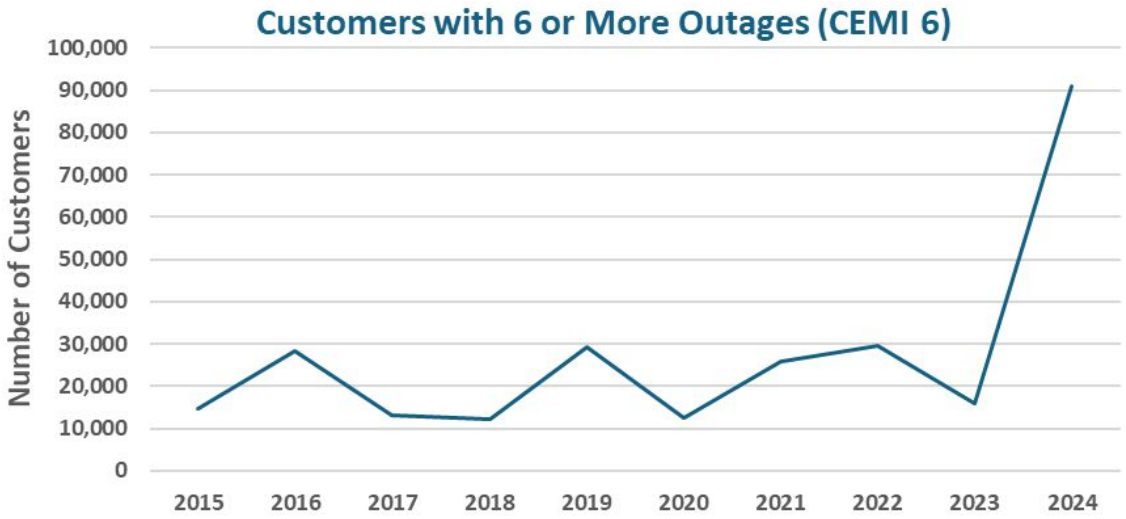
Whole System, Outage Minutes/Customer Spiked in 2024

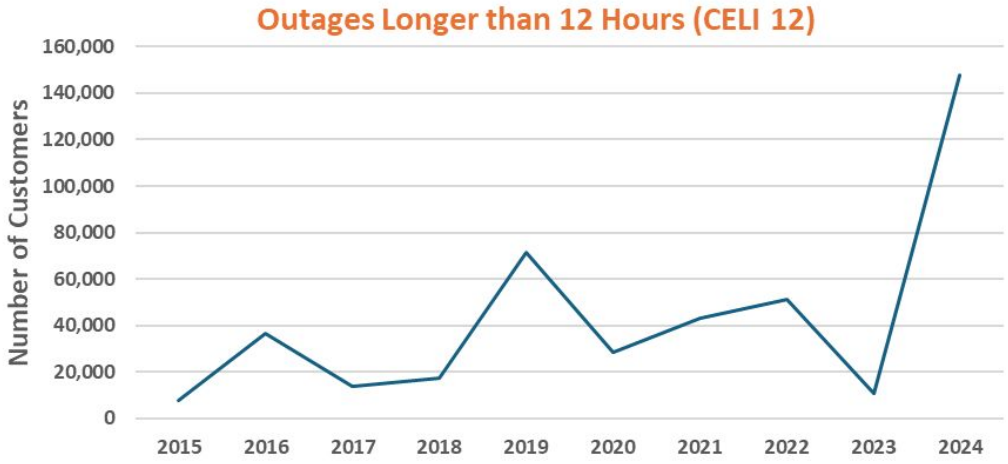


- The primary metric in this analysis is average outage minutes/customer (SAIDI) to normalize for the total number of customers in a given year
- By this metric, the average customer experienced more than double the total amount of outage time compared to what the historical trend would predict
- The goal of subsequent analysis is to build more detailed picture of the causes, when the outages occurred, and where the outages occurred to fully understand why 2024 was such an outlier.
  - Regional factors
  - Specific feeders
  - Causes

At a system level, a combination of the number of customers impacted and duration drove the increase in outage minutes

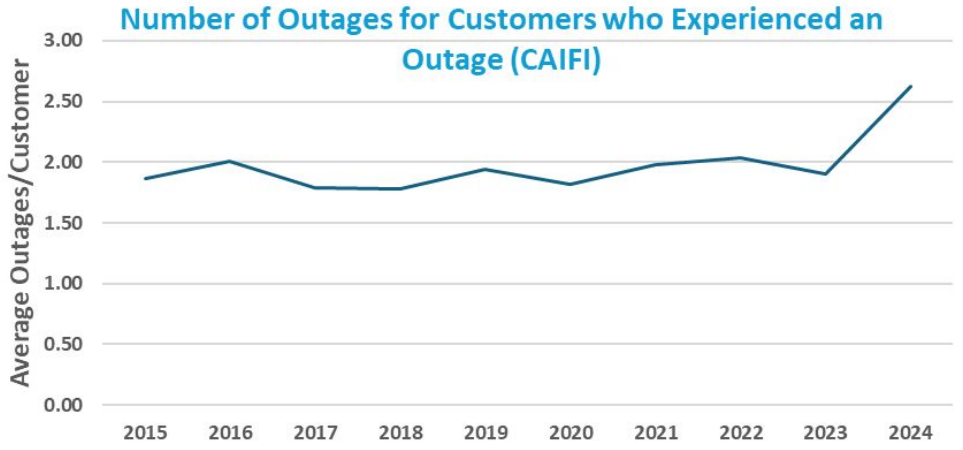
Whole System - More Customers Experienced Frequent and Long Duration Outages than Previous Years





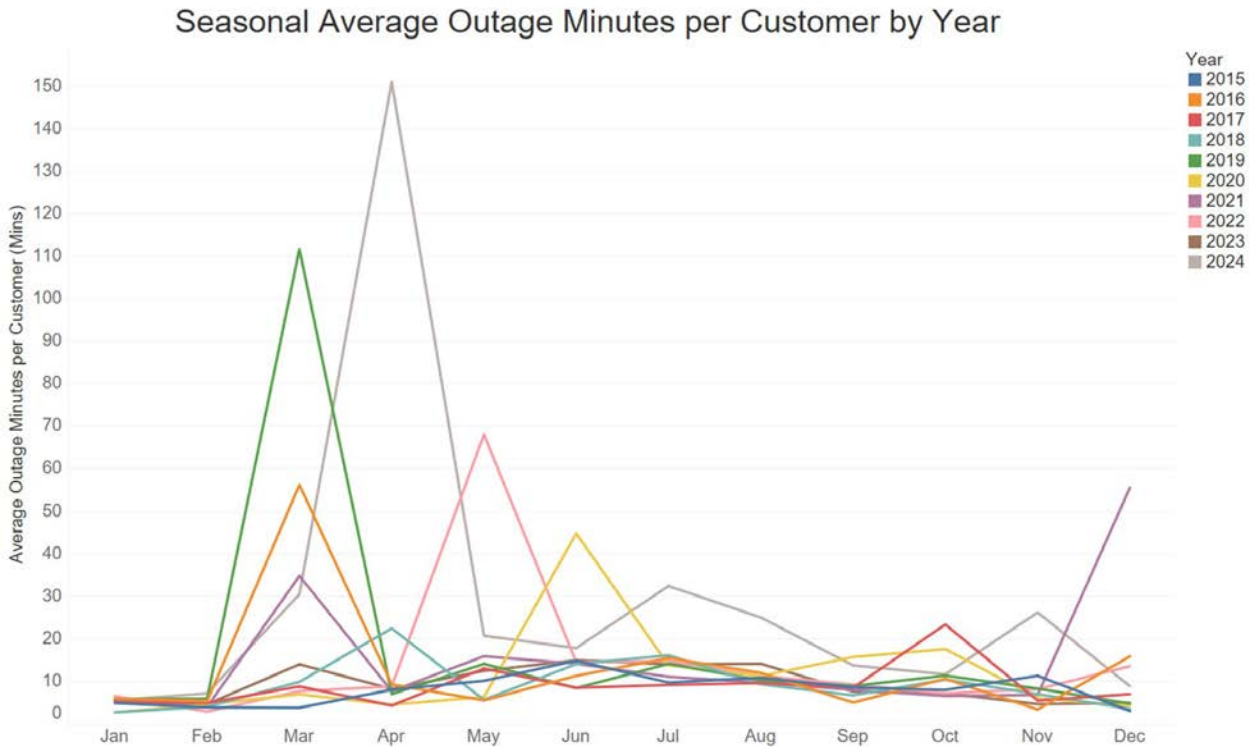
- In 2024, the highest number of customers in the last 10 years experienced six or more outages
  - These **~90,000 customers** (6% of all customers) **experienced at least 21%** of all outages in 2024, nearly double the next highest share in this 10 year period.*
- The number of customers who experienced outages that were 12 hours or longer was also at an all time high
  - These **~148,000 customers** (less than 10% of all customers) **experienced at least 29%** of all outage minutes in 2024**
- Customers who experienced an outage experienced more outages on average than previous year, ~25% increase compared to the historical trend.

Customers who experienced frequent and/or long outages in 2024 were more disproportionately burdened than previous years



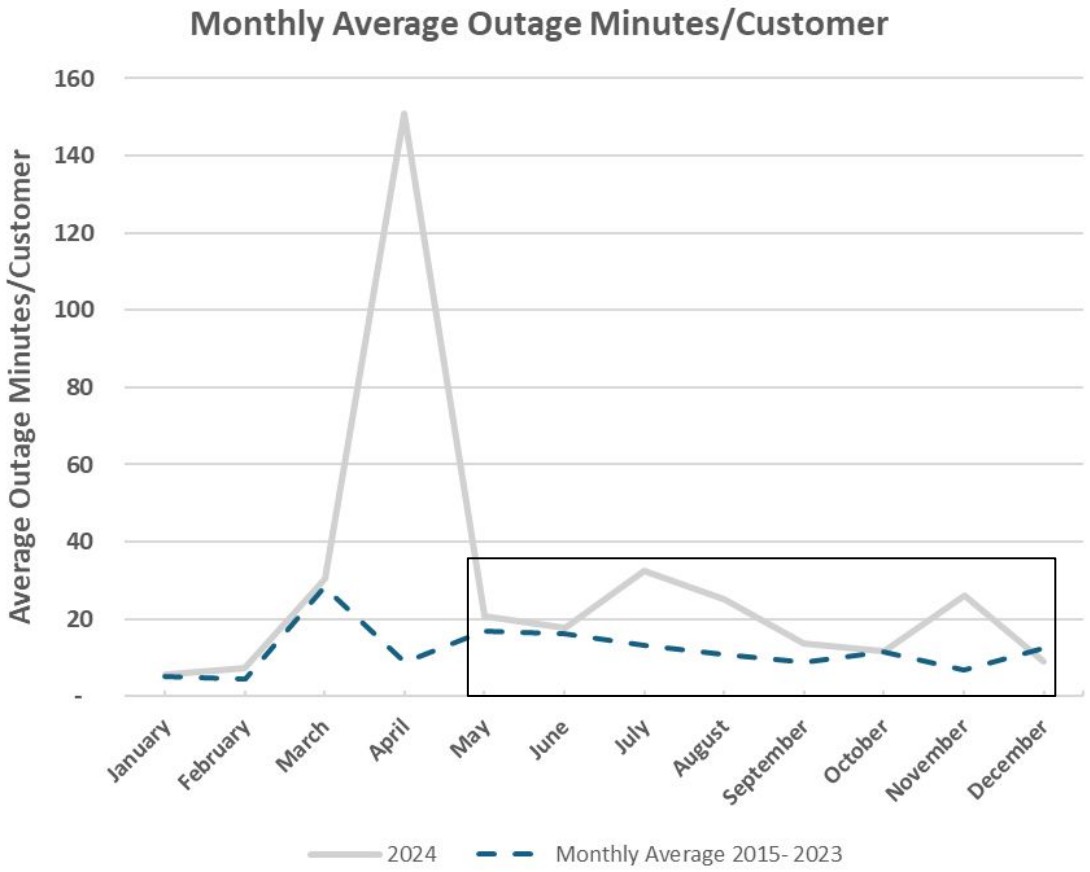
* Determined by taking the total number of outages experienced by CEMI6 customers relative to the total number of outages (CEMI6 x 6/Total outages). This is a floor, because some of these customers experienced more than 6 outages in 2024.
** This factors in customers who experienced outages of 24 hours or longer as well. Of the ~148,000 customers who experienced and outage of 12 hours or longer, ~69,000 experienced an outage of 24 hours or longer. This is a floor, because some of these customers experienced outages between 12 and 24 hours, or outages that were longer than 24 hours.

Whole System, Historic Seasonality of Outages



- There is a seasonality component to when significant outages occur. Many of the larger outages occur in the spring.
- Large spikes generally correspond to severe weather events that caused a large number of prolonged outages:
  - March 2016/2019: Major spring snow storms
  - December 2021: The Marshall fire in Boulder County
  - April 2024: A major wind storm at the same time that PSCo was implementing new Wildfire System Operations procedures
- Most of the very-large events are “Major Events”, which is a specific designation on days in which weather conditions may impact the grid, such as:
  - High winds
  - High temperatures
  - Dry conditions
  - Heavy snow
- The wind event in April of 2024 was the largest disruption since at least 2015 and was a significant driver of the high outage minutes in 2024
- During this event, most of PSCo’s system was in a wildfire safety mode to mitigate wildfire risk and damage to the system, and implemented its first Public Safety Power Shutoff (PSPS)

Whole System, Historic Seasonality of Outages



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- During this event, most of PSCo’s system was in a wildfire safety mode to mitigate wildfire risk and damage to the system, and implemented its first Public Safety Power Shutoff (PSPS)

Even factoring in the significant wind event in April, 2024 consistently had higher outage minute the rest of the year compared to the historical average

- The monthly average is the average number of outage minutes/customer for a given month from 2015-2023

Summary of Whole Service Area

At a whole service area level:

1) Customer are experiencing more outages year-over-year
2) In 2024, customers experienced more outages on average in than previous years
3) In 2024, customers experienced longer outages on average than in previous years
4) In 2024, many more customers experienced multiple outages than in previous years, which cannot be explained by a single significant weather event
5) In 2024, many more customers experienced very long outages than in previous years
6) The April windstorm was a significant component of that increase

Taken together, the average customer experienced more time without service and a more customers experienced more and/or longer outages than previous years. Most of that increase was due to the April windstorm, but a singular storm does not explain 100% of the increase.

A more granular analysis will help us understand what areas of PSCo's system were most impacted and why 2024 was worse than previous years.

Outage History Compared to 2024: No Exclusions

Regional Level

Historic Outage Analysis By Region Without Exclusions

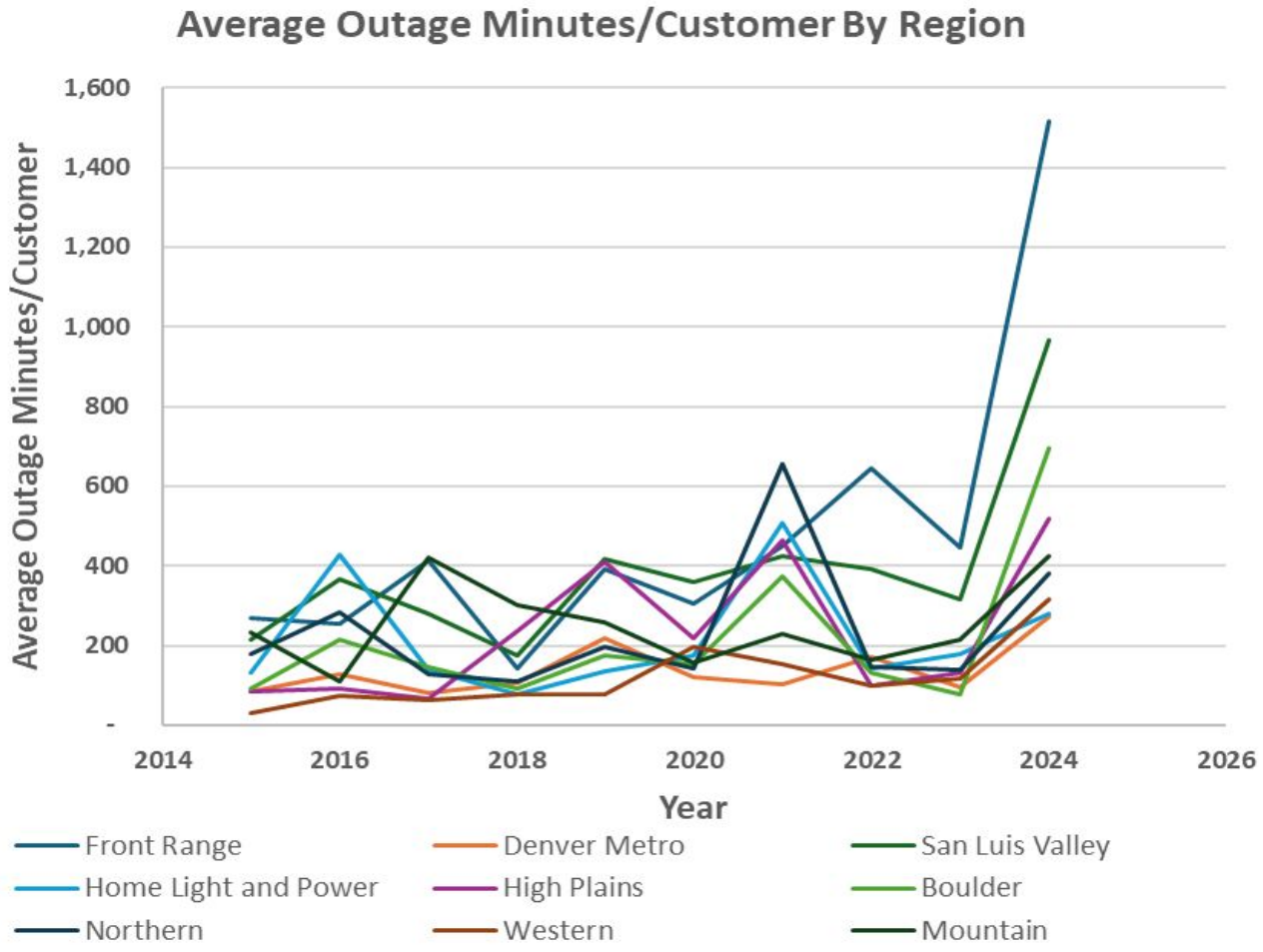
Regional Analysis, History of Outage - No Exclusions

There are 10 regions in PSCo's system in Colorado

Region	Customers in 2024
Boulder	138,775
Denver Metro	1,102,568
Front Range	18,980
High Plains	12,184
Home Light and Power	68,481
Mountain	40,839
Northern	42,407
San Luis Valley	26,872
Western	76,720
Total	**1,527,826**

Each region was impacted differently in 2024, but there were a few themes that emerged.

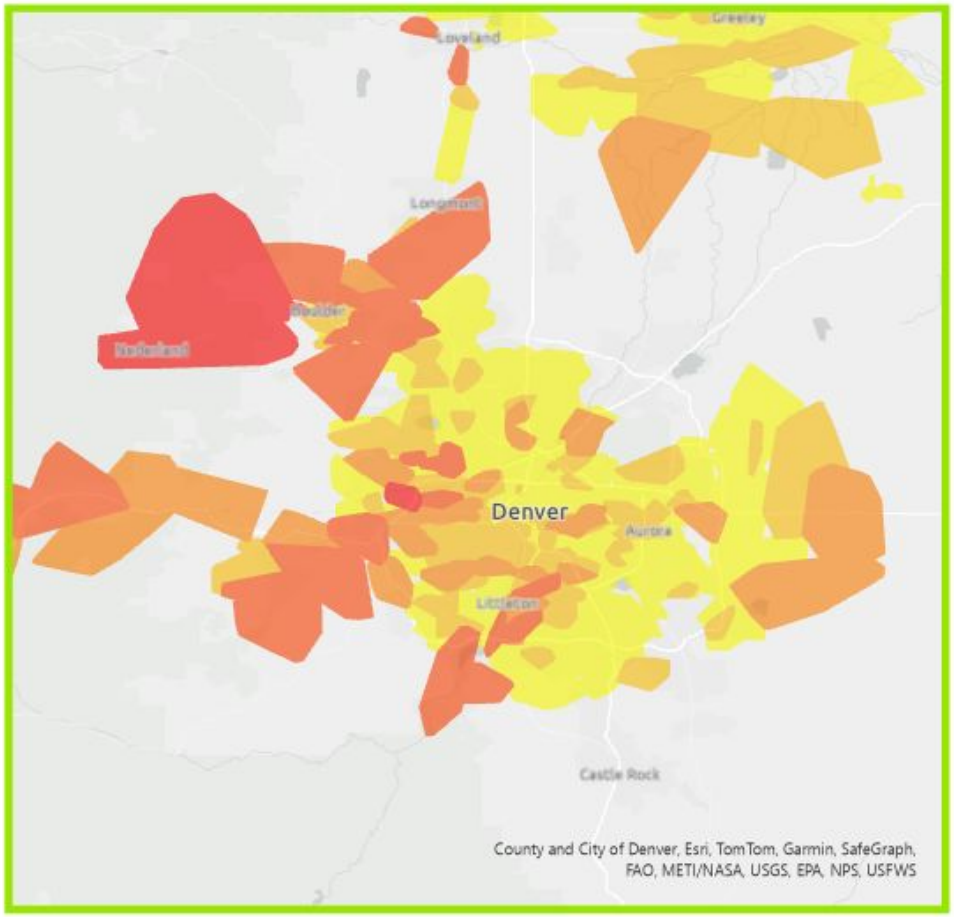
- **Every region had an increase in outage minutes/customer compared to 2023**
- Some regional increases far exceeded their historic trends
- Some regions were within their historic trends, even accounting for an increase

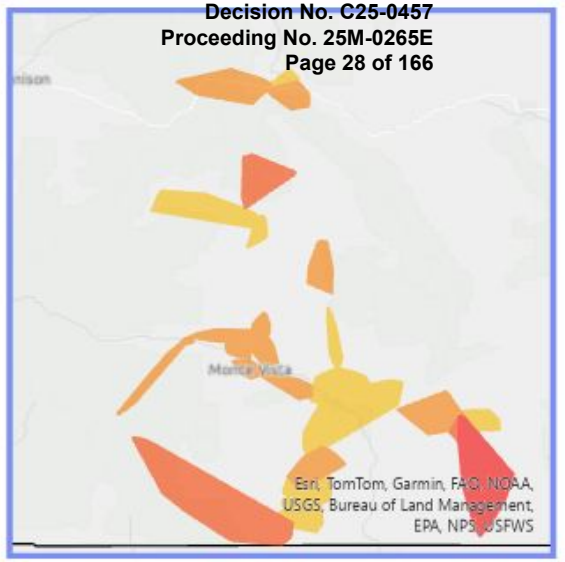


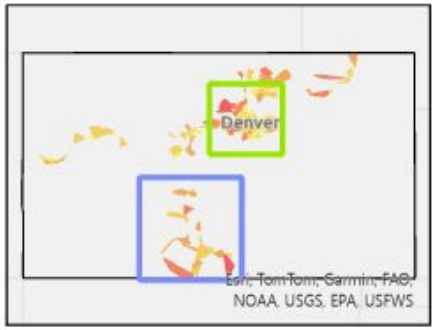
Note: There are the regions outlined on slide 8, which provide the descriptions of each region

System-Wide Look at Outages in 2024

- Before zooming into the 15 worst feeders, it is helpful to understand the distribution of the most extreme outage minutes by feeder across the system
- The map shows the average outage minutes per customer in 2024 at the feeder level for the whole system
- The feeders with the highest number of outage minutes/customer are shown in red*







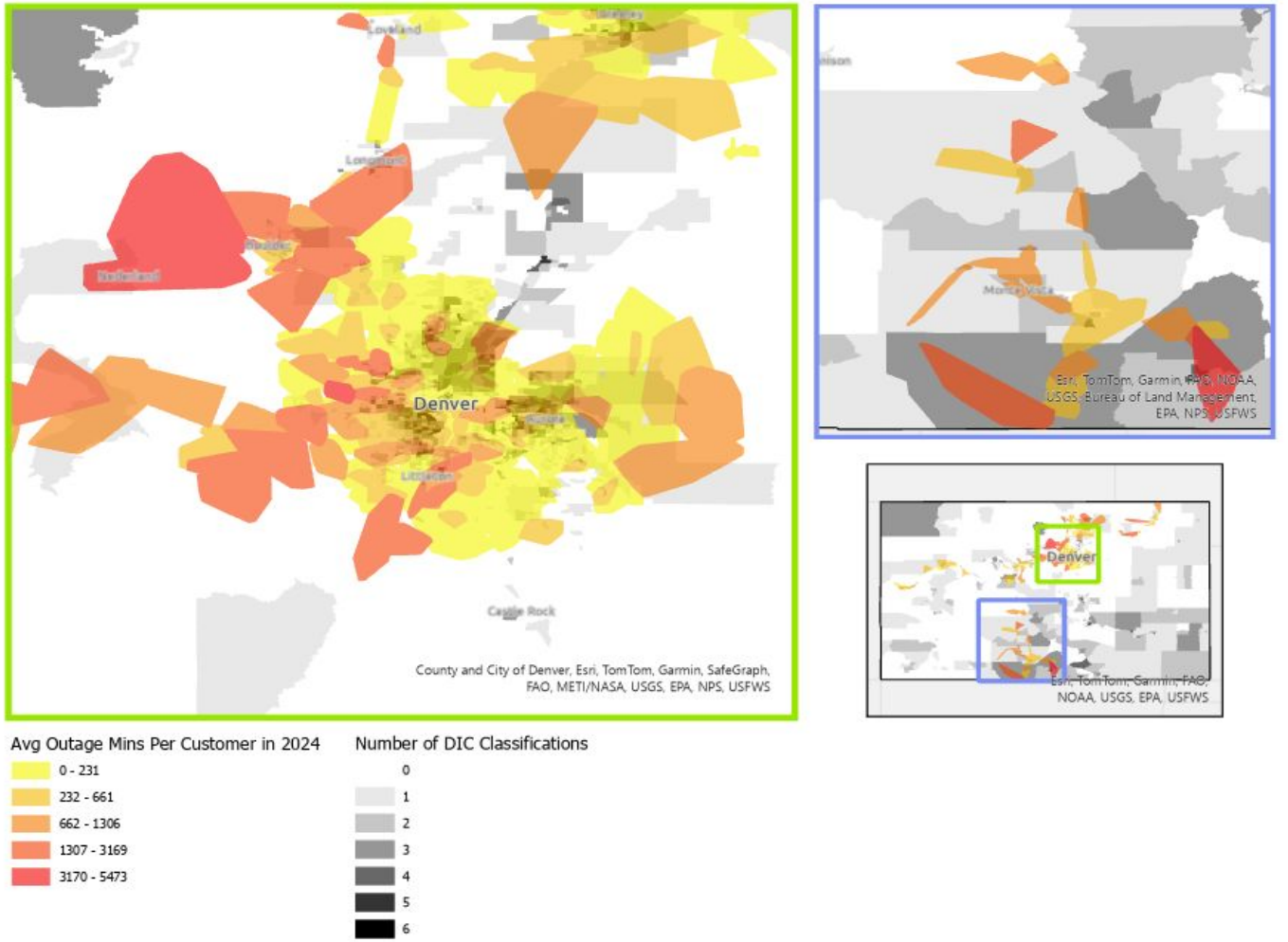
Avg Outage Mins Per Customer in 2024

- 0 - 231
- 232 - 661
- 662 - 1306
- 1307 - 3169
- 3170 - 5473

* Map symbology described in detail in Appendix O

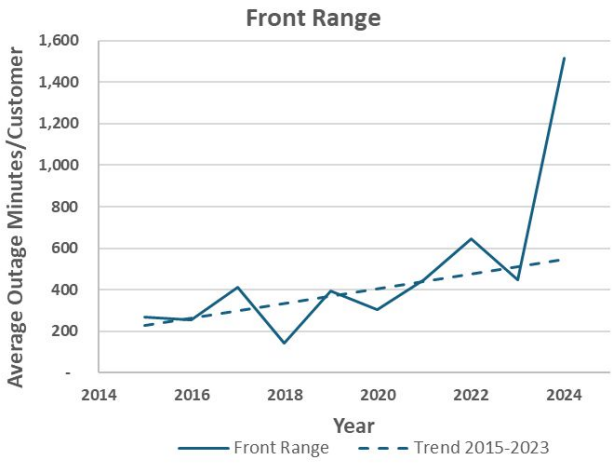
Outages and Disproportionately Impacted Communities

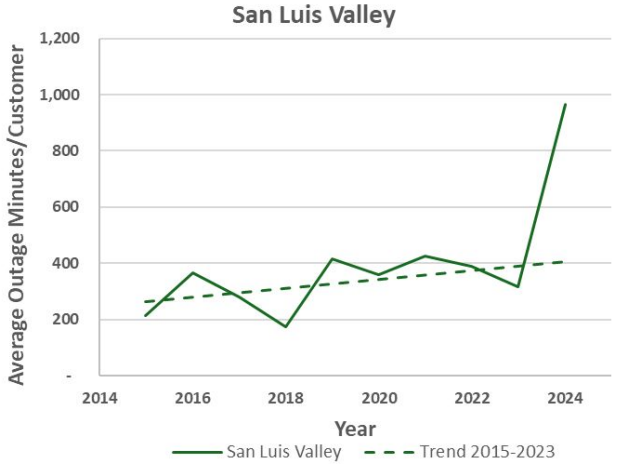
- The map below shows the Disproportionately Impacted Community (DIC) designation by Census Block Group overlaid with the average annual outage minutes by feeder*
- The San Luis Valley is largely considered a DIC, thus the feeders with high outages in 2024 in the San Luis Valley fall in DICs
- In 2024, there does not appear to be a high correlation between the specific factors that drove up outage rates in 2024 and census blocks with DIC designations.
- Because this is a feeder-level analysis, more granular geospatial and statistical analysis would be needed to identify highly concentrated outage impacts on subsections of feeders in DICs.**

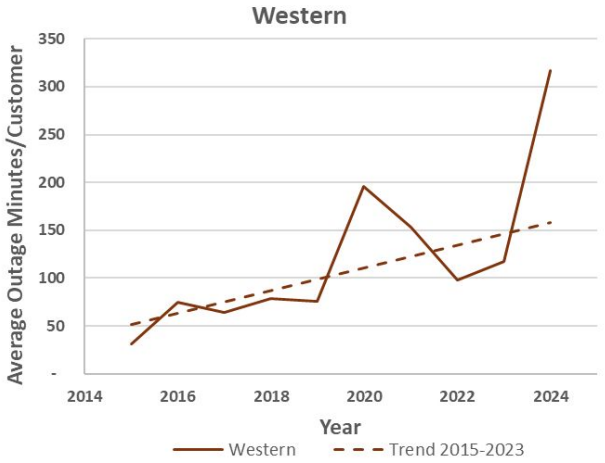


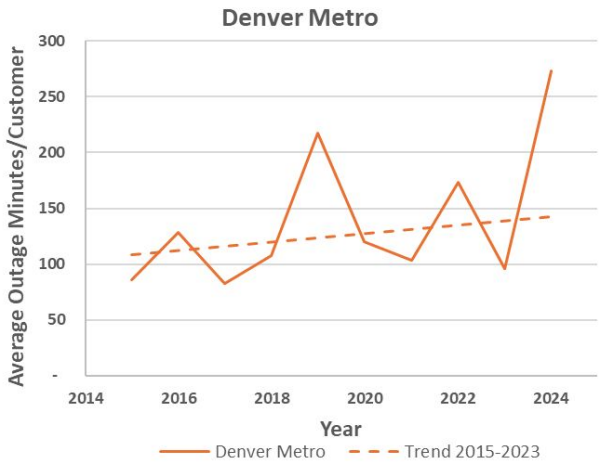
*The definitions for the components that make a Census Block Group categorized as a DIC are provided in the Appendix N
**Staff illustrates this point further in the feeder level analysis of this report (Section VIII)

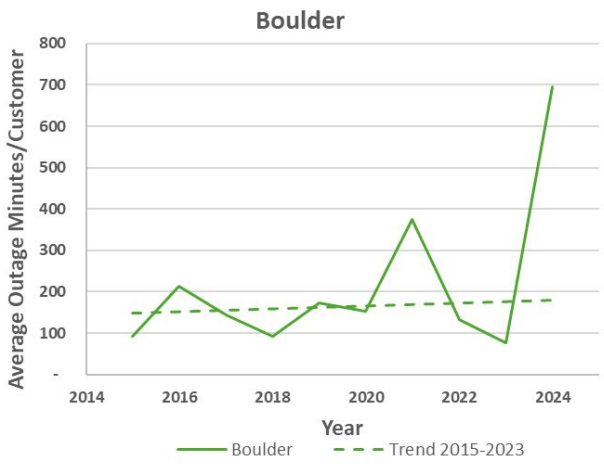
Regions with Increased Outage Minutes Relative to Their Historical Baseline

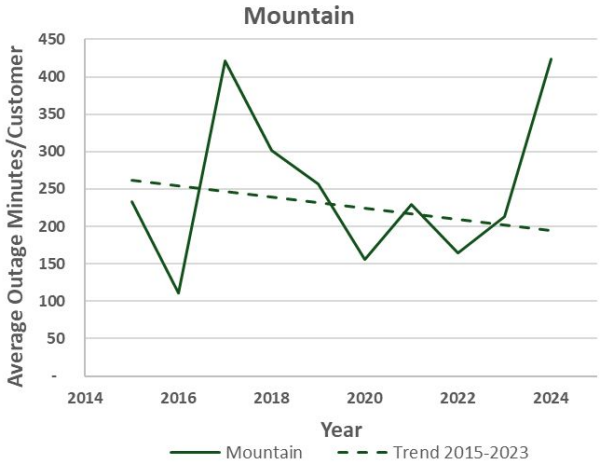






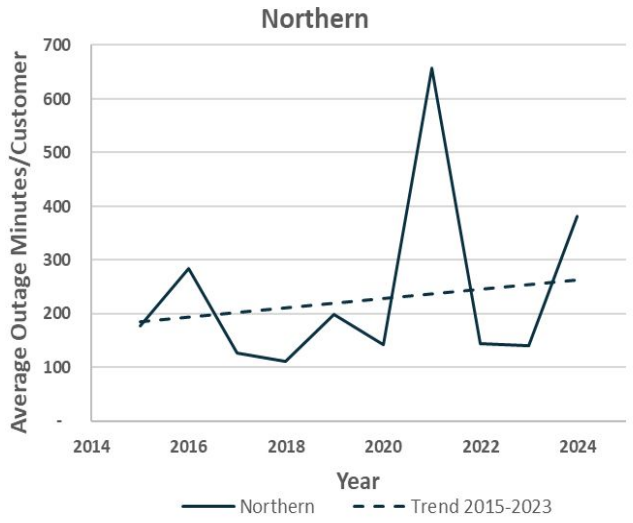


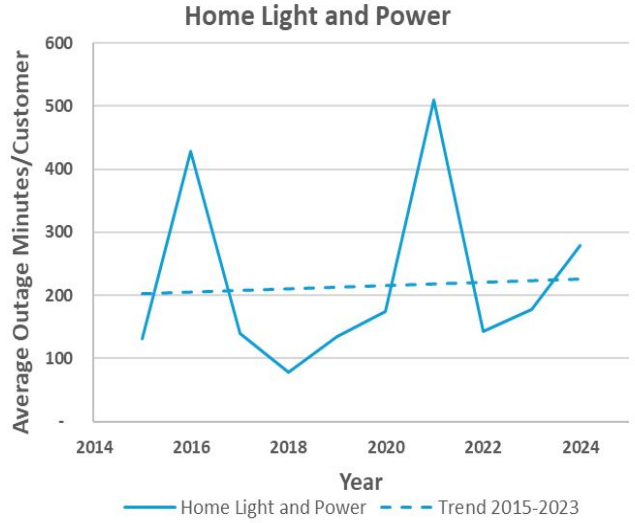


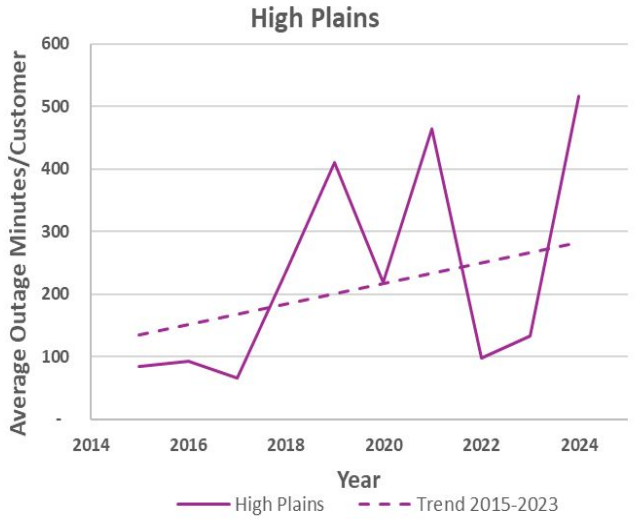


- 2024 was compared to the historical trend from 2015-2023
- The average customer in the Front Range, Denver Metro, San Luis Valley, Boulder, Western, and Mountain regions experienced higher-than average outage minutes/customer in 2024
- In each of these regions, outage minute rates were either increasing, decreasing, or holding steady. But all of them hit either all time or recent high levels in 2024

Regions with More Historically Consistent Outage Minutes in 2024



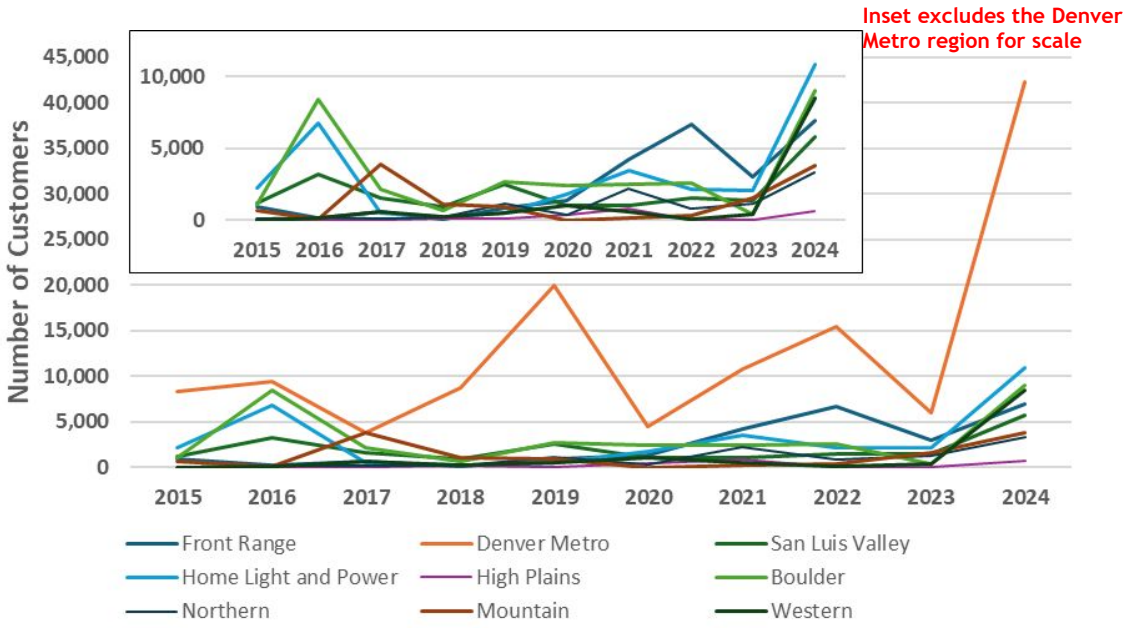




- The average customer in the Northern, Home Light and Power, and High Plains regions experienced average outage minutes in 2024 that were consistent with the historical trend
- This does not necessarily mean that all customers and/or feeders were “in-line” with historical trends, but as a whole this regions did not deviate substantially from their historical outage minute rate trends

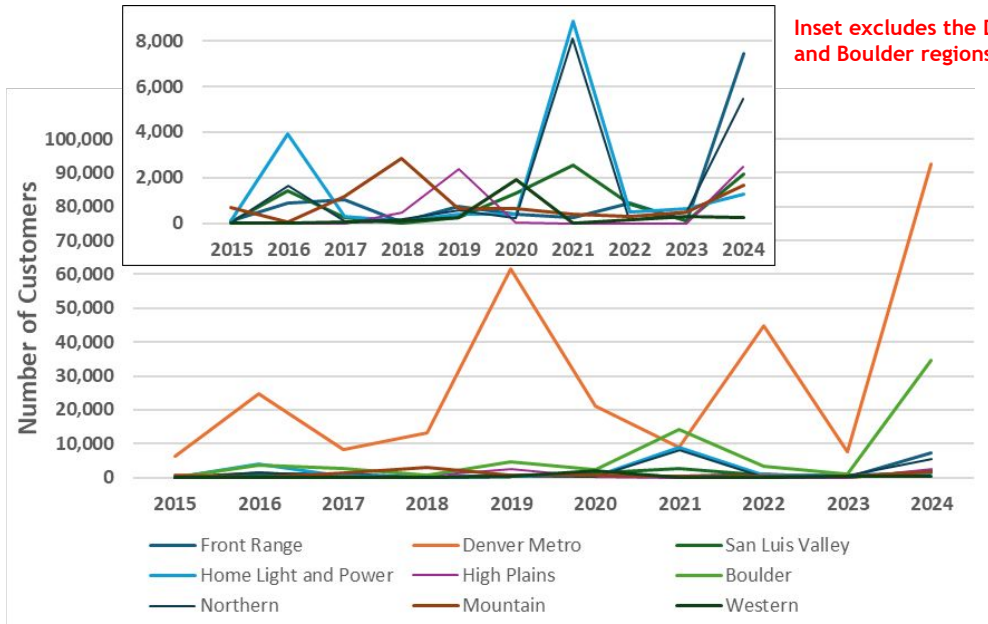
Regional Analysis, History of Outage - No Exclusions

Customers with 6 or More Outages (CEMI6)



- The Denver Metro region had the historically highest rate of customers experiencing six or more outages in a year
- Every region except the High Plains experienced an increase in customers experiencing six or more outages in 2024
  - Most increases were a recent or historic high
  - The High Plains region did not undergo ANY Wildfire Safety Operations in 2024

Outages Longer than 12 hours (CELI12)



- The Denver Metro and Boulder regions experienced historically high rates of outages longer than 12 hours and the highest overall
- The Front Range region experienced its highest historical rate of outages longer than 12 hours. The Northern was also historically high, except for 2021.
- The remaining regions were largely in line with their historical trends, but up from the previous year

Regional Summary

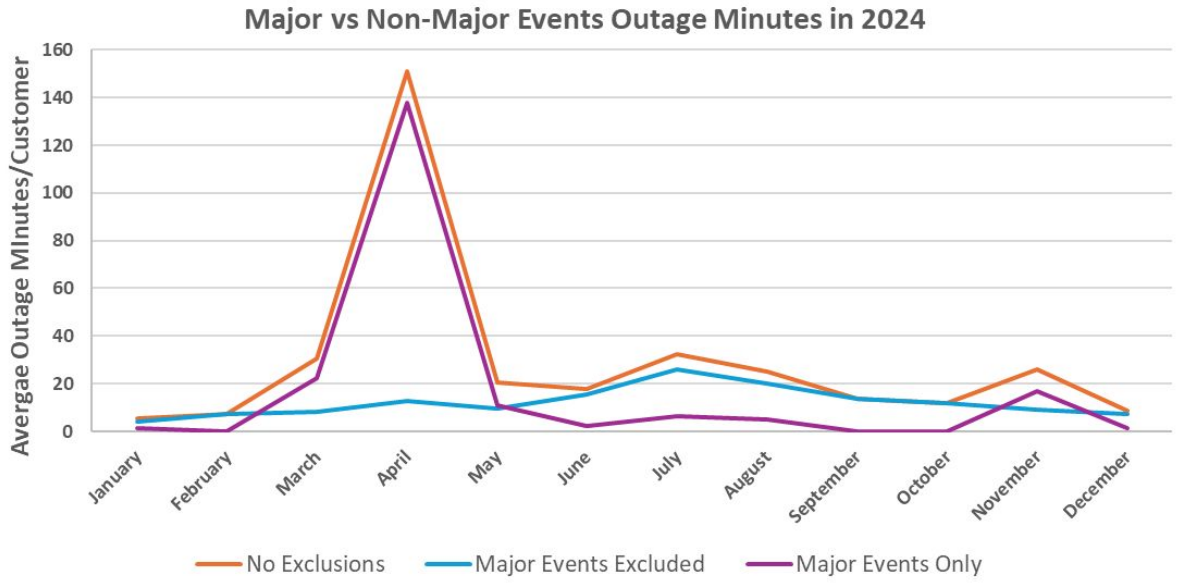
- Most regions experienced an increase in outage minutes/customer in 2024 compared to their historic trends:
  - The Front Range, Denver Metro, San Luis Valley, Boulder, Western and Mountain regions all experienced increases exceeded their historical trends
  - The Northern, High Plains, and Home Light and Power regions were largely in line with their historical trends
- However, EVERY region in PSCo's system experienced an increase in outage minutes rates in 2024 compared to 2023
- As observed at a system-level, much of the increase was driven by an increase in the number customers who experienced many outages (6 or more) and longer outages (12 hours or more)

V. Major Events Analysis

Whole System	Overall system contribution of Major Events
Regional	Regional impacts of Major Events

What are Major Events?

- "Major Event Days" (MEDs) are an Institute of Electrical and Electronics Engineers (IEEE) designation based on a set of weather conditions that increase risks to the distribution system. These are significant events that can cause many outages at the same time, such as heavy snow, severe wind, etc.
- Examples:
  - In December of 2021, the Marshall Fire occurred on a day with high winds and extremely dry conditions in Boulder County
  - In April of 2024, a significant wind storm led to a large number of outages across the metro area
- **Note:** a Major Event is not itself a "cause" of an outage, but can provide information about whether an outage occurred during a moment of extreme weather conditions (or not).



Wildfire Safety Operations

- Wildfire Safety Operations (WSO) are a specific way that the company operates the distribution system to mitigate wildfire risk in certain weather conditions. For example:
  - Wind gusts above 25 mph
  - A Fire Danger Index of moderate or greater
  - Relative humidity below 20%

- Under normal conditions, when certain safety hardware is "tripped" and a circuit is open and power cannot flow, the hardware (called a recloser) will attempt to close the circuit three times before remaining open. An open circuit connect means that customers served by that hardware are experiencing an outage.
  - In many cases, small fluctuations in a local area can trip a circuit, but the recloser allows power flow largely uninterrupted
  - During WSO, reclosers will not automatically reclose to reduce the likelihood of sparking and other issues that could start a fire

- When an outage occurs during WSO, manual inspection of the affected hardware and other connected components is required before power is restored, which increasing the duration of the outage compared to normal operation

- **The company also uses Public Safety Power Shut-offs (PSPS) to systematically cut power to targeted high fire risk areas, and did so for the first time in April 2024**

- PSCo is currently piloting Enhanced Powerline Safety Settings (EPSS) technology to reduce outage duration.
  - EPPS was first implemented on a few selected lines in April, and has been expanded during 2024

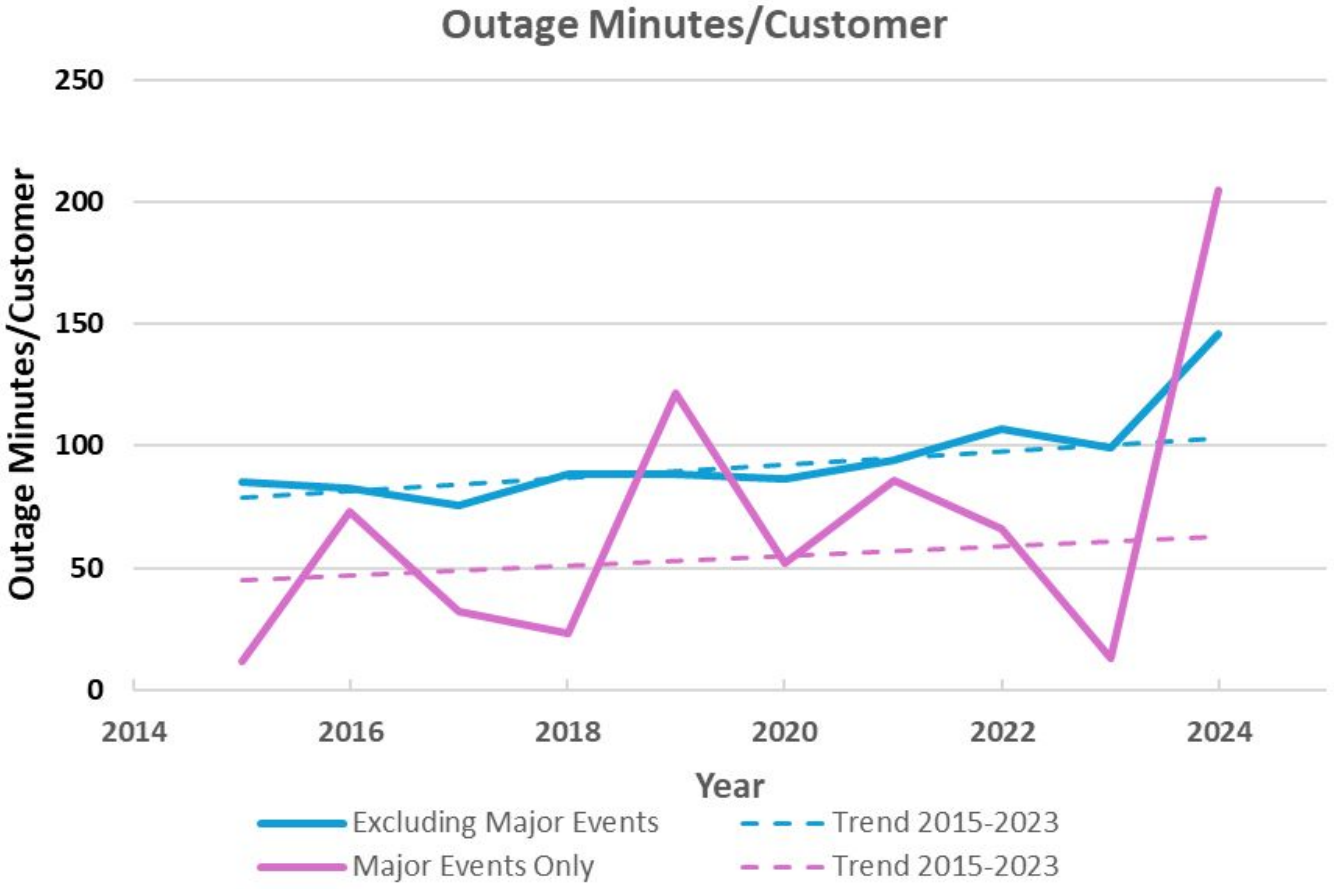
- It is unclear from the information provided by the Company as to why certain outages were considered to be impacted by WSO procedures, while others that occurred at the same time on the same feeders were not.
  - For instance, there are outage events in the WSO log that have the same primary event ID and feeders as other outages that are not considered WSO. Staff could not find a clear pattern to why certain outages were considered WSO events and others were not.
  - Additionally, the Company only began tracking WSO in April 2024, Staff only received a log of WSO outages through September 2024
  - Staff recommends that outages impacted by WSO be flagged within the main outage log.

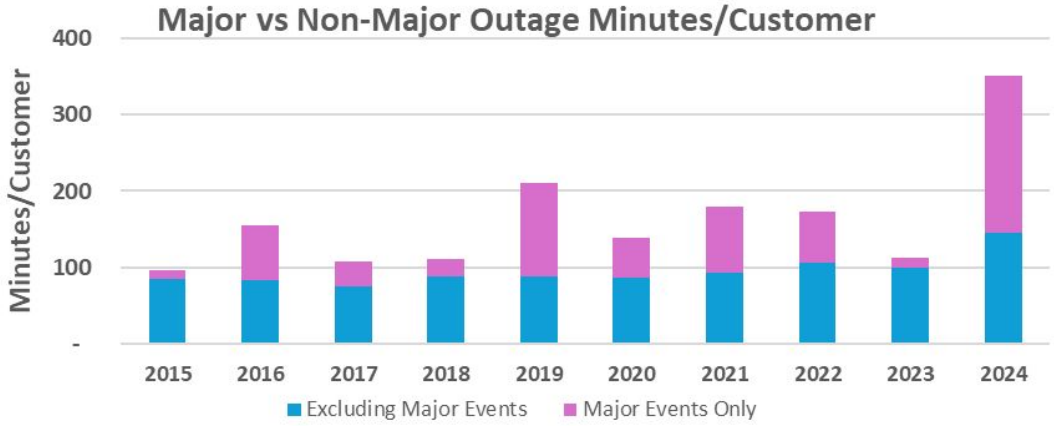
Outage History Compared to 2024: Major Events

Whole Service Area Level

Historic Outage Analysis of the Whole System Major Events

Whole System: Both Major and Non-Major Events Increased in 2024





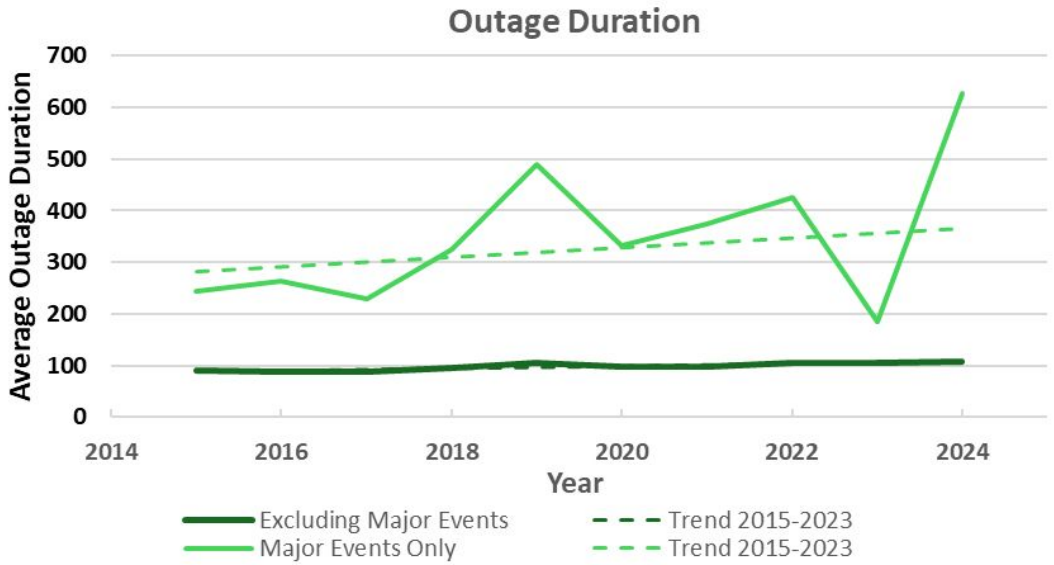
Major Events are a significant, but inconsistent, contributor to outages at a system level.

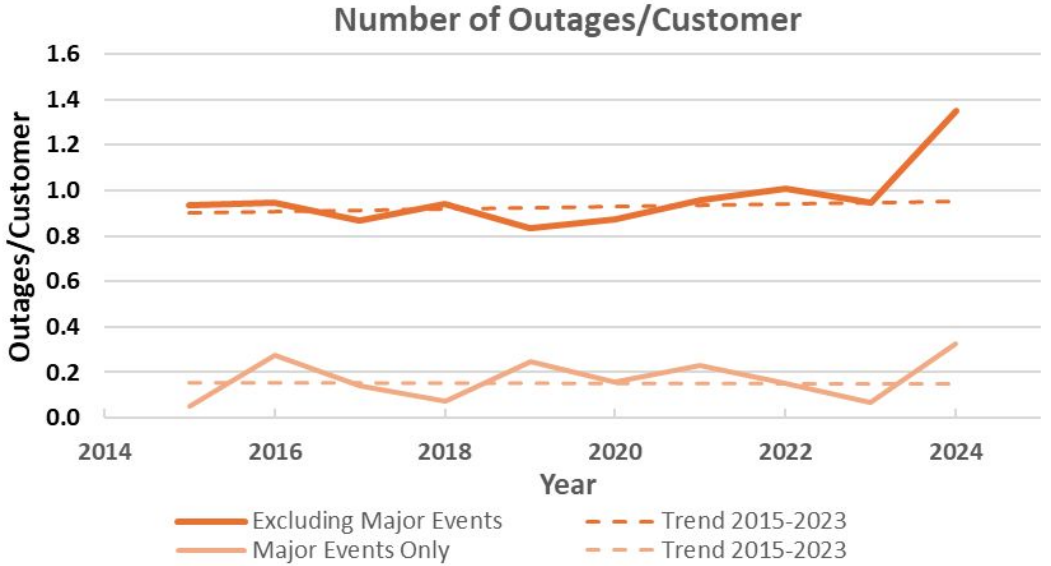
In 2024, outage minutes/customer from BOTH Major and non-Major causes were:

- **At all time highs**
- **Significantly higher than their 2015-2023 trend**

While it may be reasonable to attribute the increase for major events to a single (or series) of significant weather events, there is still an increase in minutes from underlying non-major events

Whole System: Major vs. Non-Major Events





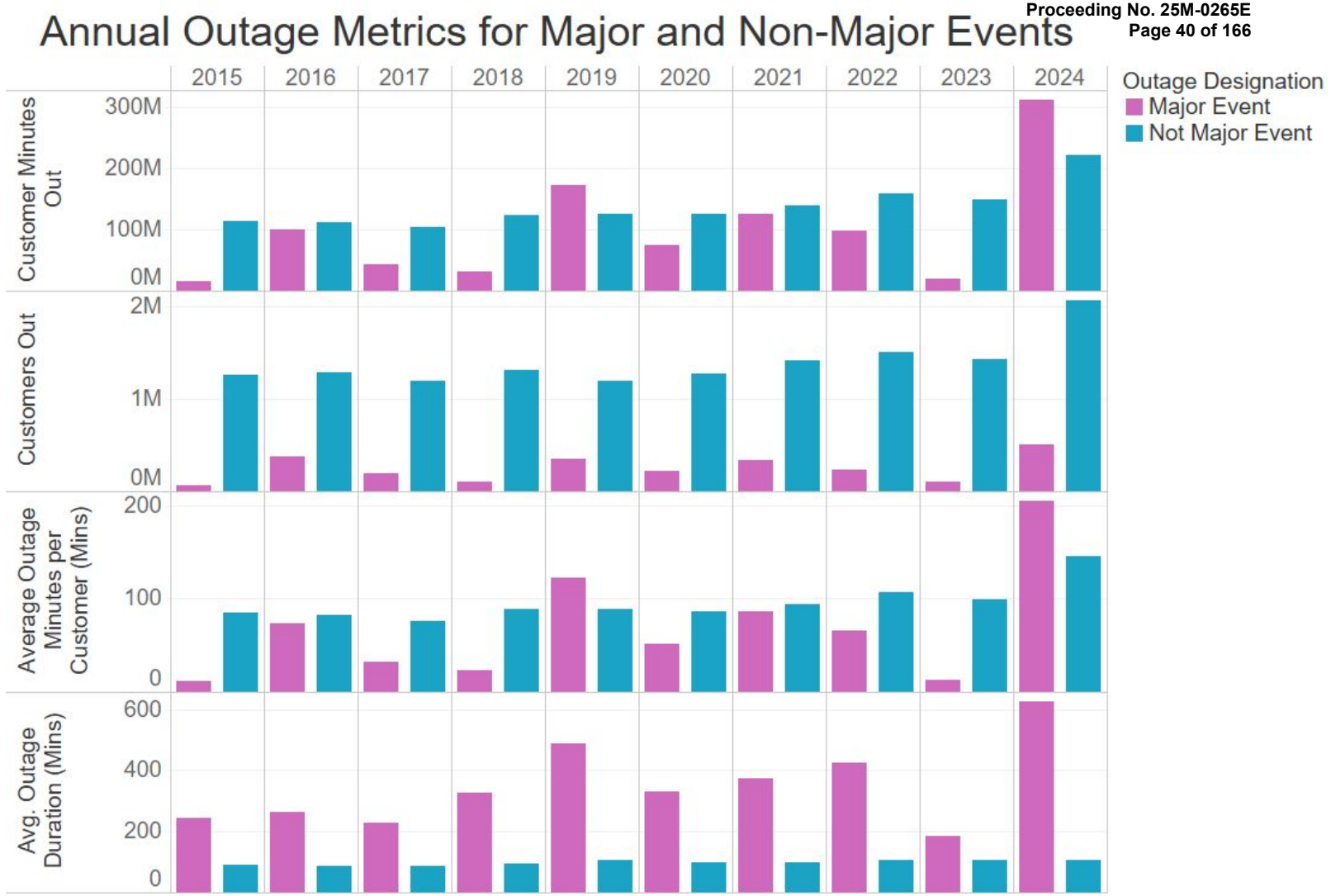
- Outages associated with Major Events are historically much longer in duration compared to other outages
- Outages associated with Major Events impact many fewer customers compared to non-major events

In 2024:

- **Major Event Outages were longer than the historical trend (which was already increasing over time)**, but caused only slightly more outages than historical trends
  - A small number of PSPS events resulted in very long outages in April 2024
- **Non-major event outage** duration was inline with historical trends, but **customers experienced about 30% more outages overall**

10 Year Comparison of Outage Metrics for Major and Non-Major Events

- Major Event outages have always had longer durations than other outages
- Major Events contributed more to average outages minutes per customer in 2024 than in years past
- Only in 2019 and 2024 did major events result in more average outage minutes per customer than outages not associated with Major Events



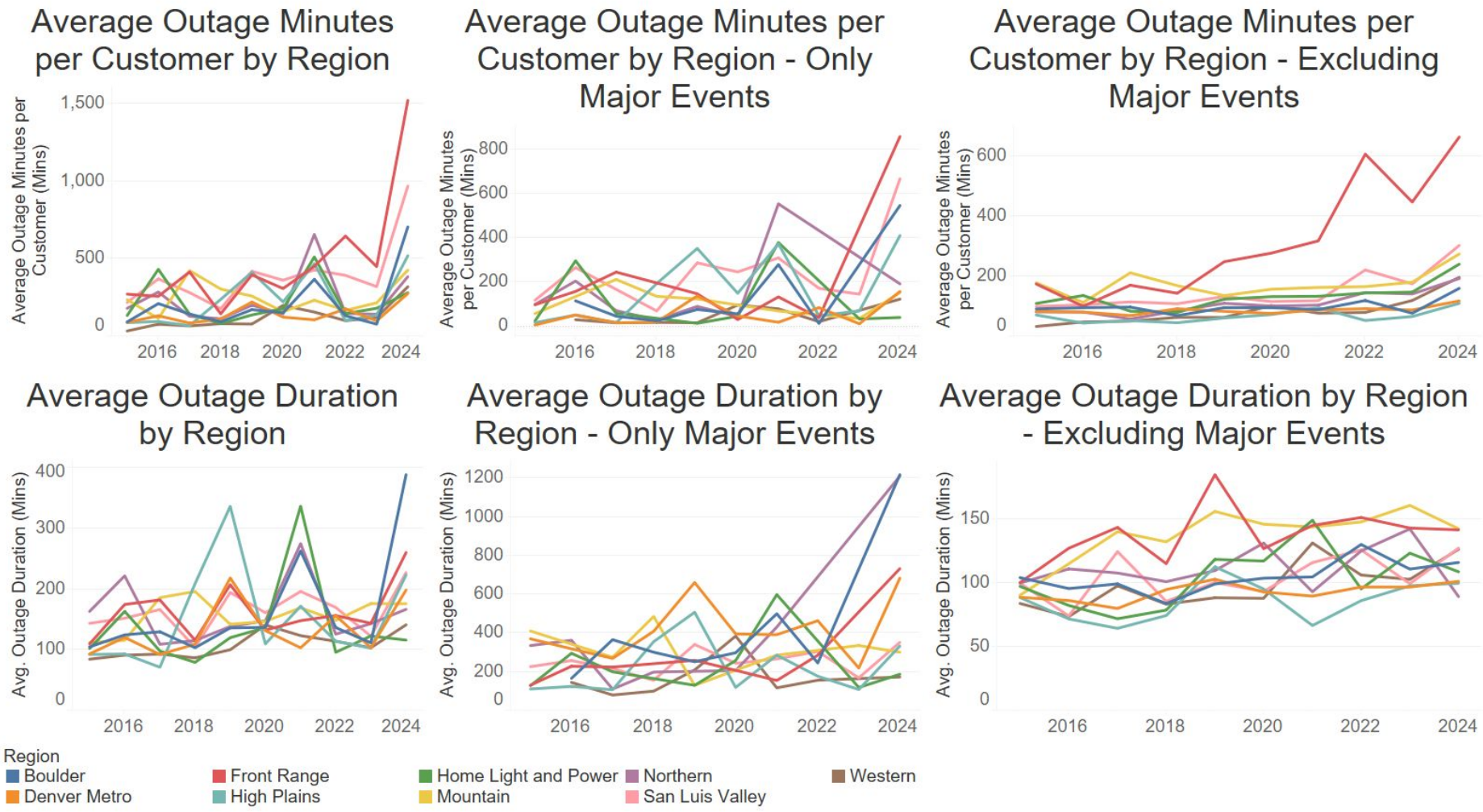
Outage History Compared to 2024: Major Events

Regional Trends

Historic Outage Analysis by Region of Major Events

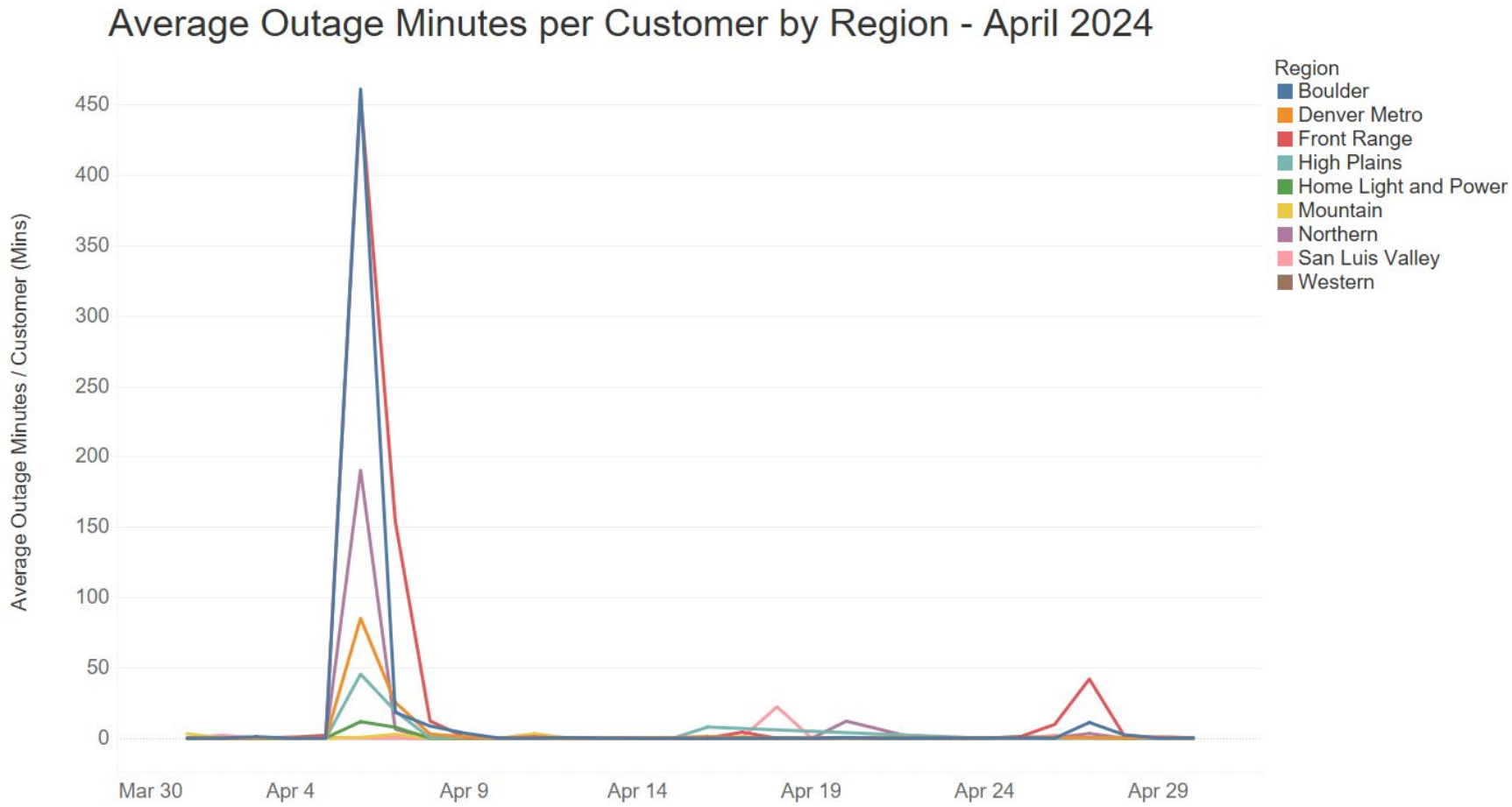
10 Year Comparison - Isolating Major Events

- Excluding Major Events, outage durations across all regions have remained relatively constant (with some regional exceptions)
- The duration of outages from Major Events has increased in recent years
- Both Major Events and non-Major Events have contributed to the increase in outage minutes over time



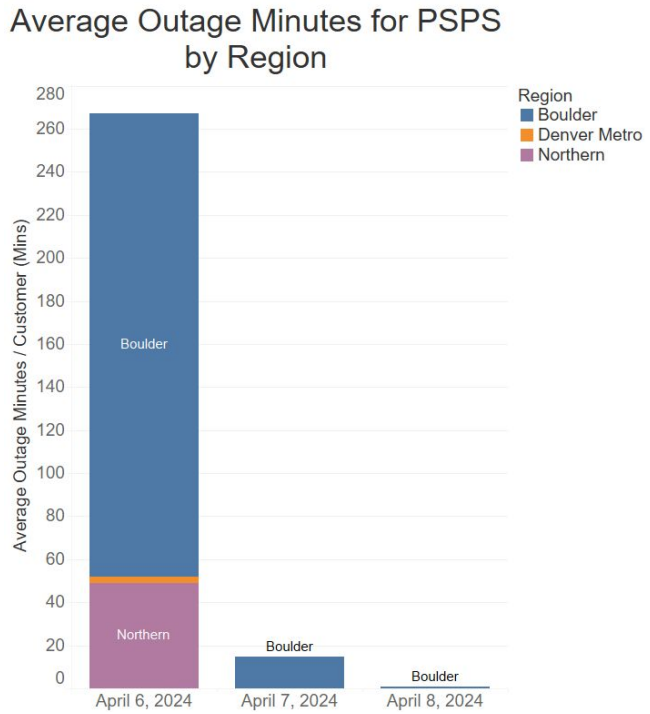
April 2024 Outages

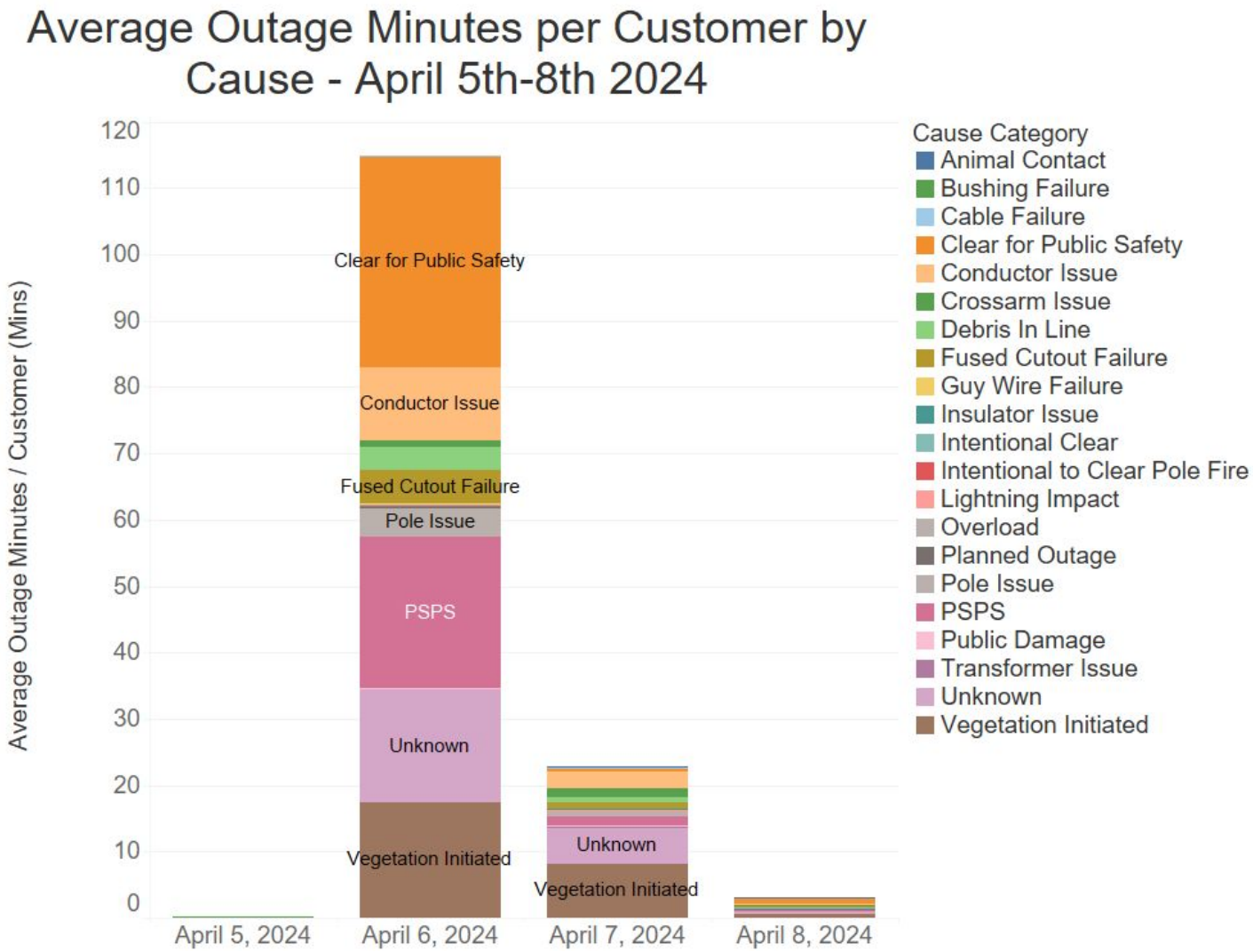
- On April 6th, 2024, PSCo initiated its first Public Safety Power Shutoff (PSPS) event
- In order to reduce wildfire risk due to extremely high winds, the Company intentionally shut off power to many customers
- **This was the only PSPS event the Company has undertaken**



April 2024 Outages

- While much of the outage minutes customers experienced on April 6th were due to the PSPS event, clear for public safety, vegetation initiated, and unknown causes also contributed, likely also due to the high winds
- According to the Company's outage log, the customers impacted by the event were in the Boulder, Denver Metro, and Northern regions

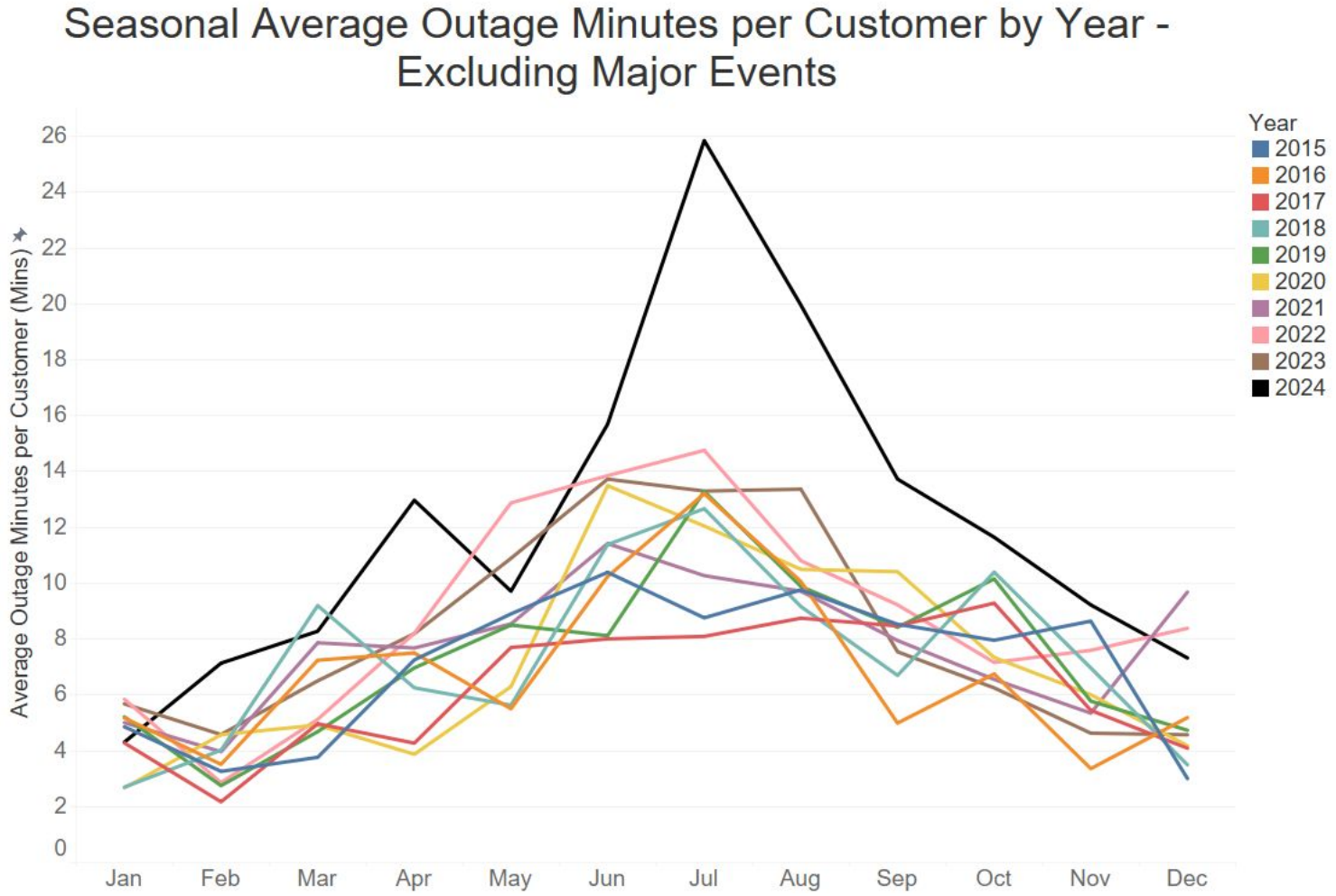




10 Year Seasonal Trend - Excluding Major Events

- Excluding major events highlights the underlying seasonal trend for outage minutes for factors other than severe weather
- Summer is historically the when customers experience the most outage minutes that are not due to severe weather events
- Even without major events, 2024 still stands out as an outlier with highest average outage minutes in nearly every month since 2015

This means that although the total amount of time customers lost power in 2024 is largely explained by major weather events, customers still experienced increased outage minutes throughout the year from other causes



Major Events Summary

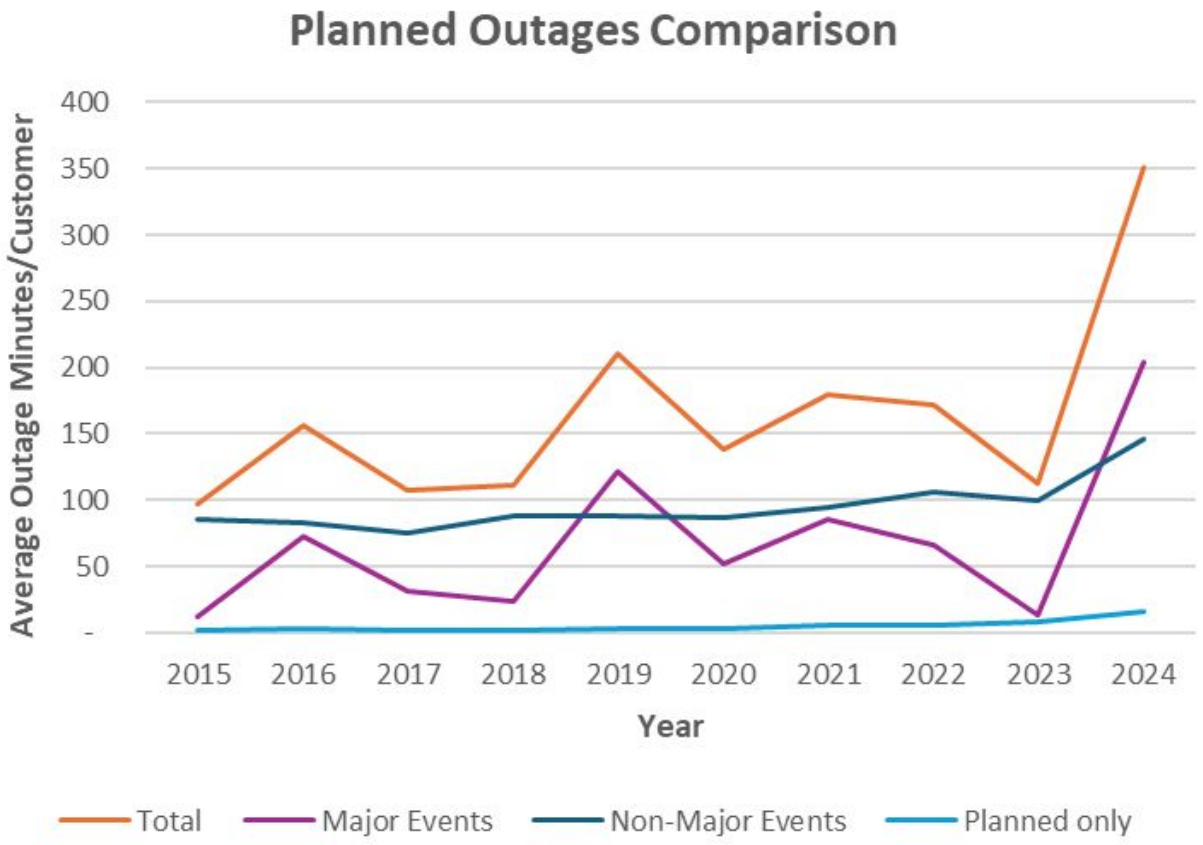
- In 2024, Major Events were the largest contributor to the increase in outage minutes in 2024 compared to previous years.
  - Especially the April windstorm
- Certain new Wildfire Safety Operation procedures likely contributed to the severity of customer outages during Major Events. For example, Public Safety Power Shut-offs, recloser settings, and other related operational activities like caused more and longer outages during Major Events
- At this time, the exact impact of the new WSO procedures, and PSPS, is unclear to Staff due to limitations of the WSO log provided

VI. Planned Outage Analysis

Planned Outages

Overall system and regional contribution of planned outages

Planned Outages



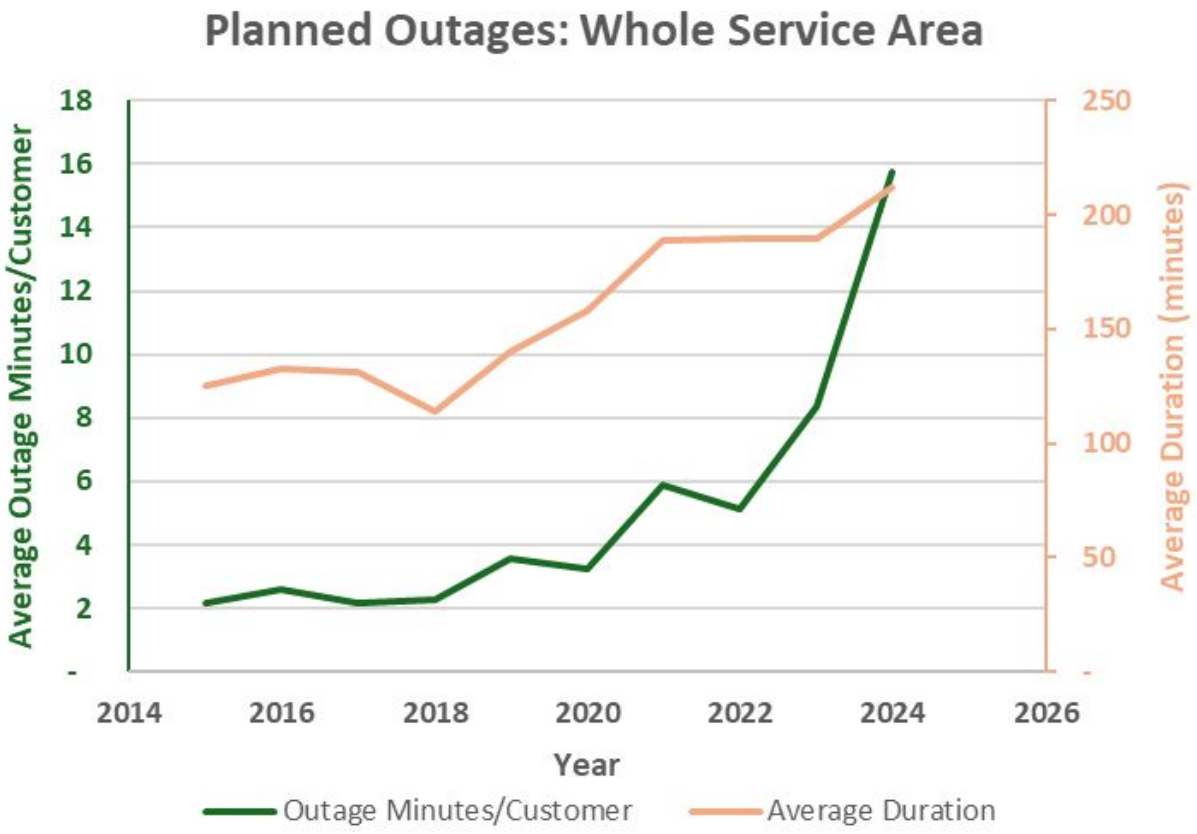
*Planned Only is a subset of Non-Major Events

Comparison: Outage Minutes/Customer					
Year	Customers	Total	Major Events	Non-Major Events	Planned only
2015	1,347,385	97	12	85	2
2016	1,362,275	156	73	83	3
2017	1,370,286	107	32	76	2
2018	1,395,859	112	23	89	2
2019	1,427,537	210	122	88	4
2020	1,446,997	138	52	86	3
2021	1,475,690	180	86	94	*6
2022	1,493,151	172	66	107	5
2023	1,510,520	112	13	99	8
2024	1,527,826	350	205	146	16

- Planned outages are historically a small component of the overall outage minutes

Planned outages comprise the following outage causes in the Company's logs: PSCo Planned Construction Outage, PSCo Planned Tree Trim Outage, Properly Planned Const Outage, Properly Planned Tr Trim Outage

Planned Outages



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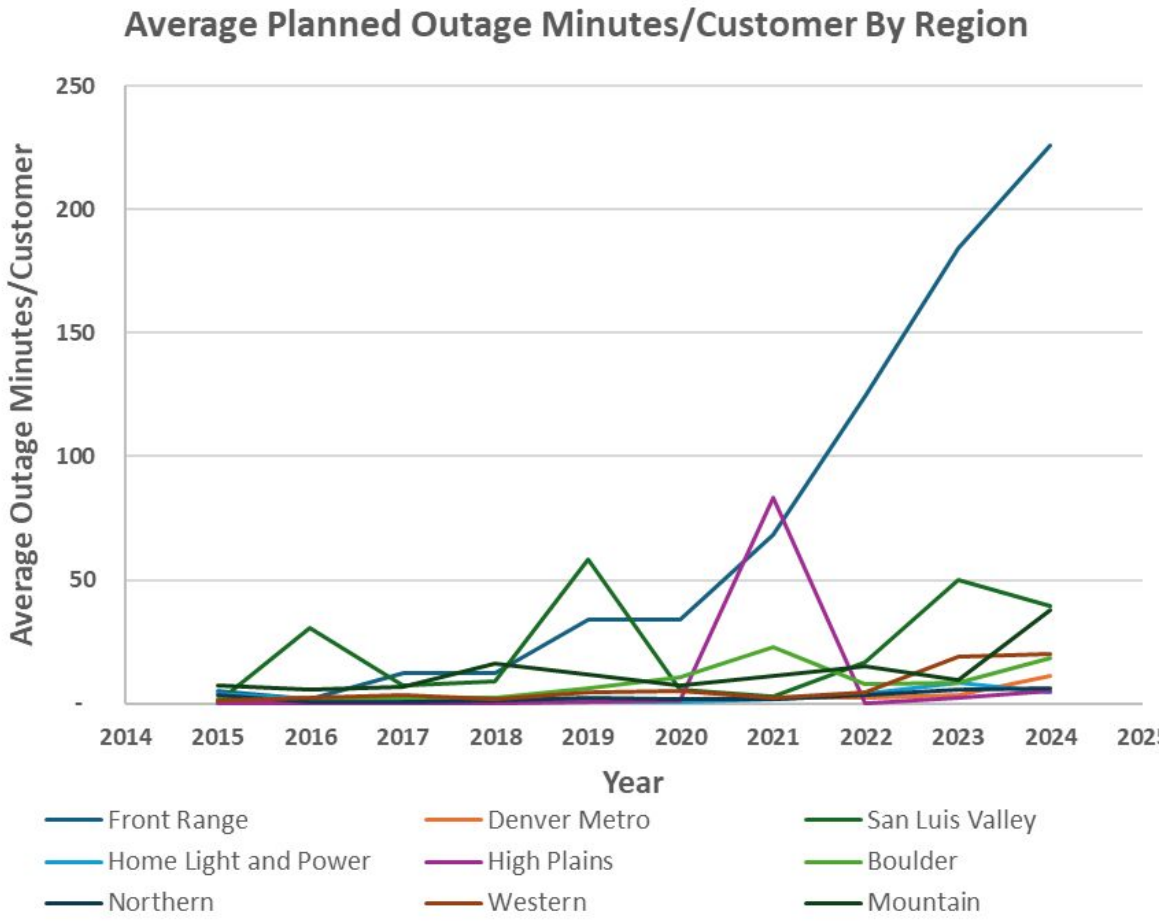
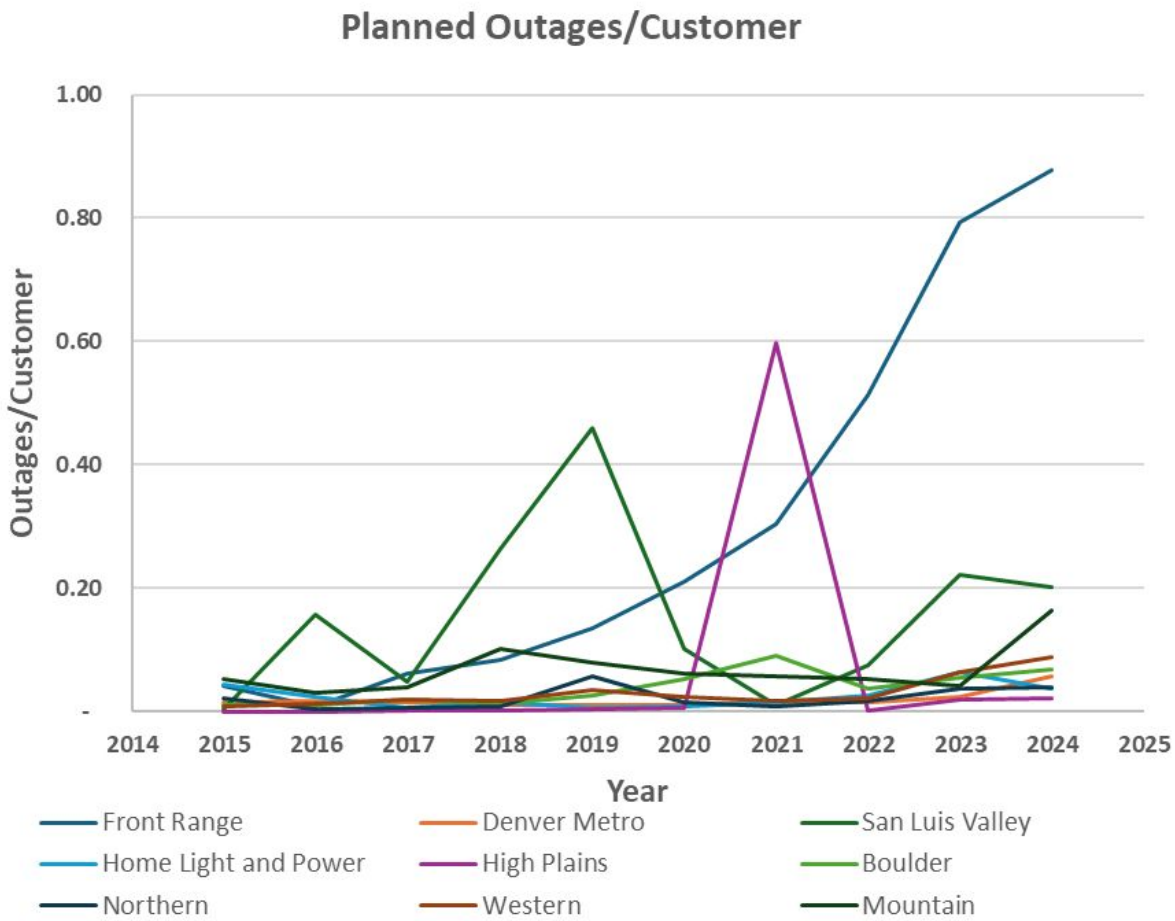
2024	1,527,826	350	205	146	16

- Planned outages are historically a small component of the overall outage minutes
- Planned outages are becoming more frequent and are lasting longer (Doubled in 2024 compared to 2023)
- PSCo's explanation for this increase is that the planned outages are associated with an increase in pole replacements and wildfire risk mitigation projects this year.
- Company communication with customers will become even more important to set appropriate expectations

Planned outages comprise the following outage causes in the Company's logs: PSCo Planned Construction Outage, PSCo Planned Tree Trim Outage, Properly Planned Const Outage, Properly Planned Tr Trim Outage

Planned Outages: Regional Picture



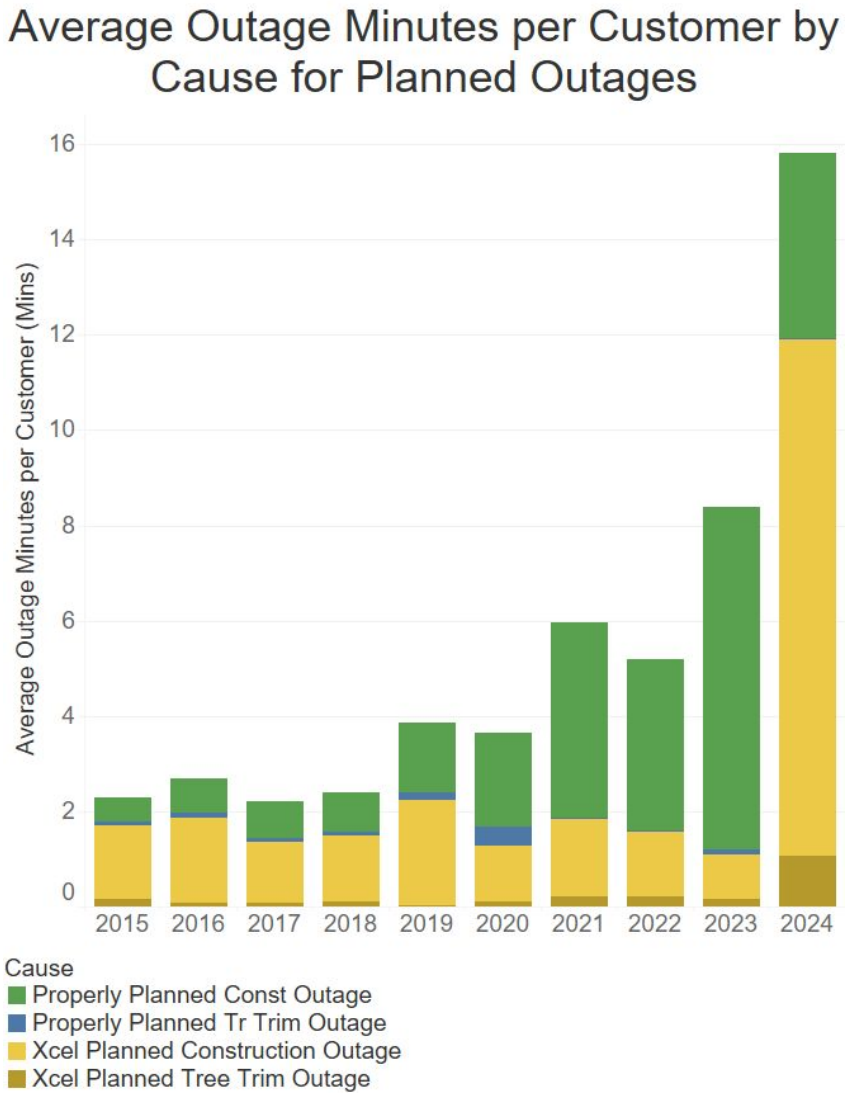


- The Front Range is largely driving the increase in planned outages, as these outages have been increasing over the last 10 years. In recent years, the San Luis Valley and Mountain region have also seen increases, but not at the level of the Front Range region over time

Planned Outages

- Planned outages are an important part of maintaining reliability of the electrical system
- The Company has a several cause designations that are “Planned Outages” that were used in this analysis:
  - PSCo Planned Construction Outage, PSCo Planned Tree Trim Outage, Properly Planned Construction Outage, Properly Planned Tree Trim Outage

Staff’s analysis shows that, although planned outages are increasing, they are not a driving factor overall



VII. Outage Causation Analysis

Whole System	Logged causes of outages on the whole system
Regional	Logged causes of outages on the system by region

Whole Service Area: Causation Categories

Average Outage Minutes/Customer										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Transformer Issue	1.0	1.2	1.2	1.6	1.4	1.0	1.8	2.0	2.8	3.8
Conductor Issue	6.2	37.2	14.7	14.0	73.4	15.3	40.4	13.9	10.2	32.0
Unknown	9.6	7.9	7.6	10.4	8.9	8.1	9.3	15.2	11.5	51.6
Animal Contact	3.3	6.8	5.1	5.4	3.8	3.5	4.4	5.7	3.7	4.2
Intentional Clear	0.5	1.0	0.6	1.3	3.2	1.0	1.5	1.9	1.3	3.3
Cable Failure	19.3	17.8	16.6	15.5	16.3	17.6	18.2	23.8	20.5	22.1
Public Damage	12.1	15.8	8.4	12.4	9.0	12.7	19.8	16.4	12.0	11.4
Insulator Issue	1.6	3.5	2.4	0.6	2.5	1.8	0.4	1.8	1.9	2.6
Planned Outage	2.2	2.6	2.2	2.3	3.6	3.2	5.9	5.1	8.3	15.8
Overload	2.1	2.8	1.3	2.7	2.7	1.8	2.4	2.2	1.2	2.0
Pole Issue	3.4	7.5	6.3	8.0	12.2	10.8	11.7	5.5	8.5	10.5
Switch Issue	4.3	4.4	3.8	2.0	7.5	2.1	3.1	3.4	1.6	2.4
Lightning Impact	3.9	5.3	2.5	3.3	5.7	2.7	2.4	2.2	5.5	1.4
Fused Cutout Failure	0.6	1.1	0.6	0.9	1.5	0.6	0.8	1.4	0.7	8.0
Vegetation Initiated	8.0	11.6	17.8	14.2	22.5	34.0	30.6	51.1	7.0	55.7
Debris In Line	1.6	1.9	2.1	2.0	1.9	3.0	1.5	9.7	1.9	9.2
Splice Issue	2.5	3.5	3.5	2.0	2.2	2.3	0.3	0.2	0.1	0.0
Accidental	2.9	1.7	1.9	3.6	1.0	1.6	1.6	1.0	3.3	1.5
Ground Settling	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Road Spray	0.2	0.1	0.2	0.3	0.3	0.5	0.0	0.3	0.4	0.0
Industrial Contamination	0.6	0.0	0.1	0.1	2.3	0.3	0.7	0.8	0.6	0.2
Terminator Failure	2.7	1.9	1.0	2.5	3.2	2.4	2.4	1.6	1.4	1.7
Metering or Assoc Eq Failure	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushing Failure	0.3	0.7	0.4	0.4	0.5	0.4	0.3	0.5	0.5	0.4
Crossarm Issue	0.9	1.6	1.2	1.4	3.1	3.4	3.0	1.5	1.9	4.8
Environmental	3.4	13.2	2.9	1.3	15.5	2.1	3.1	1.0	2.1	0.2
Fuse Link Broken	0.1	0.0	0.1	0.1	2.0	0.2	0.2	0.2	0.0	0.3
Guy Wire Failure	0.0	0.1	0.0	0.0	0.0	0.0	0.6	0.0	0.2	0.1
Improper Install	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.3	0.1
Clear for Fire/Police/Etc.	0.0	0.1	0.3	0.2	0.1	3.5	0.3	0.2	0.2	0.1
Capacitor Bank Failure	0.1	0.2	0.0	0.0	0.2	0.2	0.1	0.2	0.1	0.0
Breaker Failure	0.5	1.5	1.1	1.8	2.3	0.0	2.4	0.4	0.7	0.0
Intentional Clear For PSPS	-	-	-	-	-	-	-	-	-	24.4
Clear for Public Safety	0.0	0.1	0.1	0.3	0.1	0.3	4.4	1.4	0.3	78.9

*A number of minor categories are not shown, they are included in Appendix ???.

At a system level, eight causation categories were identified in the top 4 for outage minutes/customer in at least one year since 2015.

- Conductor Issue
- Unknown
- Cable Failure
- Public Damage
- Vegetation Initiated
- Environmental
- Intentional Clear for PSPS
- Clear For Public Safety

Planned outages is highlighted in this table because, although it has not been a top 4 category historically, it was the 6th highest in 2024 and is a significant factor in certain geographies and excluding Major Events

Of these eight:

- “Conductor Issues”, “Unknown”, “Cable Failure”, and “Public Damage”, and “Vegetation Initiated” have historically been in the top 4 of causation categories
- “Clear For Public Safety” has recently climbed to the top 4
- “Intentional Clear for PSPS” is new in 2024 and was a top 4 cause
- “Environmental” has not contributed significantly since 2019 and is not included in subsequent analysis

Regional Causation With and Without Major Events

Top 4 Causation Categories for Each Region, Including and Excluding Major Events

	Including Major Events								
Cause Category	**FR**	**DM**	**SLV**	**HL&P**	**HP**	**Bou**	**N**	**W**	**M**
Clear for Public Safety	4	3	2	2		1	1	1	1
Vegetation Initiated	2	1				3			2
Unknown	1	2	1	3	3		2	2	3
Conductor Issue		4	3	1	2	2	3		
Cable Failure								4	
Planned Outage	3					4		3	4
Public Damage			4	4			4		
Pole Issue					1				
Lightning					4				

	Excluding Major Events								
Cause Category	**FR**	**DM**	**SLV**	**HL&P**	**HP**	**Bou**	**N**	**W**	**M**
Clear for Public Safety	2	2	1	1		1	1	1	1
Vegetation Initiated						4			
Unknown	3	3	2	2	1		2	3	
Conductor Issue	4			4	2		4		
Cable Failure		1				3		4	3
Planned Outage	1	4	4	3		4		3	2
Public Damage			3		4		3		4
Pole Issue									
Lightning					3				

- These two tables show the top 4 causation categories for every region, both with and without Major Events.
- "Clear for Public Safety" and "Unknown" are consistently drivers of outage minutes across regions, even when Major Events are accounted for
  - PSCo claims that the Unknown outage causes are temporary faults that a specific cause was not found and are likely related to other known temporary faults attributed to some of these other cause categories, and that total number outages outside of MEDs is close to the 3-year average
  - Those outage events have affected more customers and had longer durations than the prior years
- "Vegetation Initiated" and "Pole Issues" are much larger factors during Major Events than at other times
  - Causes like these are still present without Major Events, but their contributions are less significant
- As discussed previously, "Planned Outages" are becoming a more significant underlying factor for outages that are not due to Major Events
- In 2024, the majority of outage minutes were during a Major Event designation

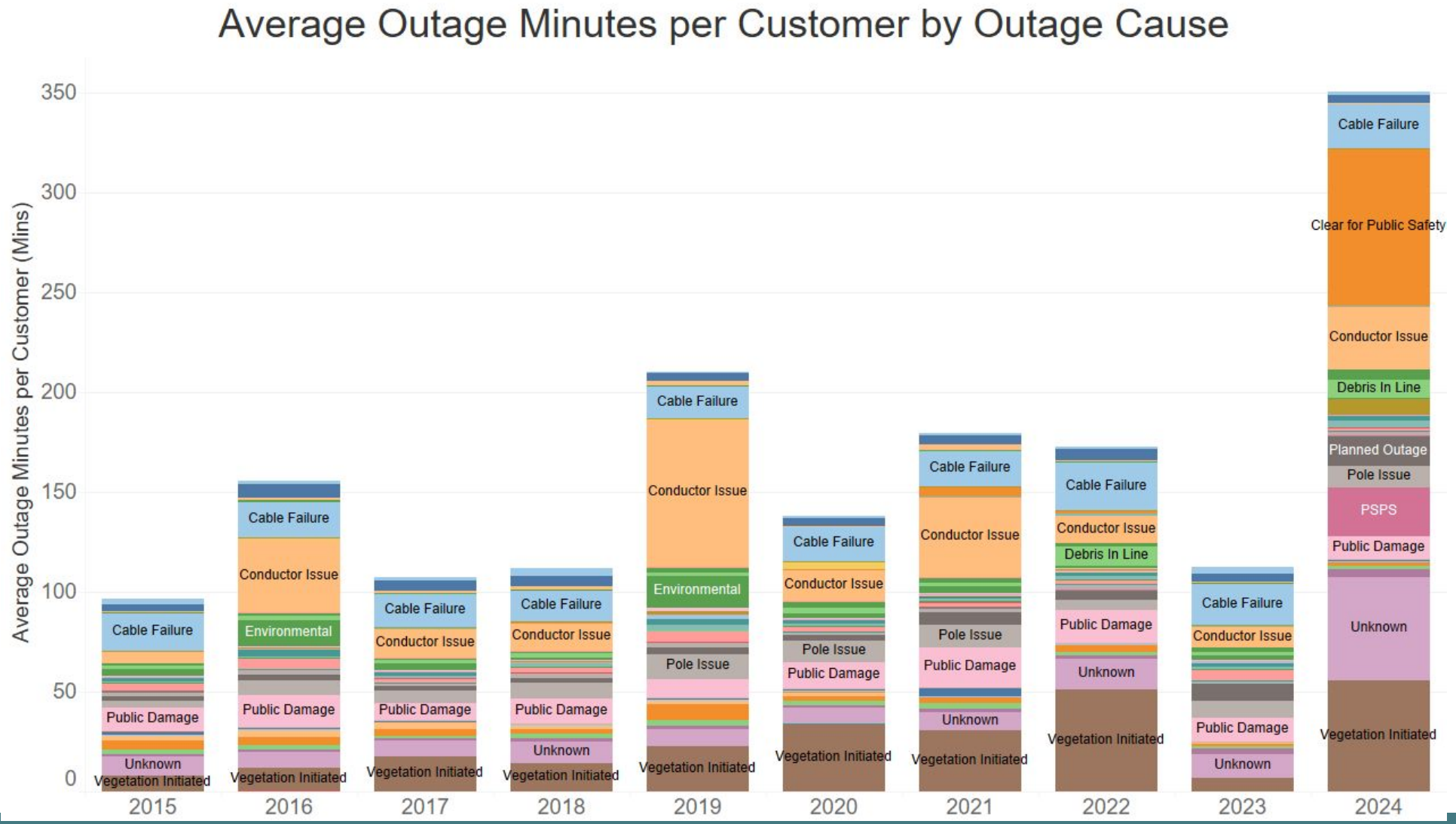
Key Takeaway: "Clear for Public Safety" is an important cause, even outside of Major Events. More insight from the Company would be helpful to explain how this cause is reported.

Constructing the Causation Categories

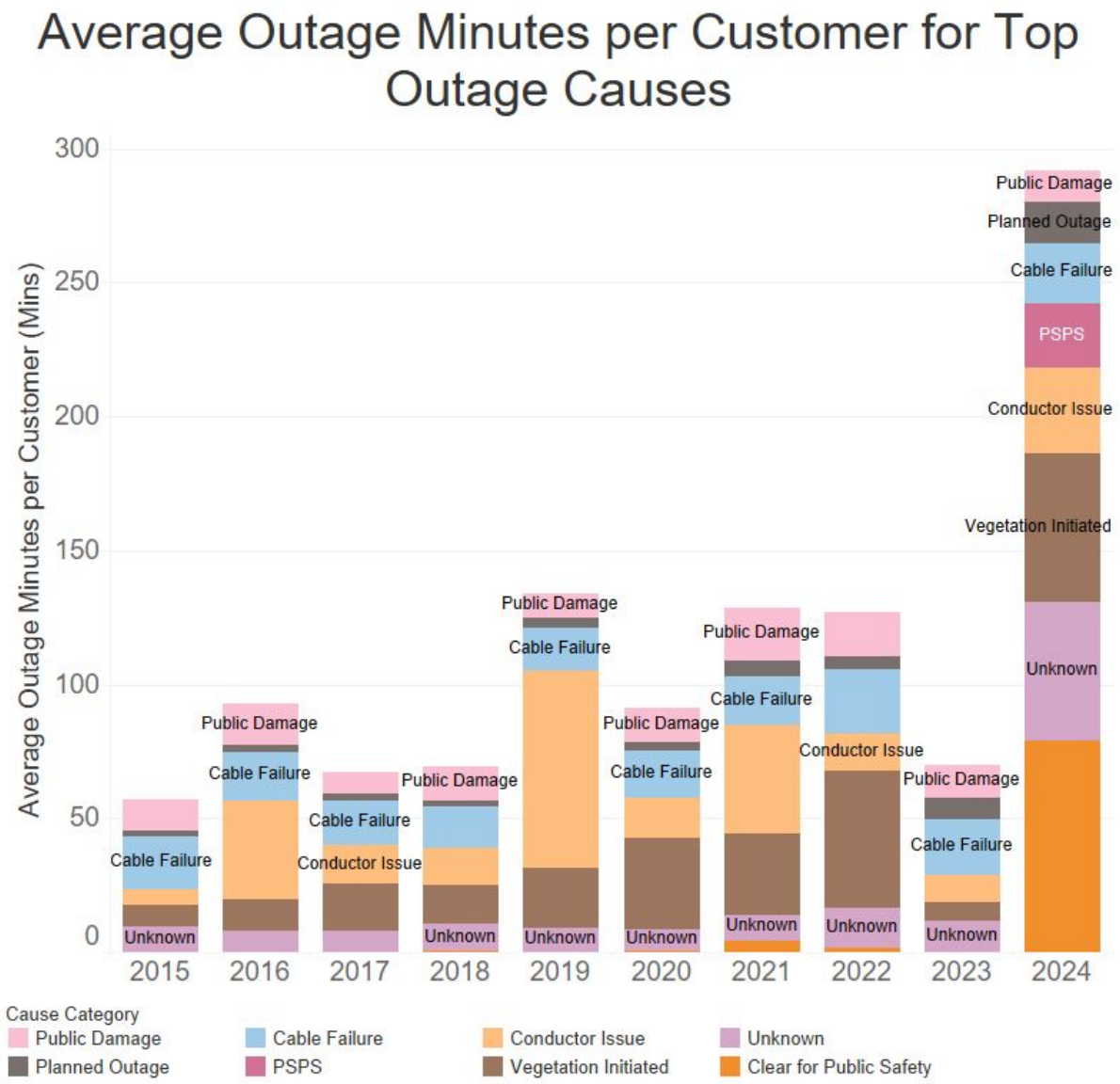
- The outage log data maintained by the company contains over 150 specific "causes", and one is assigned to each outage
- For simplicity of the analysis, these causes were sorted into "causation categories" based on common themes, for example:
  - There are 4 different types of "Planned Outages" → combined into a single category
  - There are 5 different conductor related causes, → combined into "Conductor Issue"
- **51 causation categories were created using this methodology**
- Many of the specific causes can be either at the distribution system level or the transmission system level (for example, a conductor issue can occur on a distribution or transmission line)
  - Less than 3% of of the outage minutes in 2024 were at the transmission level
  - For this analysis, staff did not differentiate between distribution or transmission level
- It is unclear what all of the causation categories mean.
  - For example, "Clear for Public Safety" and "Public Safety Power Shutoff" (PSPS) are both used for WSO-related outages, it is unclear what criteria the Company uses to apply "Clear for Public Safety"

Average Outage Minutes by Cause - Whole System

- Clear for Public Safety became the leading cause of outage minutes in 2024
- Intentional Clear for PSPS contributed significantly given that only one PSPS event occurred in 2024
- Vegetation initiated outages have been growing
- “Unknown” accounts for a significant number of minutes in 2024



Whole Service Area: Causation Categories

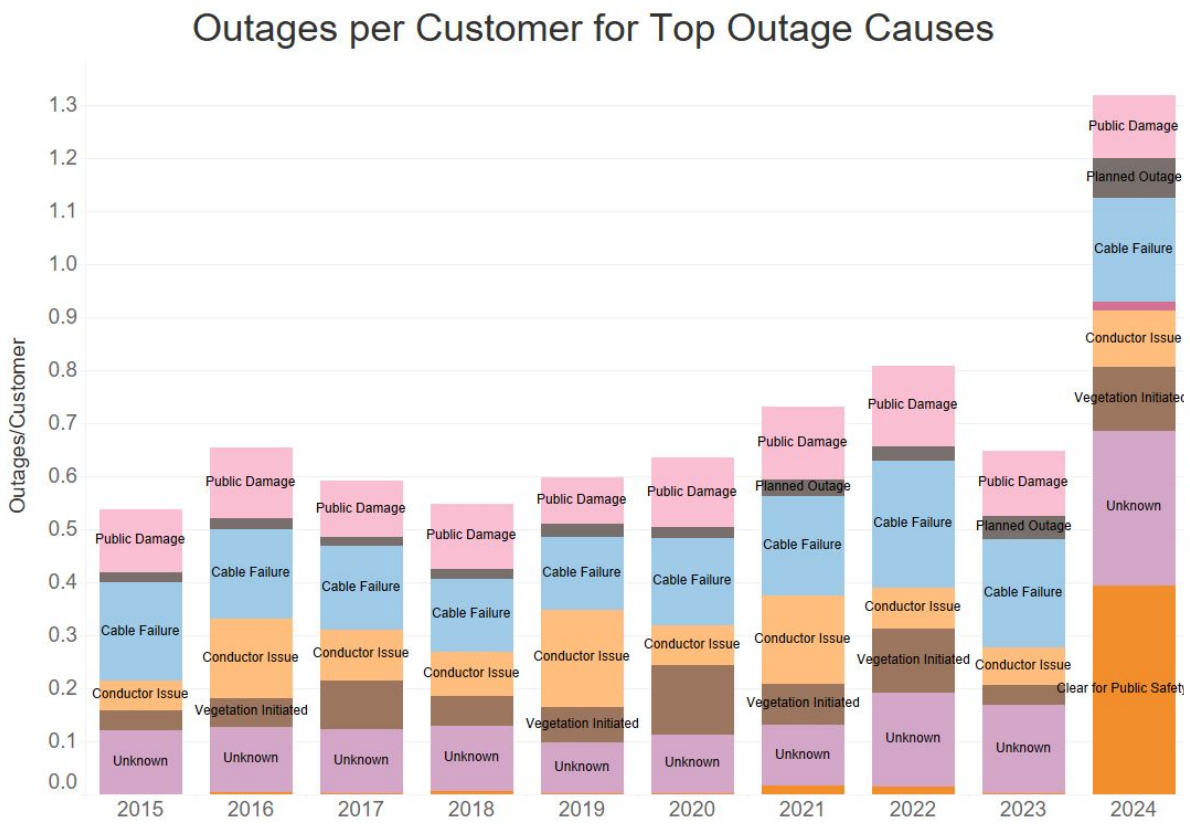


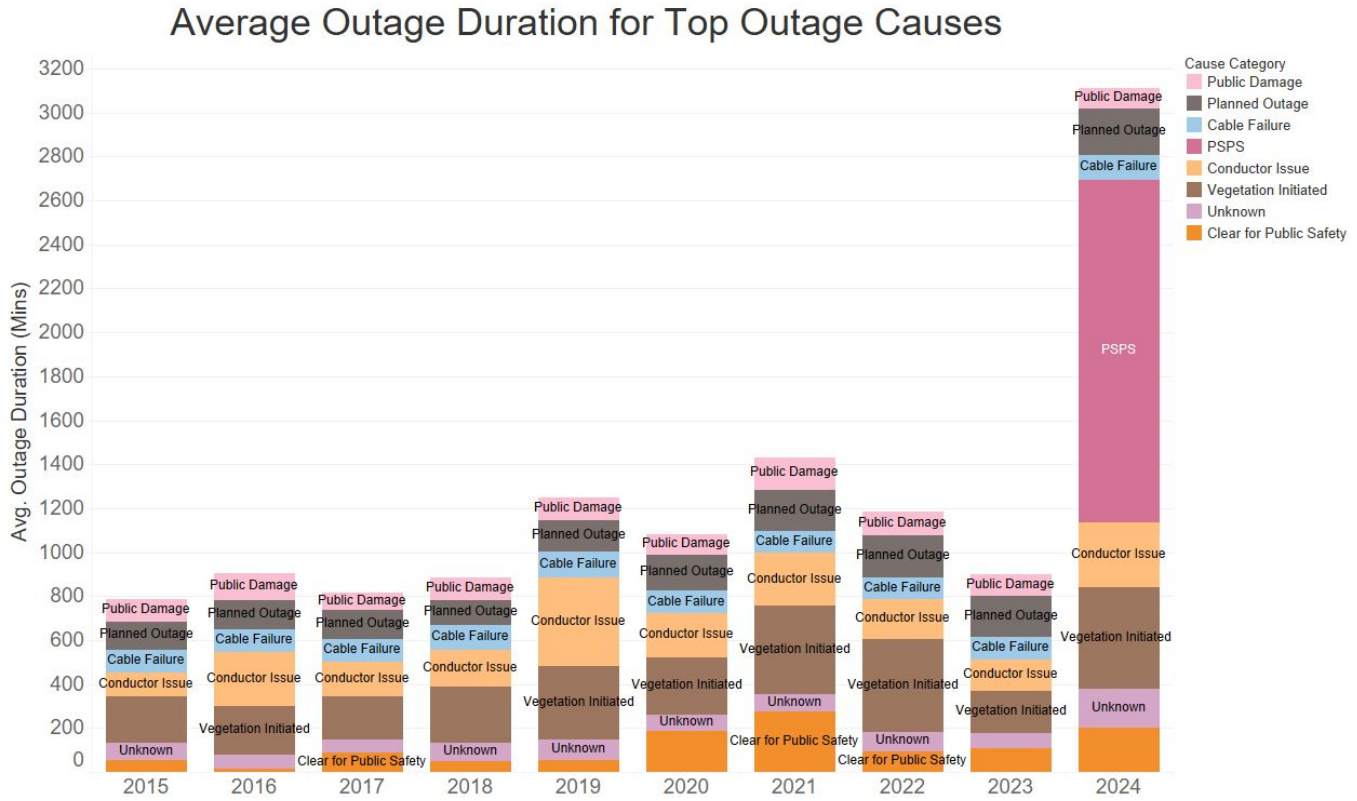
Top 4 causation categories for Outage Minutes/Customer in 2024 (**Solid lines**)

1) Clear for Public Safety
2) Vegetation Initiated
3) Unknown
4) PSPS

- Each of the Top 4 categories increased in 2024 relative to 2023, and "Conductor Issues" was the only category that was in line with its historic trend
- "Clear for Public Safety" was both the highest overall and had the largest change from its historic trend.
- 2024 was the first year that the Company utilized PSPS as a wildfire mitigation strategy, and these shut offs were used for the major April wind storm
- "Unknown" and "Vegetation Initiated" hit at all-time high levels, both of which track with the Major Events in 2024
- "Unknown" outage minutes are substantial and appear to be increasing

Whole Service Area: Causation Categories

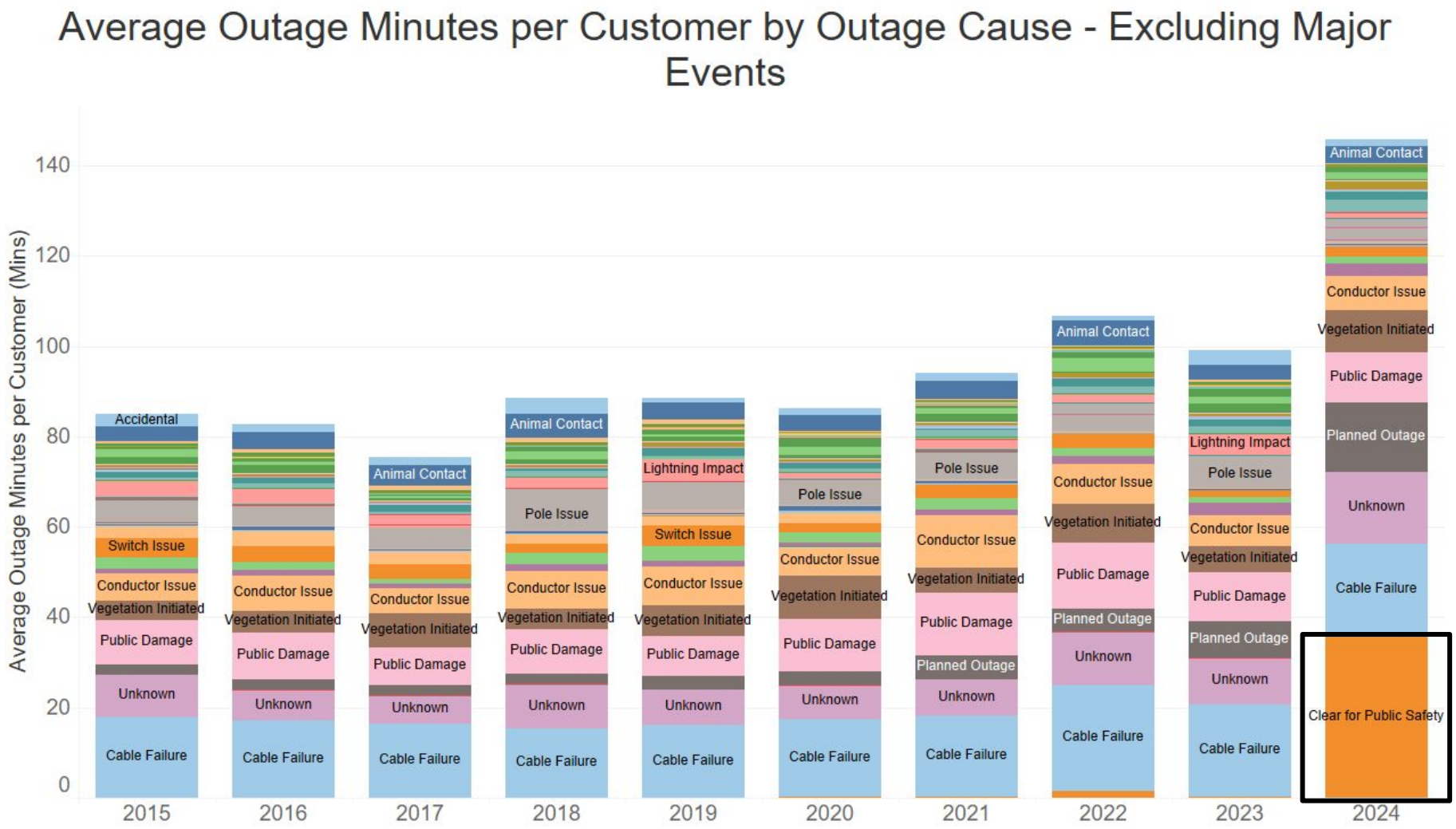




- **Clear for Public Safety**
  - Number of customers impacted increased significantly
  - Duration increased compared to 2023, but in line with historic trend
- **Vegetation Initiated**
  - Number of customers impacted in line with historic trend
  - Duration increased in 2023, and was somewhat high compared to historic trend
- **Unknown**
  - Number of customers impacted increased compared to the historic trend
  - Duration increased relative to the historic trend
- **PSPS**
  - Large impact from a small number of outages
  - Very long durations

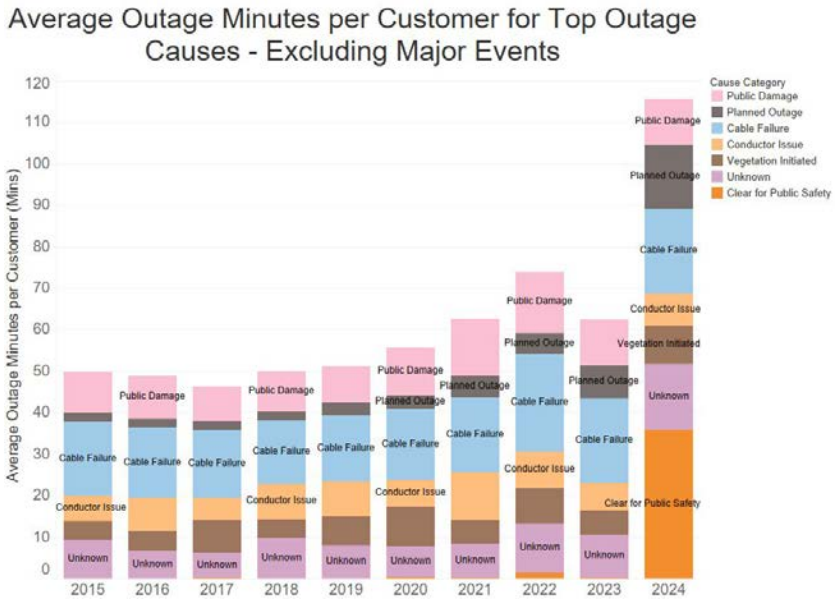
Outage Minutes/Customer by Cause - Excluding Major Events

Without outages due to Major Events, and excluding all "Clear for Public Safety" outages, average outage minutes per customer in 2024 would not be significantly greater than outage minutes in prior years



Whole Service Area: Excluding Major Events

Causation Categories: **Excluding** Major Events

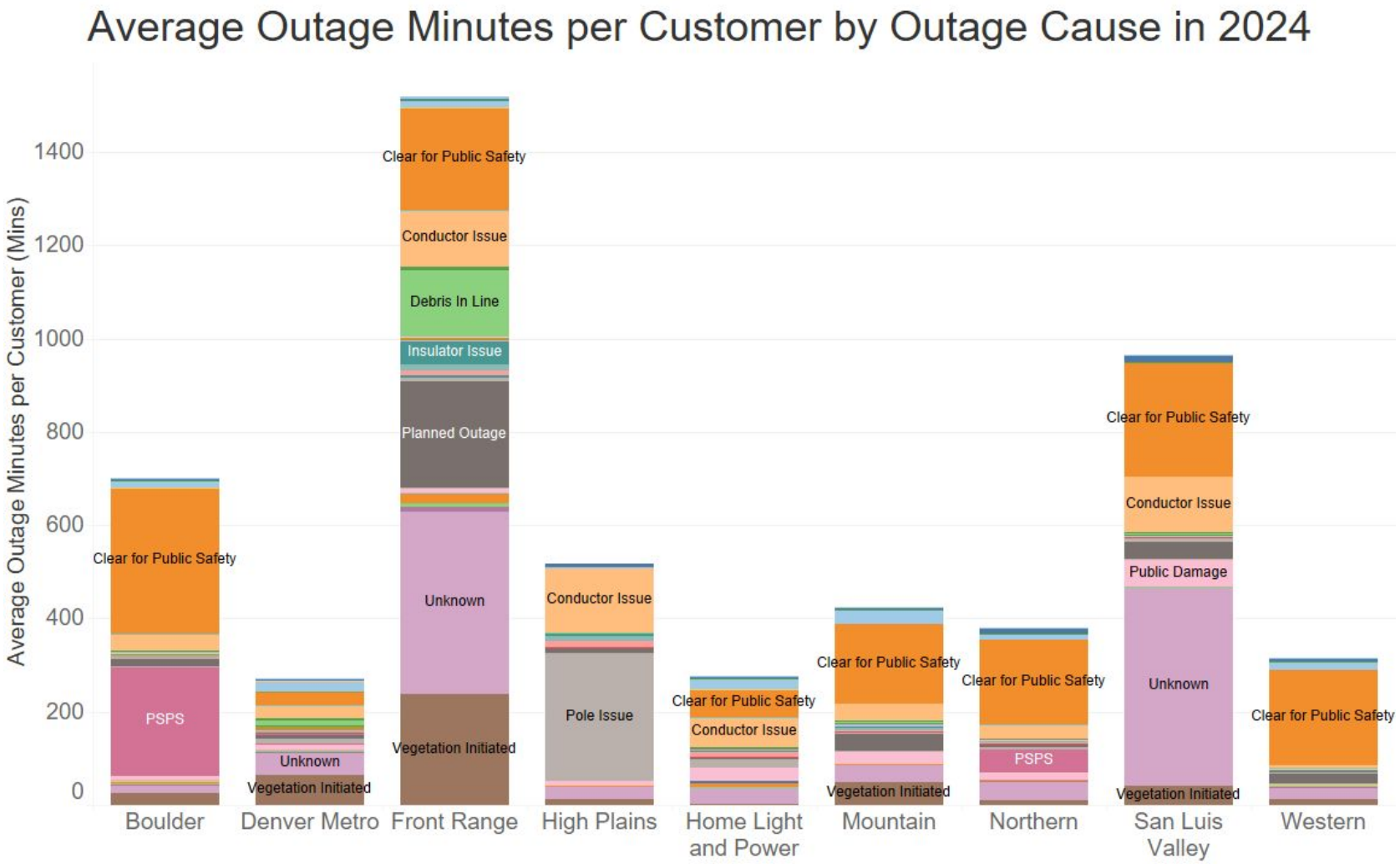


Average Outage Minutes/Customer in 2024		
Cause	**No Exlcusions**	**Excluding ME**
Clear for Public Safety	79	36
Vegetation Initiated	56	9
Unknown	52	16
Conductor Issue	32	8
Cable Failure	22	20
Planned Outage	15.8	15.4
Public Damage	11.4	11.1

- "Clear for Public Safety" is the top cause, even when major events are excluded
- The way the Company currently reports its outages does not provide enough information to differentiate whether a given cause with a Major Event designation was due to that event, or an unrelated factor that coincided with the Major Event.
- PSCo has shared that the increase in Planned Outages was associated with an increase in pole replacements and wildfire risk mitigation projects this year, citing that these outages are often in locations where the line needs to be de-energized to safely perform the necessary work.

Regional Outages by Causes in 2024

- Clear for Public Safety was a leading cause of outages for all regions except for the High Plains
- Conductor issues were widely prevalent, as they have been in previous years
- A large amount of outages causes were “Unknown” in the Front Range and San Luis Valley regions
- Planned outages had a large impact in the Front Range region
- PSPS was only a factor in the Boulder and Northern Regions



VIII. Feeder-Level Analysis

15 Worst Feeders on the System	Evaluation of the 15 Worst Performing Feeders in 2024
A South Broadway Case Study	Analysis of a Specific Area Highlighted in Public Comments

Feeder Level Analysis

15 Worst Performing Feeders in 2024

Trends for 15 Feeders With the Highest Outage Minutes per Customer in 2024

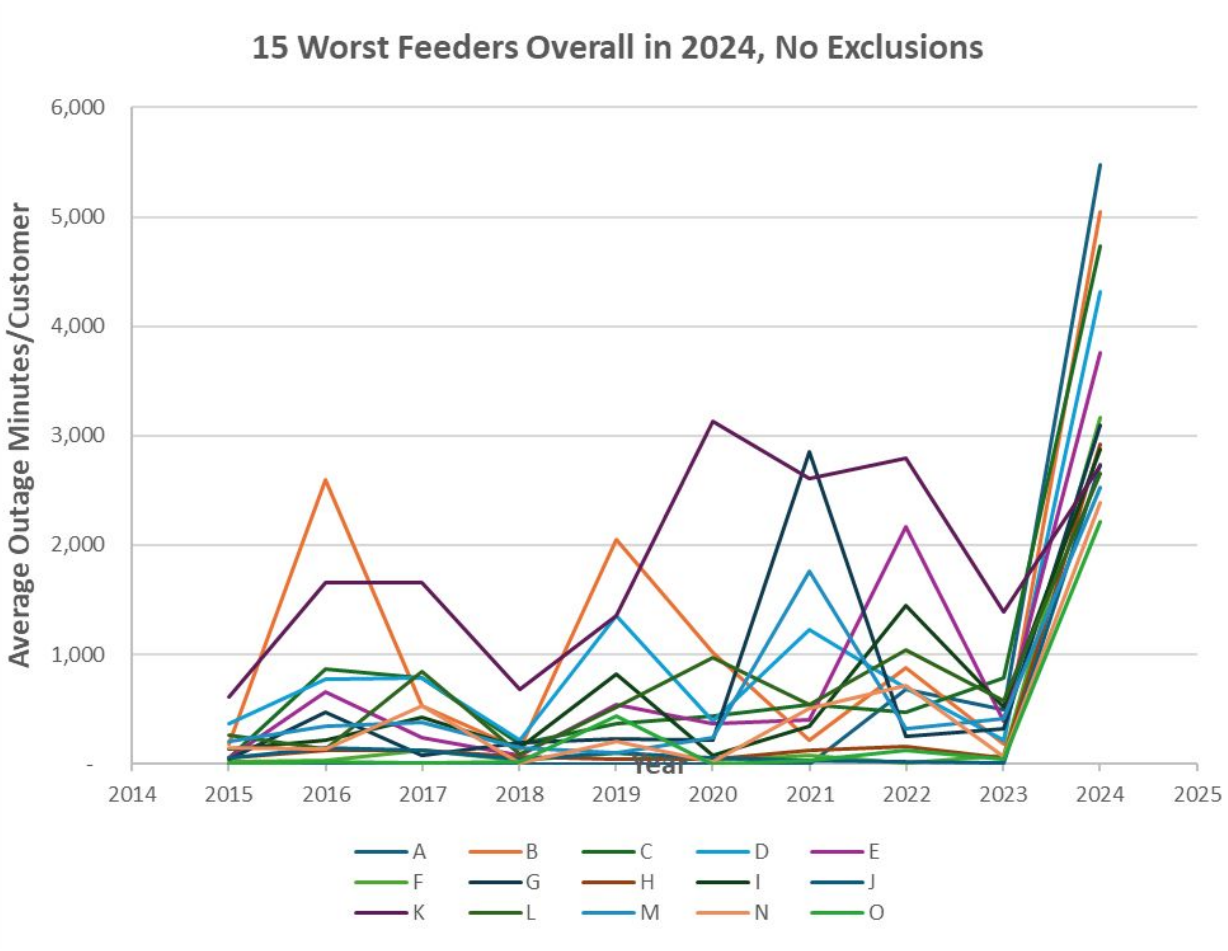
15 Worst Performing Feeders Analysis

- Staff investigated the 15 worst performing feeders on the PSCo's system in 2024 based on average outage minutes per customer with no exclusions:

- Why did Staff take this approach?
  - Including all outages helps build a complete picture of the customer experience of outages in 2024.
  - The goal is to identify the most severely impacted customer areas to capture the most important factors that drove outage minutes up in 2024.
  - The specific factors at play in any given outage will vary, the goal is to sample of the most severely impacted customers.

KEY CONCEPT: In this analysis, "feeder" is used strictly as a geographic unit. The criteria for the "worst feeders" is the average outage minutes/customer for customers served by that feeder. This does NOT mean that the entire feeder experienced any given outage, but customers that are primarily served by a particular feeder, according the the Company's log, experienced a that outage.

15 Worst Feeders in 2024, No Exclusions



Average Outage Minutes/Customer												
Region	Feeder	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2024 Customers
B	A	-	-	-	-	-	-	-	678	492	5,473	2,503
B	B	186	2,597	533	138	2,050	1,023	214	877	179	5,048	23
SLV	C	58	861	783	181	373	442	537	473	783	4,734	1,022
B	D	364	776	788	215	1,350	396	1,232	692	222	4,311	1,815
DM	E	50	662	237	78	539	369	402	2,171	393	3,760	2,662
DM	F	25	32	125	27	102	35	82	10	82	3,169	3,346
B	G	38	471	73	191	234	213	2,855	253	322	3,097	1,027
B	H	53	118	125	67	39	45	125	155	53	2,927	1,970
FR	I	137	219	429	142	822	78	341	1,442	522	2,875	1,778
B	J	56	147	126	48	103	52	26	21	7	2,738	4,609
SLV	K	608	1,662	1,660	683	1,349	3,130	2,612	2,796	1,384	2,721	1,242
FR	L	266	139	840	91	514	976	547	1,038	574	2,654	1,730
B	M	209	340	380	149	106	236	1,765	326	417	2,521	3,875
FR	N	149	138	529	12	210	17	512	717	70	2,384	1,166
DM	O	-	16	3	16	442	1	32	130	37	2,208	1,501

The 15 worst feeders were not uniformly spread across PSCo's system

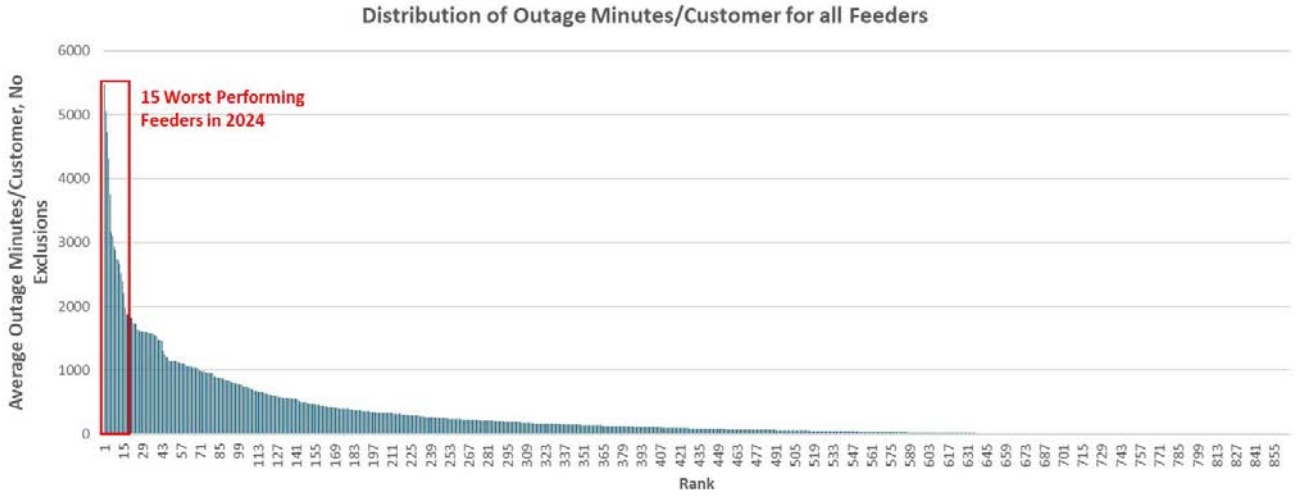
- Boulder - 7 feeders
- San Luis Value - 2 feeders
- Denver Metro - 3 feeder
- Front Range - 3 feeders

Regional Distribution of Historically Worst feeders by Average Outage Minutes/Customer

- The table to the right shows, by region, a count of where the 15 worst performing feeders in a given year were located
- The Denver Metro region historically has higher percentage of the worst feeders than other regions
- The number of poorly-ranked feeders in Boulder in 2024 was higher than previous years
- The histogram to the right show the distribution of outage minutes per customer for all feeders in PSCo's system
- The 15 worst performing feeders make up a disproportionate share of the total outage minutes
- Out of more than 850 listed feeders, the worst 15 made up 18.2% of the total outage minutes in 2024.

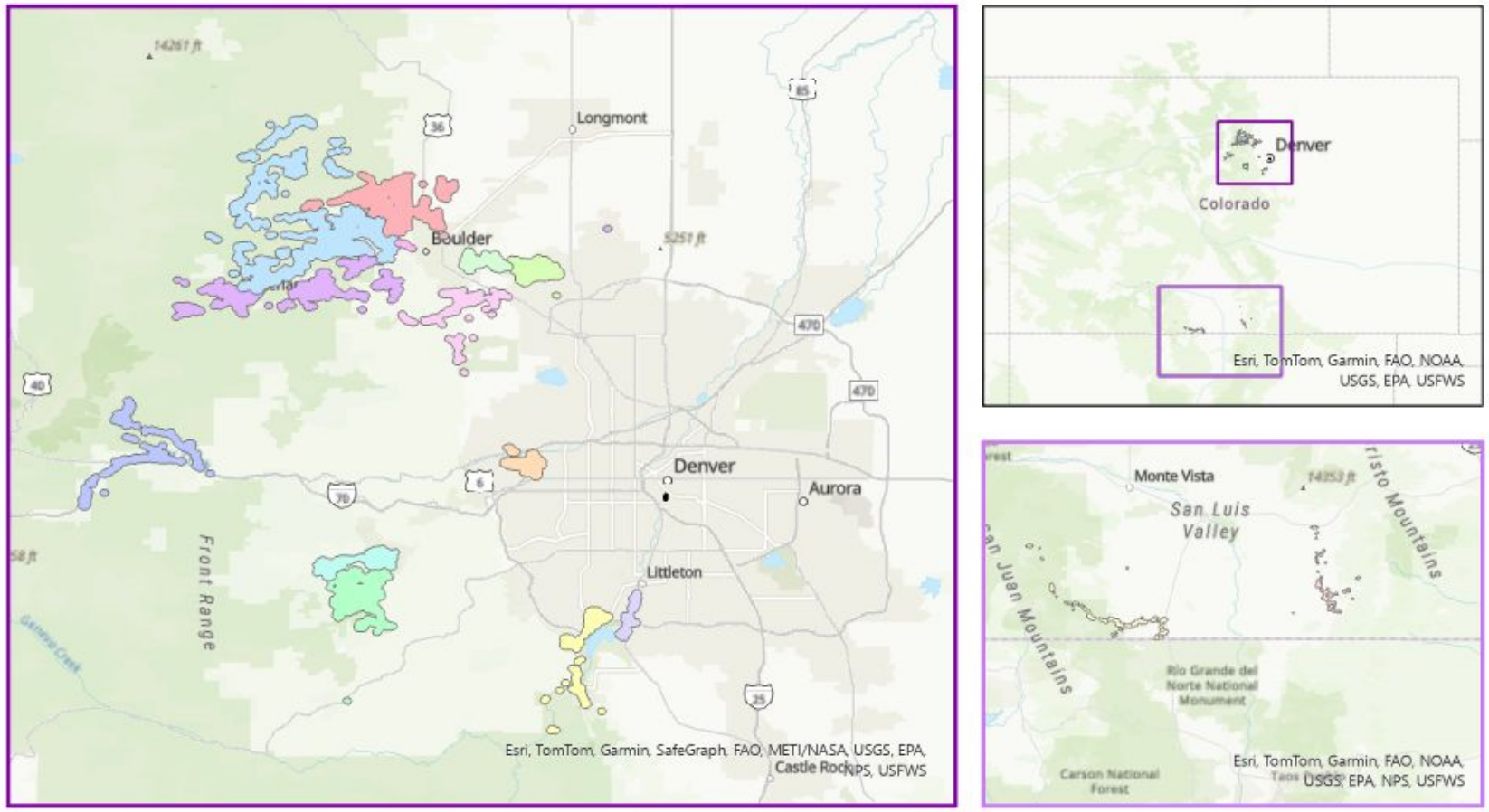
Location of Worst 15 Feeders by Year

Feeder Region	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Boulder		2	1		3	2	5			7
Denver Metro	6	2	2	6	7	3		6	4	3
Front Range			1		1	2		3	1	3
High Plains	1			3	1	1				
Home Light and Power	3	6	1			3	5	1	3	
Mountain	2		5	2					2	
Northern	2	3					3	1	1	
San Luis Valley	1	2	5	3	2	2	1	2	3	2
Western				1	1	2	1	2	1	

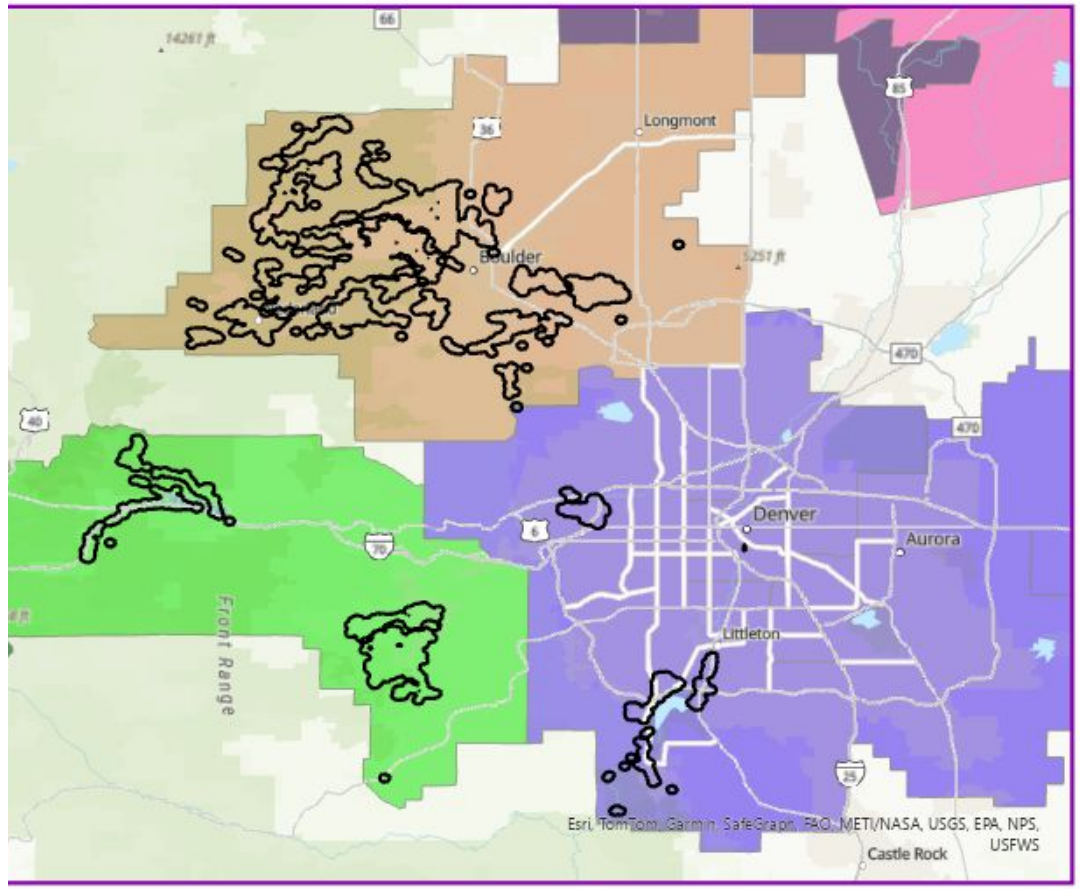


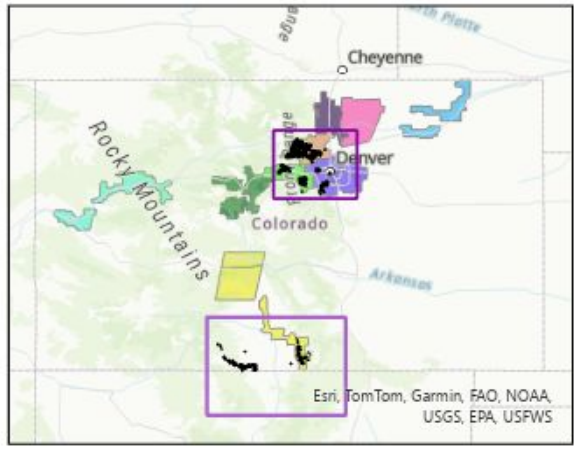
Worst Feeders in 2024

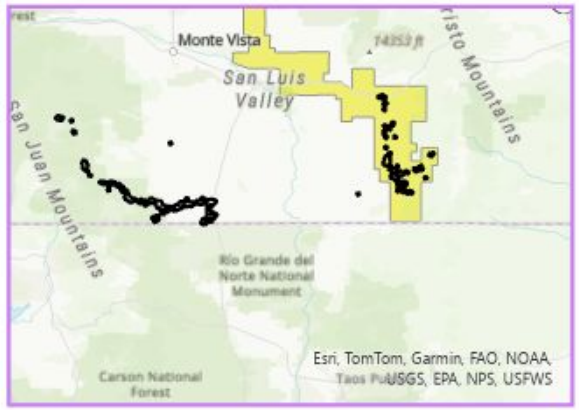
Estimated Feeder Extent for 15 Worst Feeders in 2024



Estimated Feeder Extent for 15 Worst Feeders in 2024







Legend

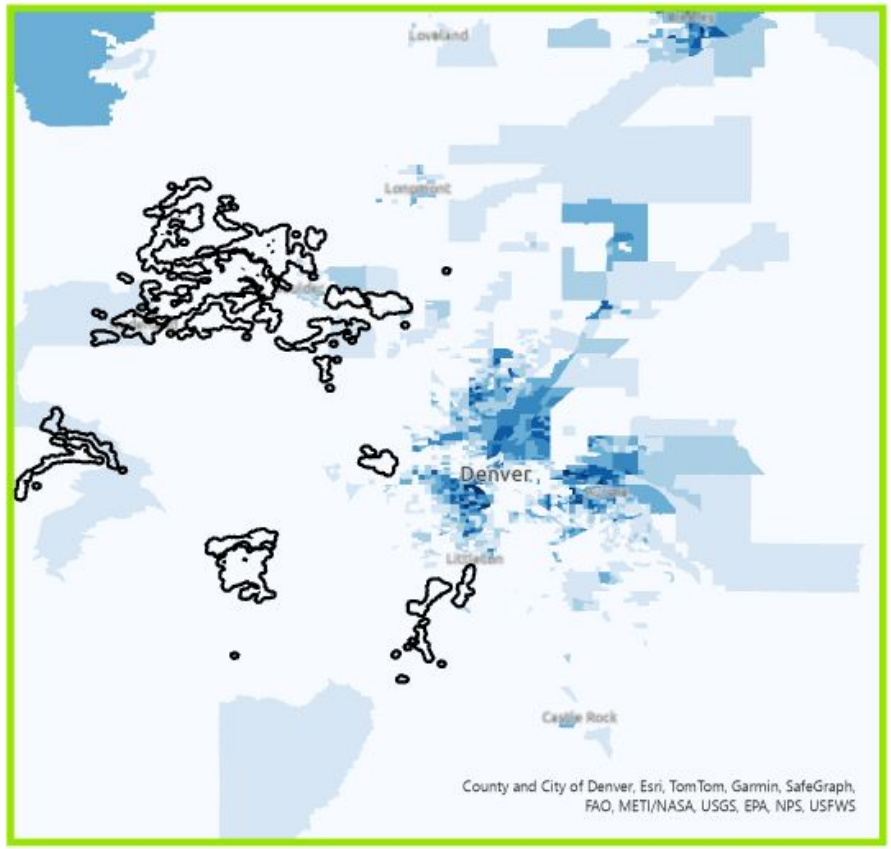
PSCo Electric Distribution Service Center Regions

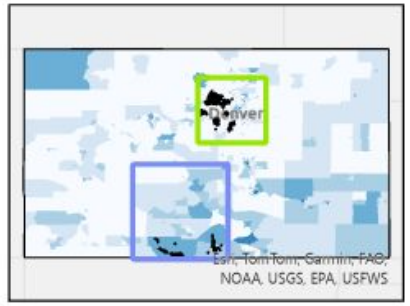
Region
- Boulder
- Denver Metro
- Front Range
- High Plains
- Home Light and Power
- Mountain
- Northern
- San Luis Valley
- Western

Estimated Areas for 15 Worst Feeders in 2024
- Estimated Areas for 15 Worst Feeders in 2024

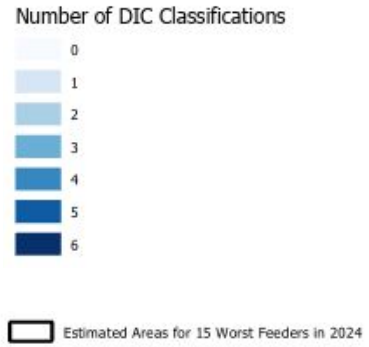
N

Estimated Extent for 15 Worst Feeders Overlaid with Disproportionately Impacted Community Designations

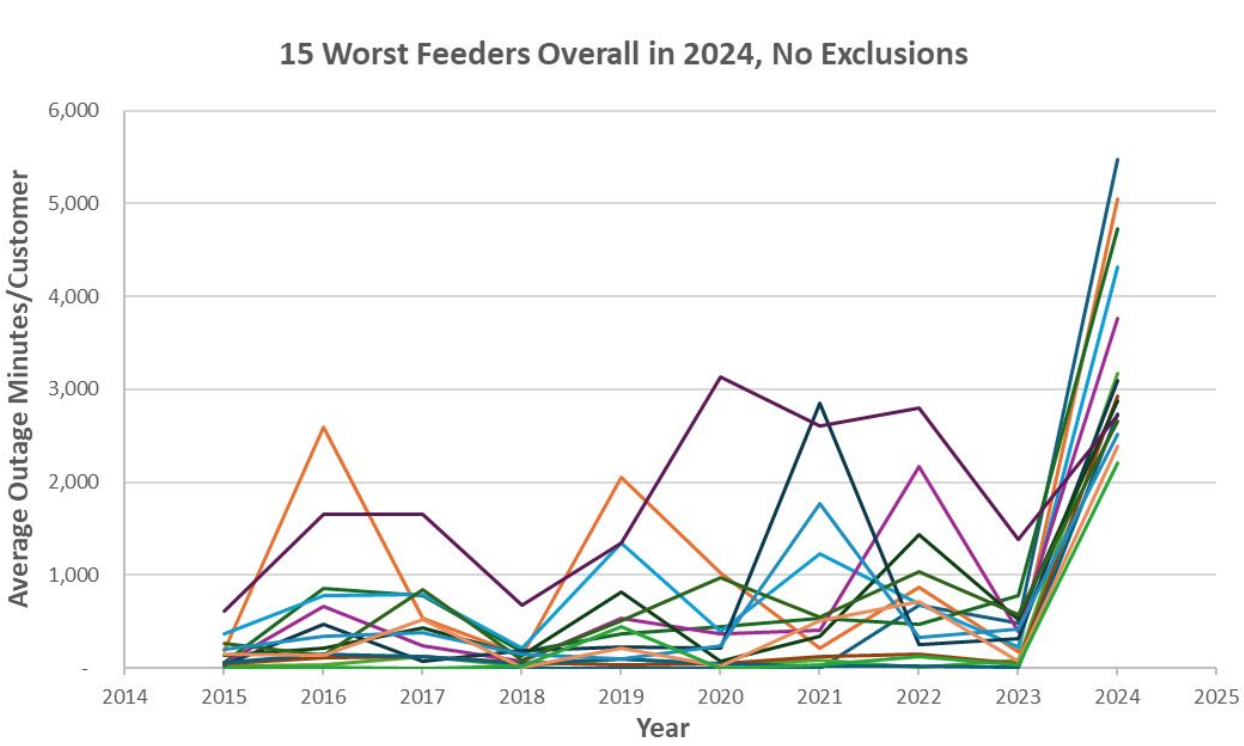


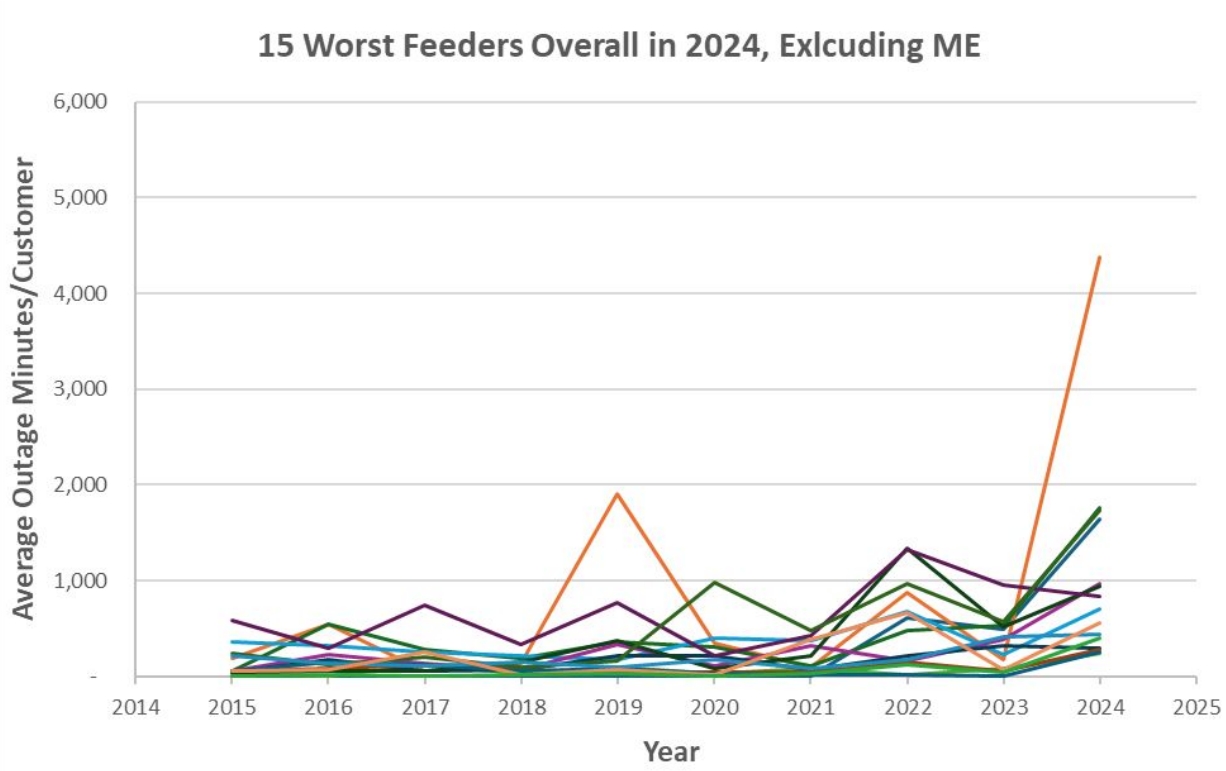


- The majority of the areas served by the worst performing feeders in 2024 were not located in Disproportionately Impacted Communities
- Two of the worst 15 feeders in 2024 are located in Disproportionately Impacted Communities in the San Luis Valley. Almost all of this region is considered a Disproportionately Impacted Community.
- More granular geospatial statics that were not possible in this investigation would be required to assess more concentrated impacts



15 Worst Feeders, Excluding Major Events

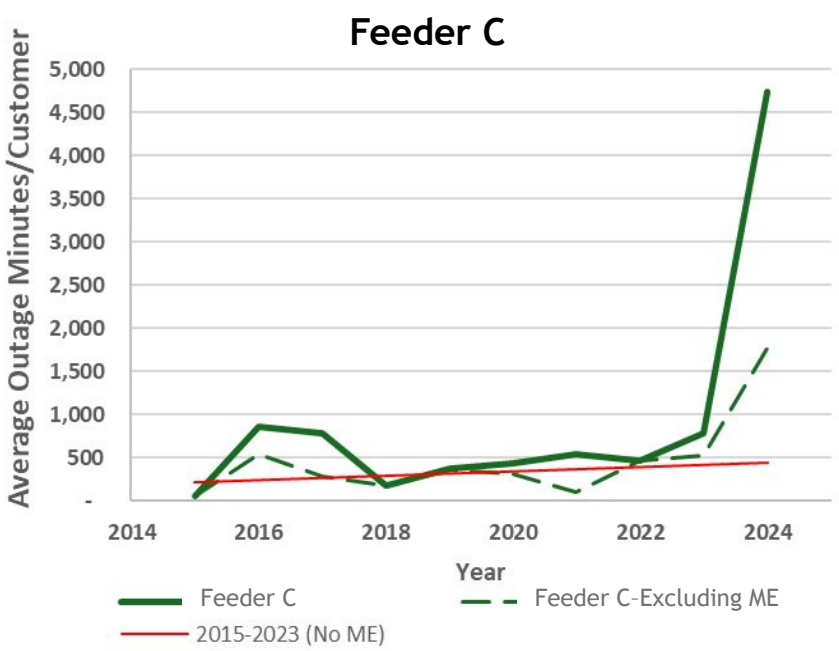


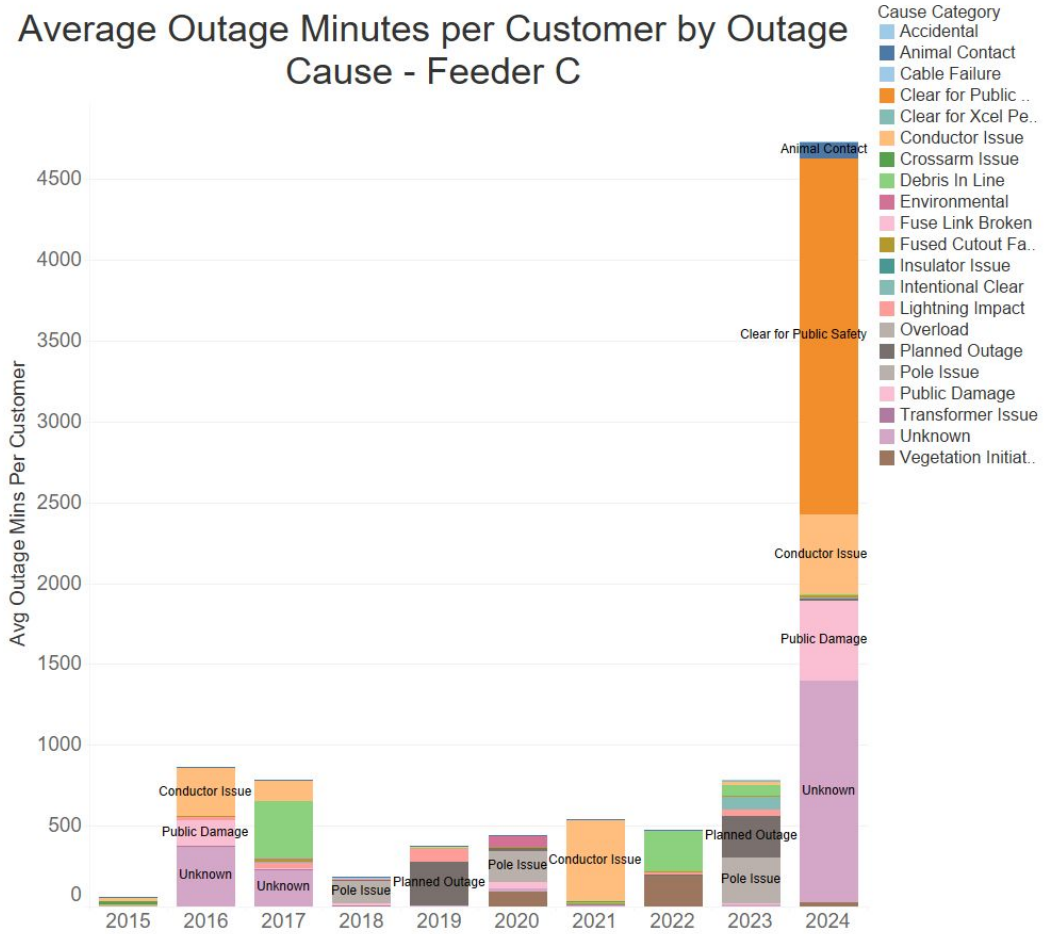


The majority of outage minutes on the 15 worst feeders were due to Major Events, but many feeders still experienced increases compared to 2023, and experiencing more outages year-over-year

*The worst feeder in 2024 excluding ME serves only 23 customers and is by far the smallest customer based served by one of the 15 worst feeders in 2024. While the impact on these customers is real, impacts from this feeder are highly concentrated and not representative of most feeders on the system.

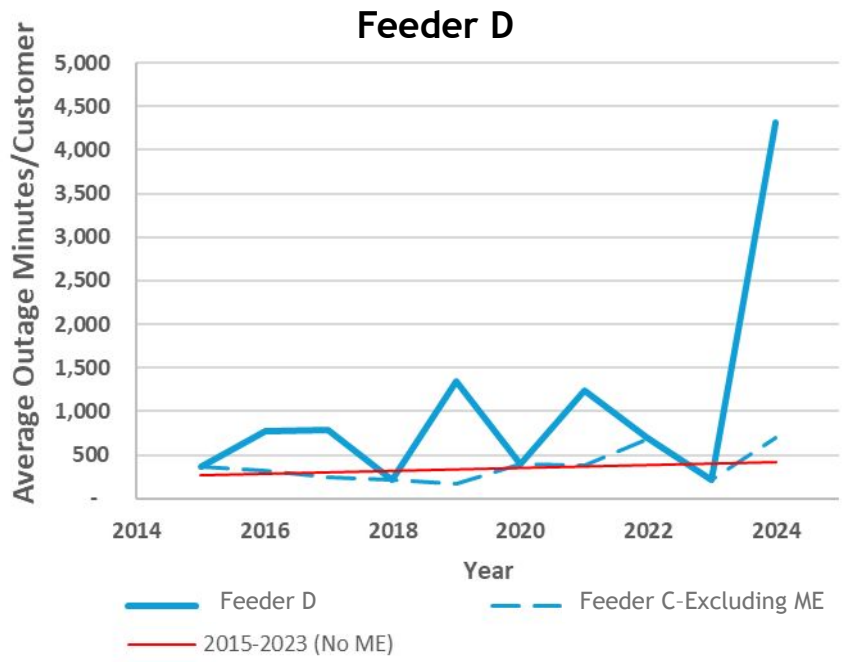
Worst Feeders Outage Minutes by Cause - Example 1



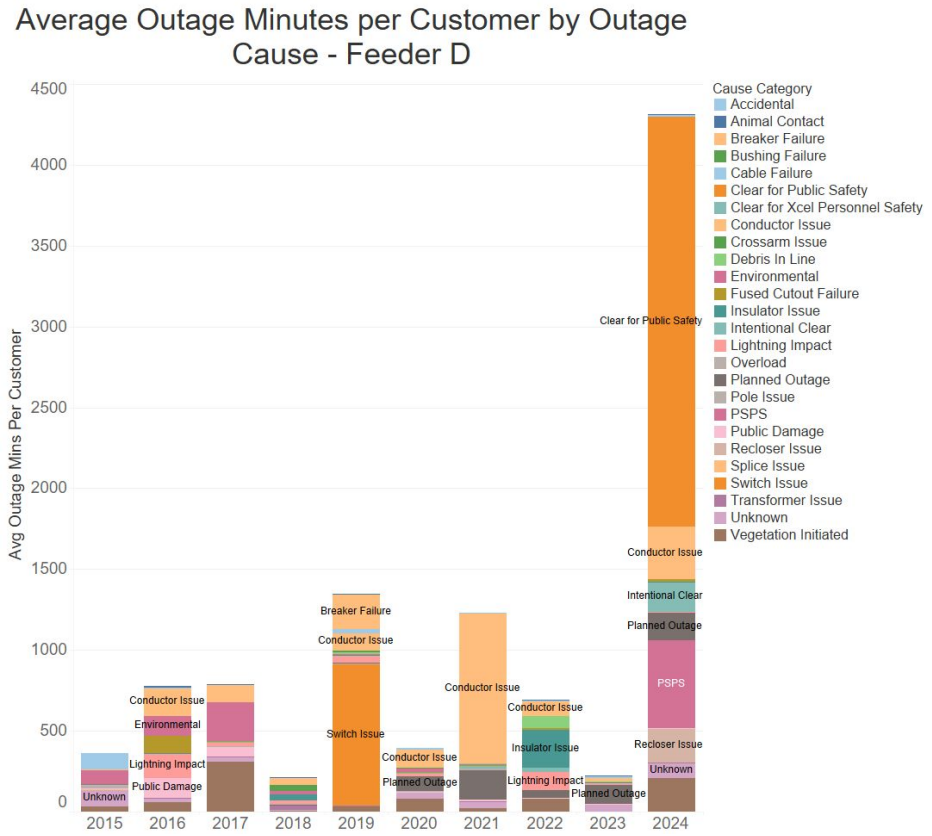


- Major events historically contribute significantly to outage minutes
- In 2024, Major Events made up 63% of the outage minutes
- Despite the significant contribution of outage minutes, there was an increase in outage minutes relative to historical trends (including previous years that include Major Events)
- A large increase in average outage minutes/customer in 2024 due to Clear for Public Safety
- Outages from unknown causes were a significant driver of the 2024 increase

Worst Feeders Outage Minutes by Cause - Example 2

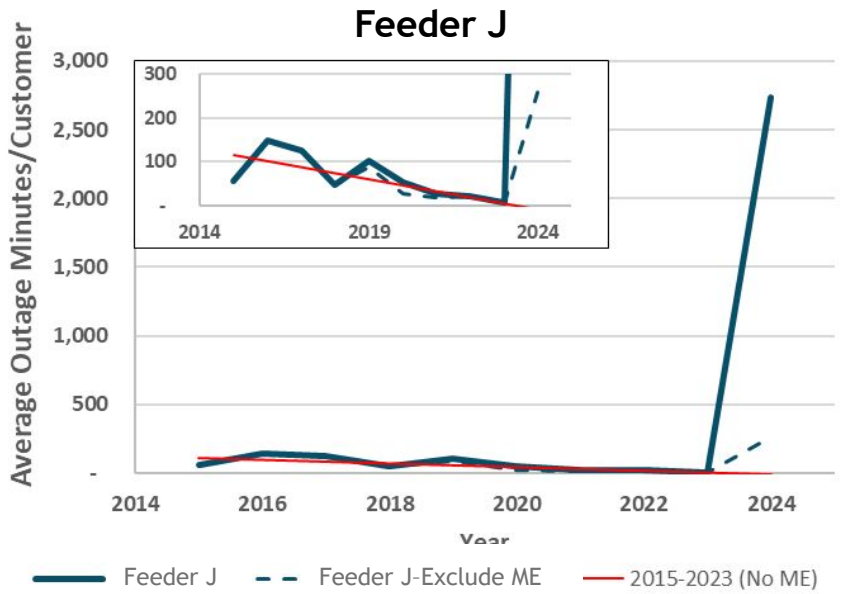


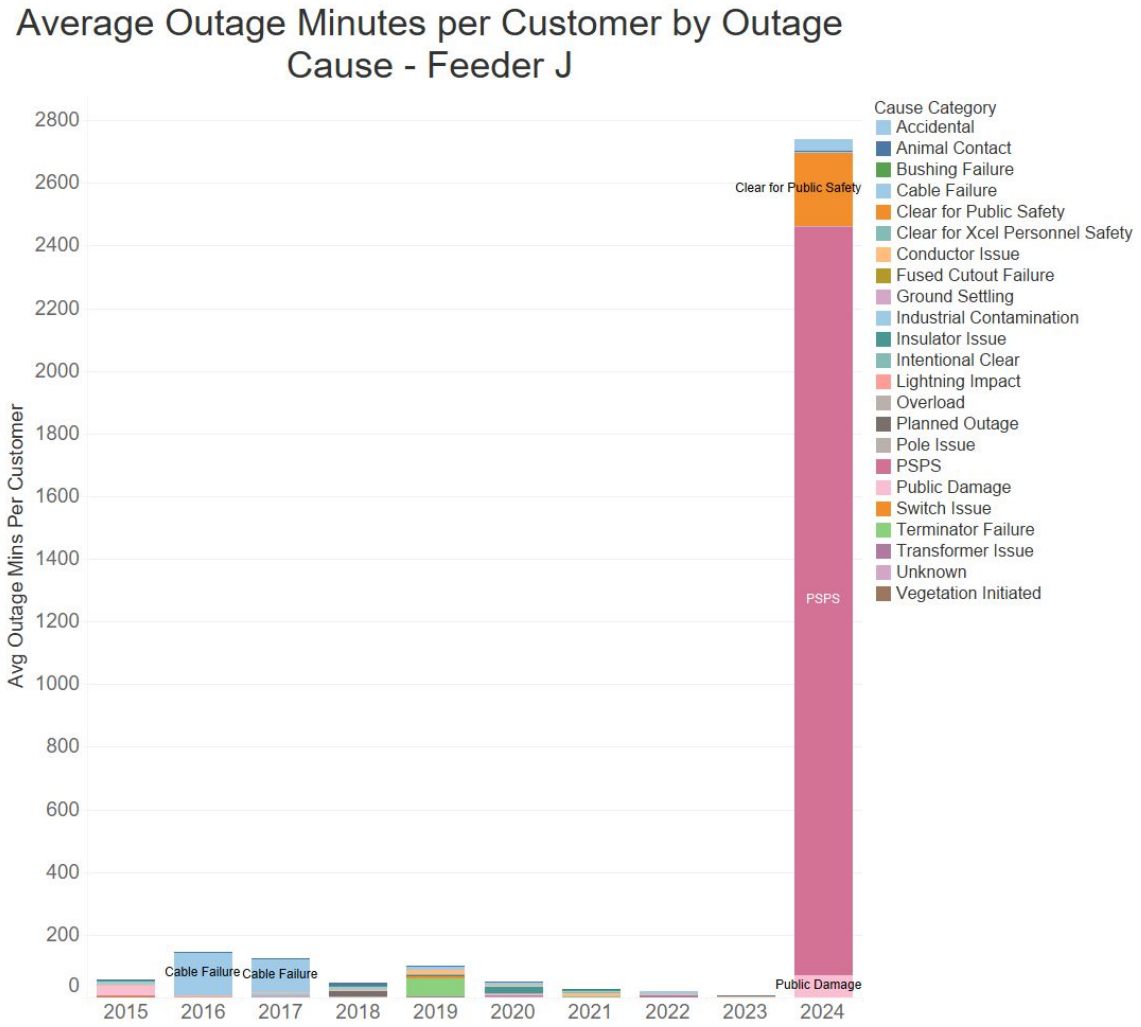
- Major events historically contribute significantly to outage minutes
- In 2024, Major Events made up 84% of the outage minutes
- Excluding Major events, outage minutes in 2024 were in line with the historical baseline (excluding ME)



- A large increase in average outage minutes per customer in 2024 due to Clear for Public Safety
- The April 2024 PSPS event had a significant impact

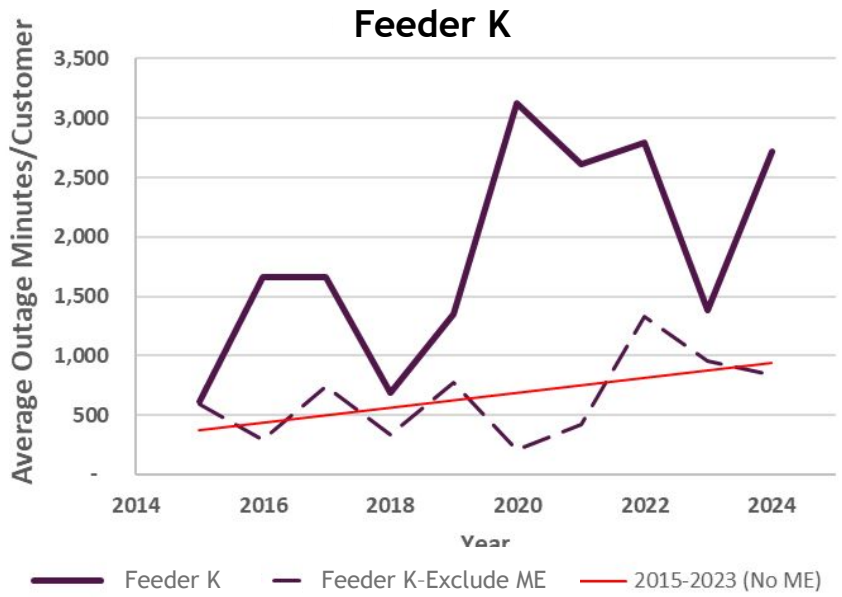
Worst Feeders Outage Minutes by Cause - Example 3

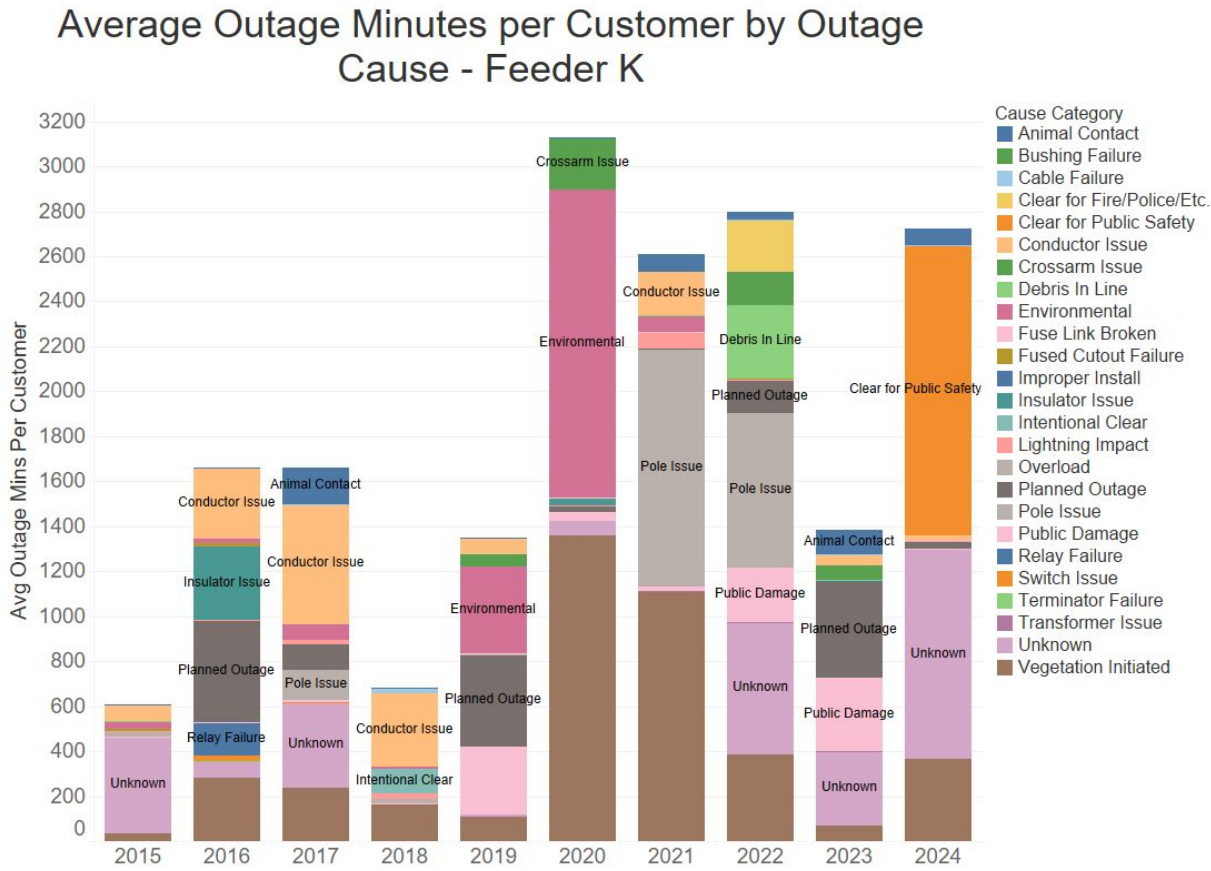




- Major Events are historically a minor factor
- In 2024, Major Events made up 91% of the outage minutes
- Despite the overwhelming contribution of Major Events, there was an increase in outage minutes relative to historical trends (including previous years that include Major Events)
- Significantly impacted by the PSPS event and by Clear for Public Safety Outages in 2024

Worst Feeders Outage Minutes by Cause - Example 4





- Major events historically contribute significantly to outage minutes
- In 2024, Major Events made up 69% of the outage minutes
- Excluding Major events, outage minutes in 2024 were in line with the historical baseline (excluding ME)
- Impacted by outages of many causes over time.
- Vegetation Initiated outages have perpetuated over the last 9 years.
- Outages of unknown cause have been significant over time at this feeder

15 Worst Feeders Summary

- All but one of the worst 15 feeders in this analysis were not only the worst on the whole system in 2024, but reached all time high outage minute levels

- For some of the feeders highlighted in this analysis, Major Events were a significant component (even the far and away primary component), but customers still experienced above-average outage levels that are not fully explained by significant weather events in 2024
  - Many customers experienced levels of outage minutes, even when you exclude Major Events, that exceeded a normal year including Major Events

- These 15 feeders experienced the worst impacts in 2024, they help us understand the factors than drove outage minutes up across the Company's system

https://www.weather.gov/bou/April_Windstorm_2024

Feeder Level Analysis

A South Broadway Case Study

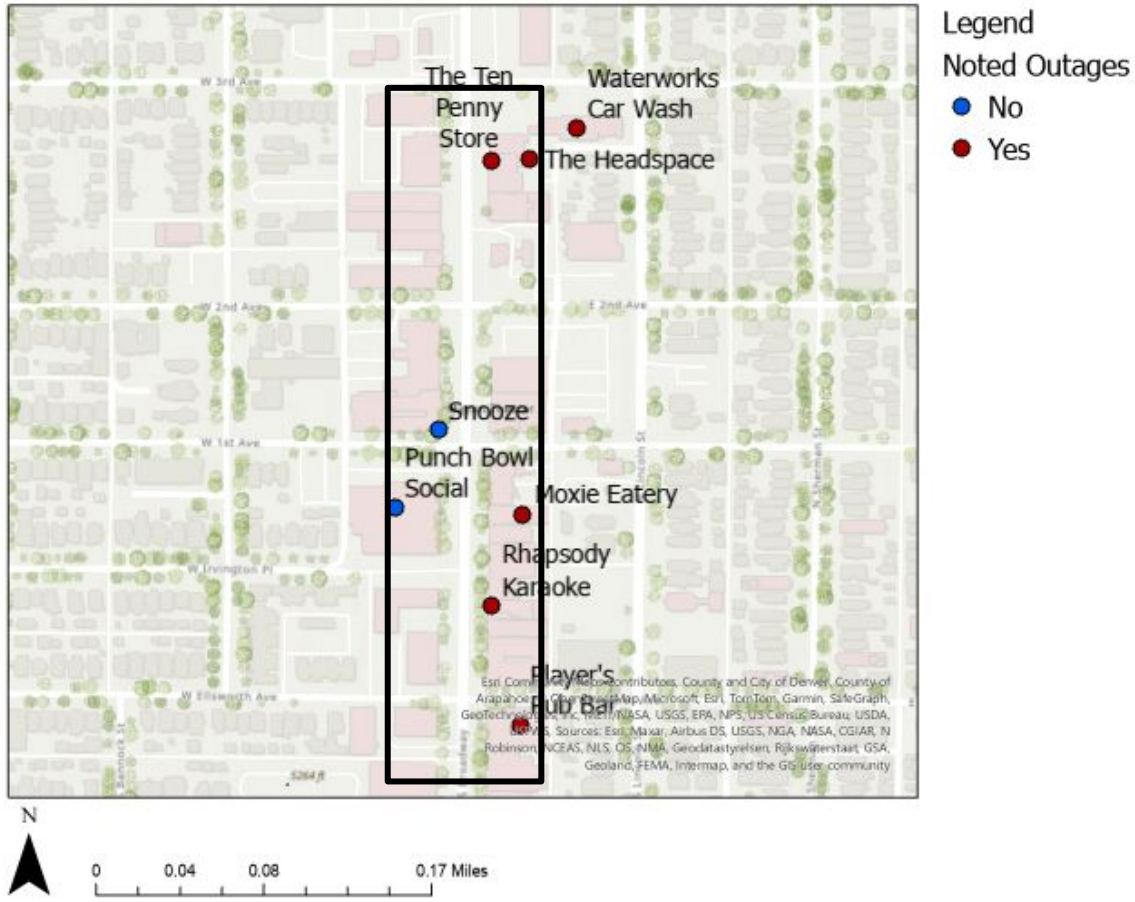
Evaluation of 2024 Outages For Specific Area from the Public Comments

Outages Impacting the Lincoln/Broadway Corridor Registered Neighborhood Organization

- The Public Utilities Commission received filed comments from businesses regarding outages in the area bounded by Lincoln to the east, Broadway to the west, Bayoud Ave to the south, 3rd Ave to the north
- Outages were listed as occurring on the following dates in 2024: 1/21, 4/6, 4/7, 4/8, 6/8, 6/10, 6/16, 7/17, 7/18, 7/20, 8/3, 8/6, 8/7
- Several news articles covered the outages, including KDVR and Westword
  - https://kdvr.com/news/local/whats-behind-power-outages-on-the-broadway-lincoln-corridor/
  - https://www.westword.com/news/xcel-blames-squirrels-denver-outages-plaguing-broadway-21766985
  - News articles mentioned that outages only impacted establishments on the eastern side of Broadway

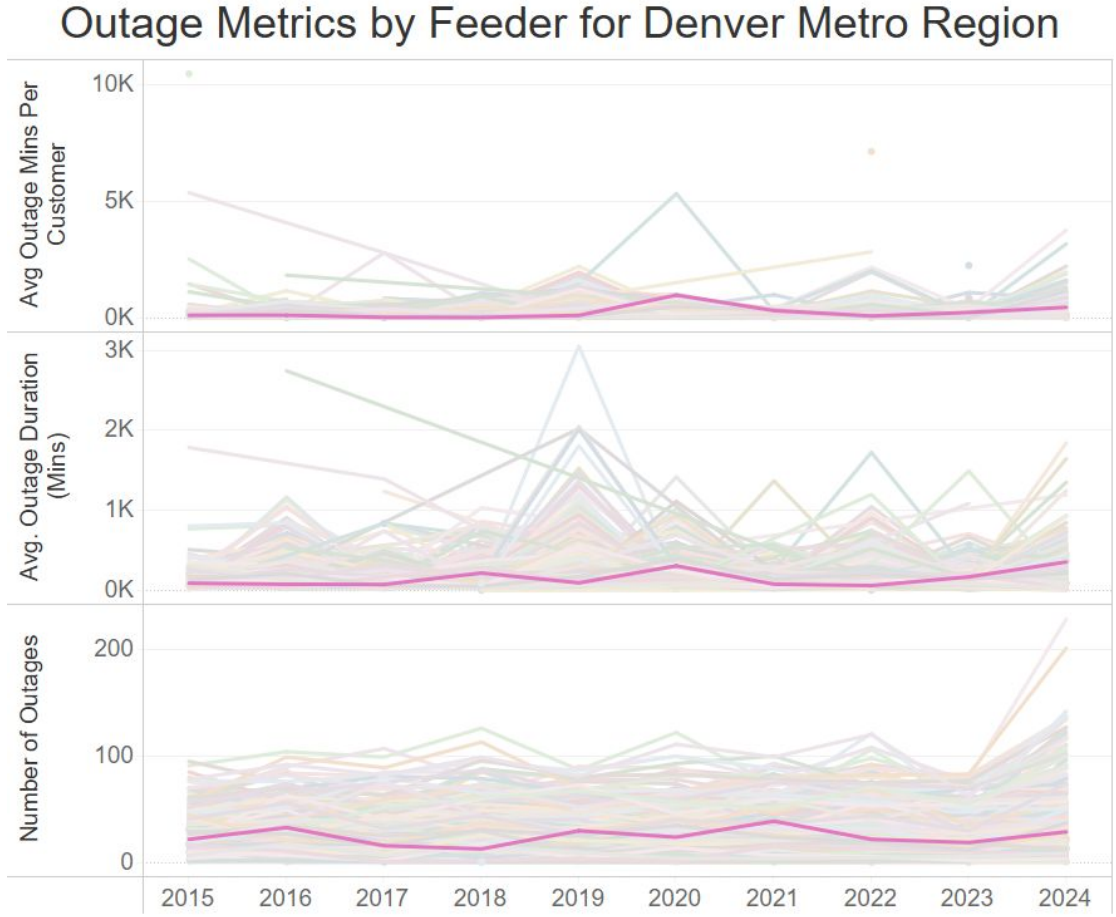
Area Impacted

- News articles and public comments cite businesses impacted by the outages (represented by the red dots), as well as businesses that maintained power (represented by blue dots) during specific outages (South Broadway street segment shown in box).
- Staff identified that businesses on the eastern side of Broadway are served by a different distribution feeder than customers on the western side of the street
- Customers served by the feeder on the east side of South Broadway experienced more outage minutes/customer and longer average outage durations than adjacent feeders in 2024



Feeder Serving the Eastern Side of South Broadway in Relation to other Feeders in the Denver Metro Area

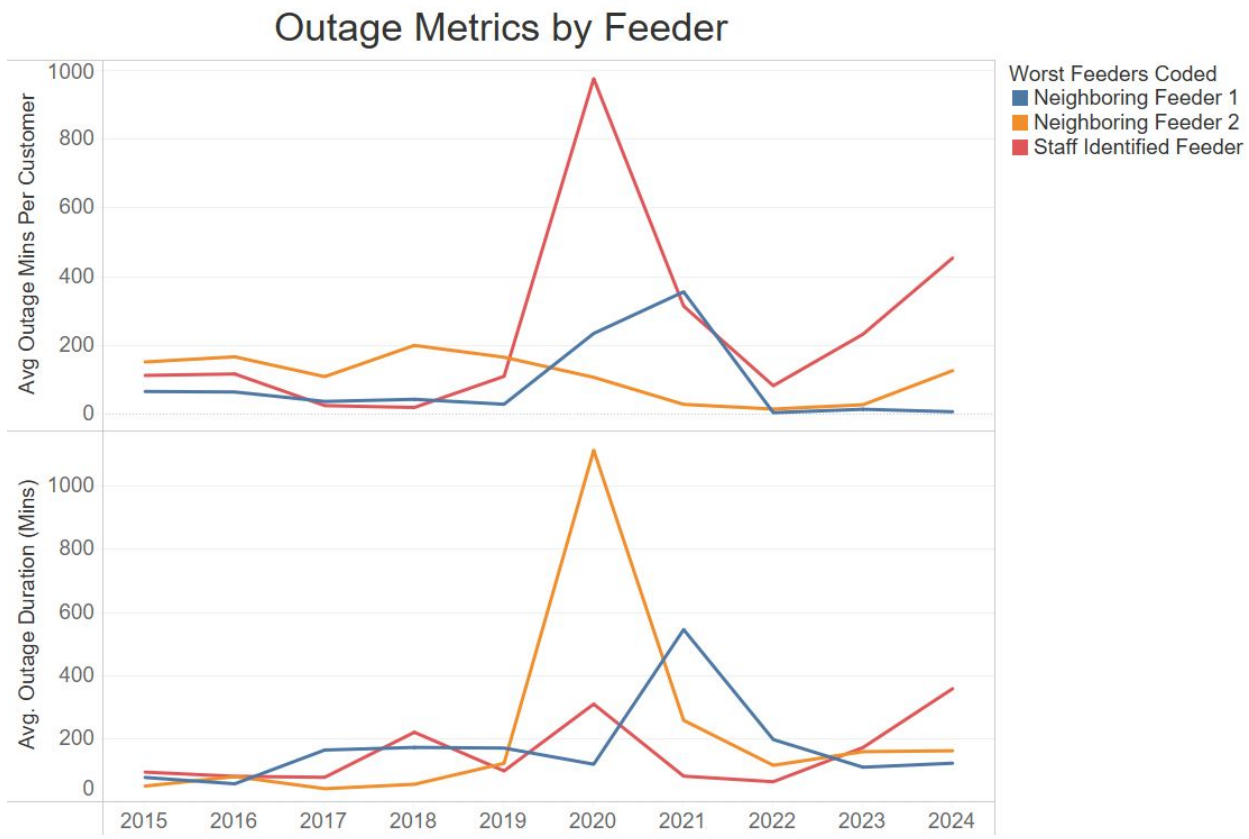
- Compared to all feeders in the Denver Metro Region, the feeder that staff has identified as serving the east side of South Broadway (shown in pink), does not stand out
- Average outage minutes per customer, average outage duration, and number of outages experienced were higher in 2024 than in many, but not all, prior years
- Feeder-level analysis does not capture highly concentrated outage spikes on a particular area of a feeder, like those experienced by this subset of customers.



Feeders in the area

- Customers served by this feeder experienced more outage minutes/customer and longer average outage durations than the adjacent feeders in 2024
- The feeder that staff has identified as serving the east side of South Broadway experienced more outage minutes/customer than the average customer in the Denver Metro Region
- **The approximately 175 customer served by this specific feeder section experienced outage minutes comparable to the worst feeders on the system in 2024.**

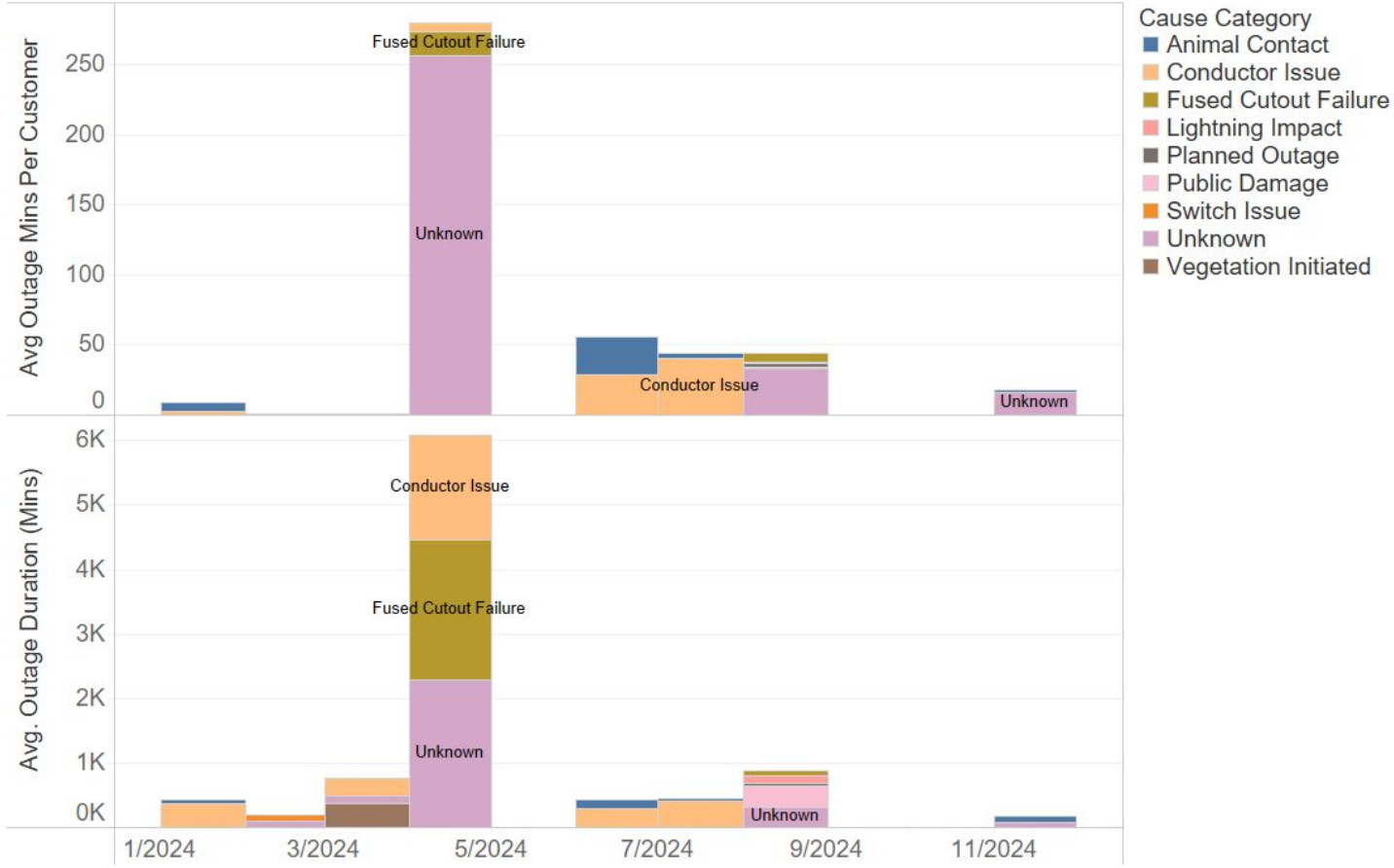
Outage Metrics	Denver Metro Region	Staff-Identified Feeder	Customers on Feeder Section *
Customers Served	1,102,568	1,762	~175
Outages/Customer	1.38	1.26	45,974
Average Duration	198	358	320-380
Minutes/Customer	273	454	~4200



Staff estimated outage impacts on the specific customers served by the relevant section of the feeder that staff has identified as serving the east side of South Broadway using the dates and number of customers (172) provided in public comments. Staff was able to verify most of the events, the majority of which impacted exactly or close to 175 customers. Three events were excluded for this analysis because they impacted fewer than 10 customers, and staff included two additional events that occurred after the public comments were submitted because they each impacted 174 customers. Staff then estimated the the number of minutes and average duration for the outages that impacted these specific customers from this set of events.

Outage Causes by Month for the Feeder that Staff Identified as Serving the East Side of South Broadway

- Most of the outage minutes customers experienced in April 2024 had an unknown cause, but coincided with the April wind event that impacted the whole system
- The April windstorm impacts on this feeder appear to be highly concentrated on this subset of customers.
- Conductor issues also caused many of the remaining 2024 outage minutes



IX. Investigation Summary

- The Commission opened this investigation in response to customer reports of high levels of outages in 2024 across PSCo's system
- From 2015 through 2023, PSCo's system shows an overall trend of increasing outage minutes and outage incidents
- Systemwide outage minutes in 2024 were much higher than the 2015-2023 trend would have predicted
- Outages were widespread across PSCo's service territory
- Wildfire Safety Operations appear to account for some, but not all, of the increase in outages in 2024
- A small number of the worst performing feeders account for a substantial portion of 2024 outage minutes
- The outages on South Broadway in Denver appear to be associated with a particularly problematic section of a single feeder. Although this feeder as a whole was not among the 15 worst performing feeders in 2024, Staff estimates that customers on this section of this feeder experienced 2024 outage minutes comparable to the worst feeders in PSCo's distribution system
- Under PSCo's existing Quality of Service Plan, the Company paid ~$6.5 Million in penalties based on 2024 performance
- PSCo's outage log provides only limited insight into outage causes

IX. Recommendations

- The Commission should require the Company to include additional information in its monthly outage log:
  - The following outage metrics should be reported separately for DICs:
    - Customers Out
    - Cust Mins Actuals
    - Duration Actual Minutes
  - IEEE 1366 Op Co Level (Major Events Designation)
  - IEEE 1366 Region Level (Major Events Designation)
  - Outage during WSO settings
  - Whether EPSS was used
- The Commission should require the Company to record outages with greater geographic precision, at a minimum incorporating affected census blocks into the current outage log
- The Commission should promulgate QSP rules
- The Commission should encourage and require, as appropriate, more proactive communication around all types of planned and Company-controlled outages

Colorado Public Utilities Commission

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Appendices

Appendix A: Overview of the Company's System

Appendix B: Outage Metrics For Whole Service Area and by Region

Appendix C: Seasonal Outage Minutes per Customer by Region and Year

Appendix D: Seasonal Outage Minutes per Customer by Region and Year - Excluding Major Events

Appendix E: System-Wide Outage Metrics, Yearly and Seasonal - Excluding Major Events and Planned Outages

Appendix F: Seasonal Outage Minutes per Customer by Region and Year - Excluding Major Events and Planned Outages

Appendix G: System-wide Outage Causation Categories, with and without Major Events

Appendix H: Outage Cause Categories List

Appendix I: 15 Worst Feeders 10-year trend, Outage Minutes per Customer - No Exclusions

Appendix J: 15 Worst Feeders 10-year trend, Outage Minutes per Customer - Comparisons with and without Major Events

Appendix K: Customer Count and Average Outage Minutes Per Customer by Region

Appendix L: 10 Worst Ranked Feeders by Region

Appendix M: 10 Worst Feeders by Region by Year - Excluding Major Events

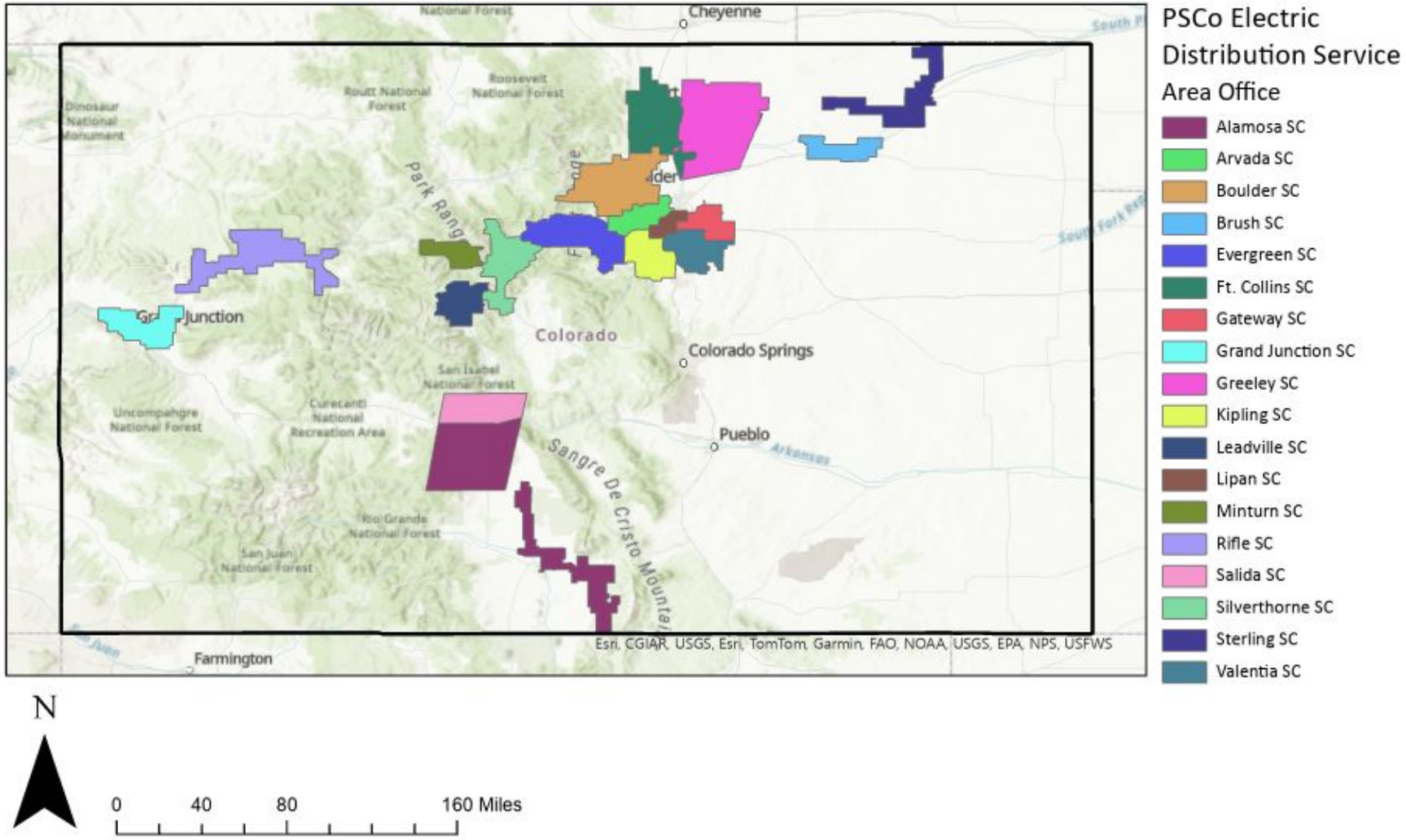
Appendix N: Disproportionately Impacted Community Definition

Appendix O: Disproportionately Impacted Communities: Average Outage Minutes per Customer Map Symbology

Appendix A: Overview of the Company's System

Area office regions for PSCo electric distribution service

Area Office	Customers in 2024
Alamosa SC	19,749
Arvada SC	270,488
Boulder SC	138,775
Brush SC	4,198
Evergreen SC	18,980
Ft Collins SC	42,407
Garfield SC	16,792
Gateway SC	53,139
Greeley SC	68,481
Kipling SC	281,849
Leadville SC	4,348
Lipan DC	232,327
Mesa SC	59,928
Salida SC	7,123
Sterling SC	7,986
Summit SC	35,661
Vail SC	830
Valentia SC	264,765
Total	**1,527,826**



Appendix B: Outage Metrics For Whole Service Area and by Region

Appendix: Outage Metrics for Whole Service Area

Whole Service Area

Year	Customer Count	Customer Minutes Out	Average Outage Minutes per Customer (Mins)	Avg. Outage Duration (Mins)
2015	1,347,385	130,330,689	97	99
2016	1,362,275	212,104,541	156	127
2017	1,370,286	147,297,705	107	107
2018	1,395,859	155,810,273	112	110
2019	1,427,537	300,178,541	210	194
2020	1,446,997	199,912,205	138	134
2021	1,475,690	265,089,592	180	151
2022	1,493,151	257,430,093	172	148
2023	1,510,520	169,407,899	112	110
2024	1,527,826	535,341,251	350	209

Whole Service Area - Major Events

	Customer Minutes Out		Average Outage Minutes per Customer (Mins)		Avg. Outage Duration (Mins)	
Year	Not Major Event	Major Event	Not Major Event	Major Event	Not Major Event	Major Event
2015	114,634,706	15,695,983	85	12	91	243
2016	112,700,157	99,404,384	83	73	88	263
2017	103,493,780	43,803,925	76	32	87	228
2018	123,634,676	32,175,597	89	23	94	325
2019	126,326,581	173,851,960	88	122	106	488
2020	124,902,657	75,009,548	86	52	99	331
2021	138,698,970	126,390,622	94	86	98	375
2022	159,306,154	98,123,939	107	66	106	426
2023	149,896,495	19,511,403	99	13	105	185
2024	222,799,771	312,541,480	146	205	108	626

Appendix: Outage Metrics by Region

Regional Customer Count

Region	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Front Range	17,856	17,921	17,758	18,002	18,185	18,405	18,772	18,850	18,906	18,933
Denver Metro	968,969	980,490	986,108	1,005,764	1,030,027	1,042,443	1,061,202	1,074,390	1,086,889	1,103,851
San Luis Vall..	23,460	23,573	23,684	23,929	24,327	24,972	25,788	26,285	26,586	26,870
Home Light a..	59,079	59,946	60,169	61,317	62,044	63,728	65,756	66,790	67,656	68,586
High Plains	11,636	11,703	11,680	11,753	11,847	11,932	12,047	12,070	12,110	12,182
Boulder	129,965	130,533	131,175	132,731	135,369	136,682	138,840	138,901	140,564	137,364
Northern	30,355	31,446	32,675	34,075	35,923	37,228	39,264	40,463	41,340	42,483
Western	68,871	69,361	69,706	70,611	71,464	72,408	73,978	74,911	75,667	76,718
Mountain	37,194	37,302	37,331	37,677	38,351	39,199	40,043	40,491	40,802	40,839
Grand Total	1,347,385	1,362,275	1,370,286	1,395,859	1,427,537	1,446,997	1,475,690	1,493,151	1,510,520	1,527,826

Regional Customer Minutes Out (Mins)

Region	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Front Range	4,805,152	4,566,617	7,321,580	2,554,311	7,148,489	5,613,482	8,415,409	12,130,950	8,435,965	28,741,062
Denver Metro	83,865,646	126,734,423	81,494,013	108,832,572	224,464,246	125,659,655	109,817,025	186,500,710	104,932,004	300,998,017
San Luis Vall..	5,044,945	8,659,848	6,605,064	4,194,664	10,132,149	8,958,919	10,954,349	10,252,991	8,435,114	25,953,881
Home Light a..	7,739,292	25,708,214	8,415,814	4,779,983	8,355,464	11,160,867	33,453,817	9,548,502	12,025,225	19,054,652
High Plains	988,943	1,081,193	771,023	2,766,743	4,855,258	2,613,145	5,599,344	1,177,905	1,610,275	6,292,249
Boulder	11,673,349	27,123,654	18,425,876	12,024,606	22,857,983	20,328,004	50,644,931	17,992,171	10,594,073	96,486,526
Northern	5,383,307	8,880,778	4,121,441	3,757,650	7,086,012	5,291,912	25,674,600	5,836,108	5,772,857	16,210,684
Western	2,152,429	5,202,077	4,441,120	5,538,582	5,441,539	14,194,058	11,345,059	7,344,775	8,917,117	24,293,787
Mountain	8,677,625	4,147,738	15,701,776	11,361,163	9,837,400	6,092,163	9,185,058	6,645,982	8,685,269	17,310,393
Grand Total	130,330,689	212,104,541	147,297,706	155,810,273	300,178,541	199,912,205	265,089,592	257,430,093	169,407,899	535,341,251

Regional Average Outage Minutes Per Customer (Mins)

Region	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Front Range	108.9	173.9	181.5	115.1	206.5	131.7	147.3	155.6	143.1	259.5
Denver Metro	92.5	119.8	91.6	108.6	217.6	130.9	102.6	155.6	102.9	197.7
San Luis Vall..	142.9	151.3	165.7	103.3	193.7	160.3	195.4	169.1	121.7	226.4
Home Light a..	101.3	162.6	97.4	78.6	119.3	135.9	335.7	95.3	122.1	115.4
High Plains	91.6	92.4	70.6	208.3	335.5	109.1	171.1	113.4	102.0	222.6
Boulder	104.1	123.9	129.0	102.7	135.4	136.3	262.1	135.9	110.8	387.6
Northern	162.5	221.1	108.4	114.6	137.7	147.0	274.1	125.1	142.4	166.0
Western	83.8	90.5	92.3	86.1	99.4	140.2	122.6	113.4	102.7	140.5
Mountain	111.3	115.0	185.3	195.4	141.3	146.1	168.6	147.8	175.4	175.2
Grand Total	98.6	127.4	106.7	110.4	193.9	133.9	151.5	148.2	110.3	209.1

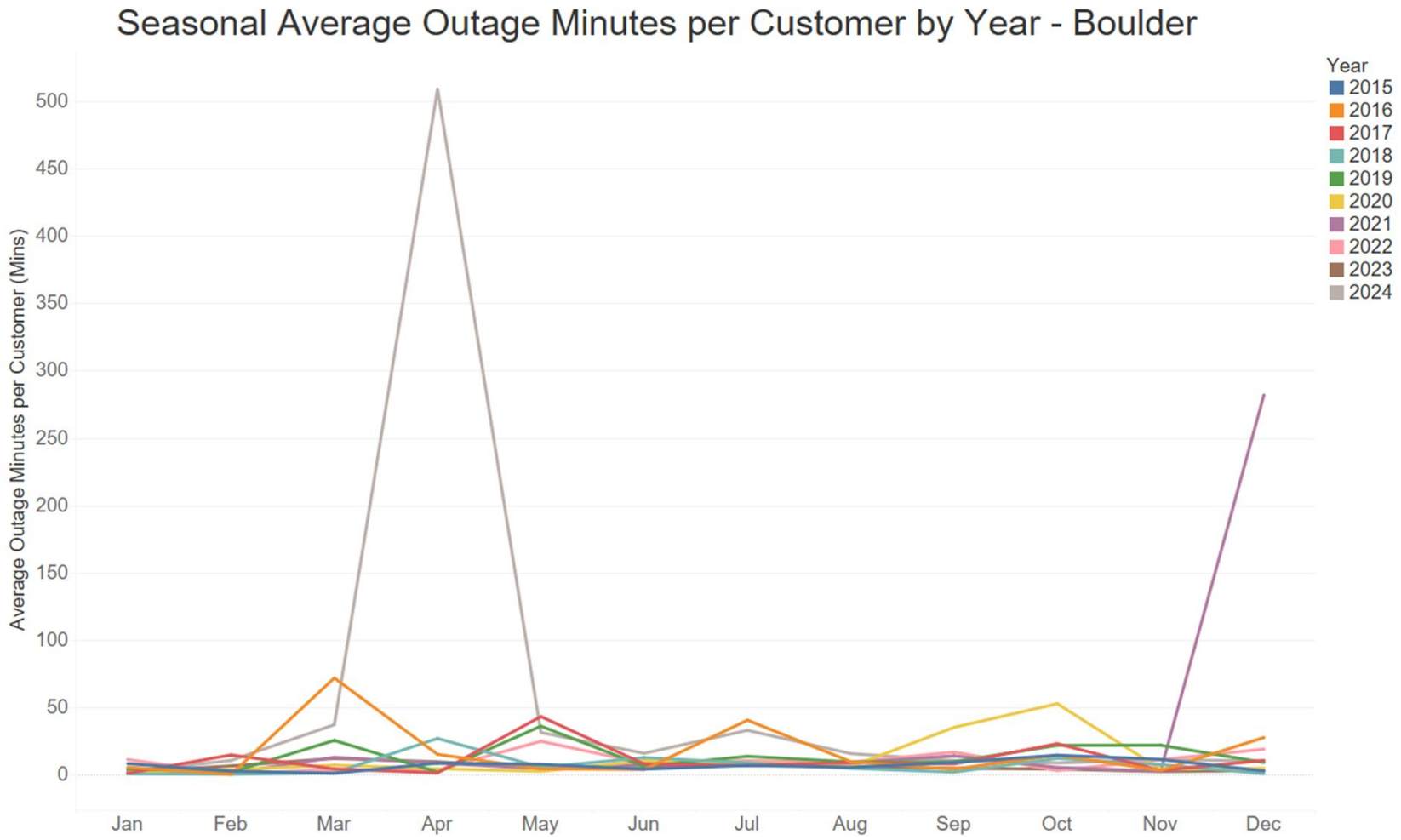
Regional Average Outage Duration (Mins)

Region	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Front Range	109	174	181	115	207	132	147	156	143	259
Denver Metro	93	120	92	109	218	131	103	156	103	198
San Luis Vall..	143	151	166	103	194	160	195	169	122	226
Home Light a..	101	163	97	79	119	136	336	95	122	115
High Plains	92	92	71	208	335	109	171	113	102	223
Boulder	104	124	129	103	135	136	262	136	111	388
Northern	162	221	108	115	138	147	274	125	142	166
Western	84	90	92	86	99	140	123	113	103	140
Mountain	111	115	185	195	141	146	169	148	175	175
Grand Total	99	127	107	110	194	134	151	148	110	209

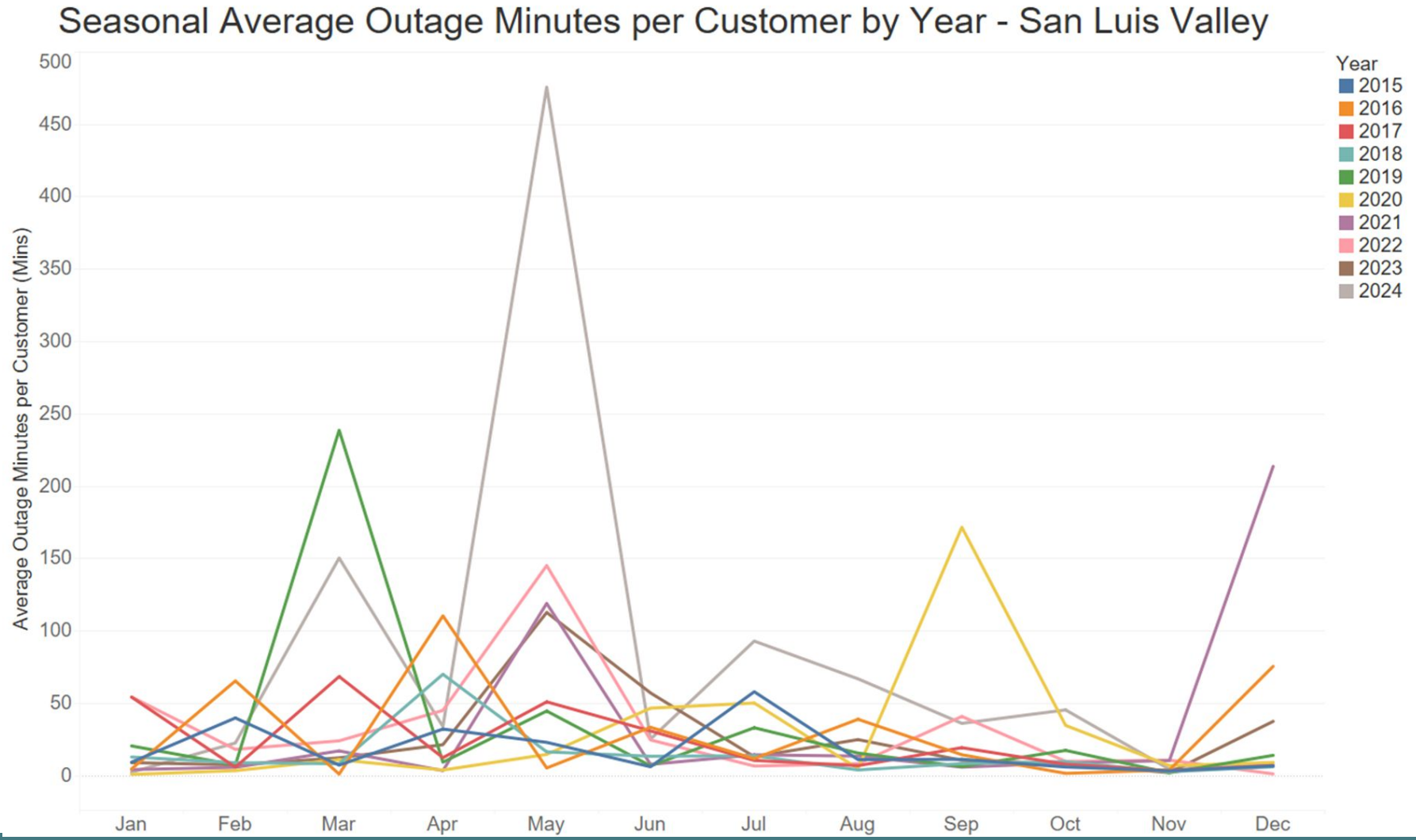
Appendix C: Seasonal Outage Minutes per Customer by Region and Year

Boulder Seasonal Trend by Year

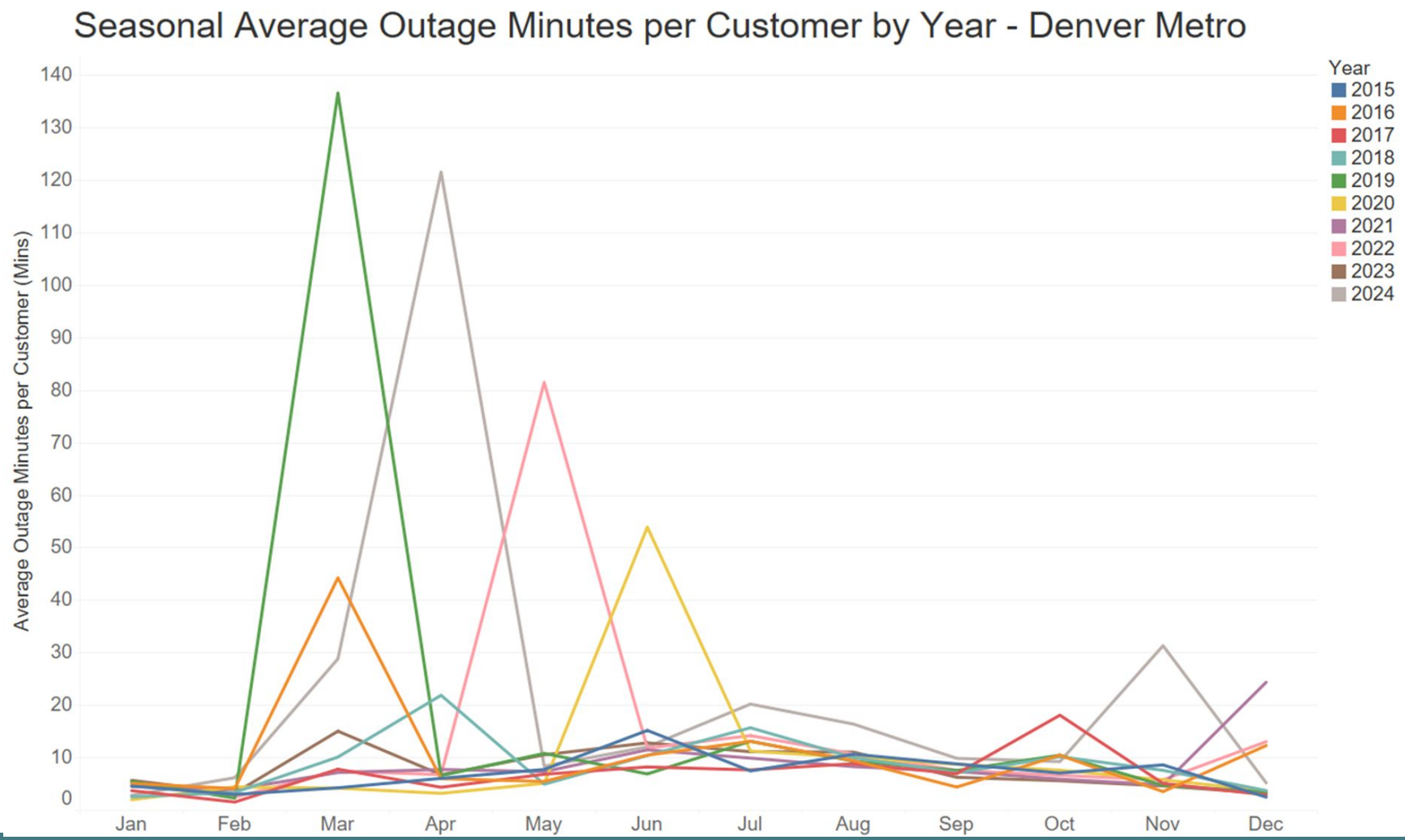
- April 2024 outlier event apparent



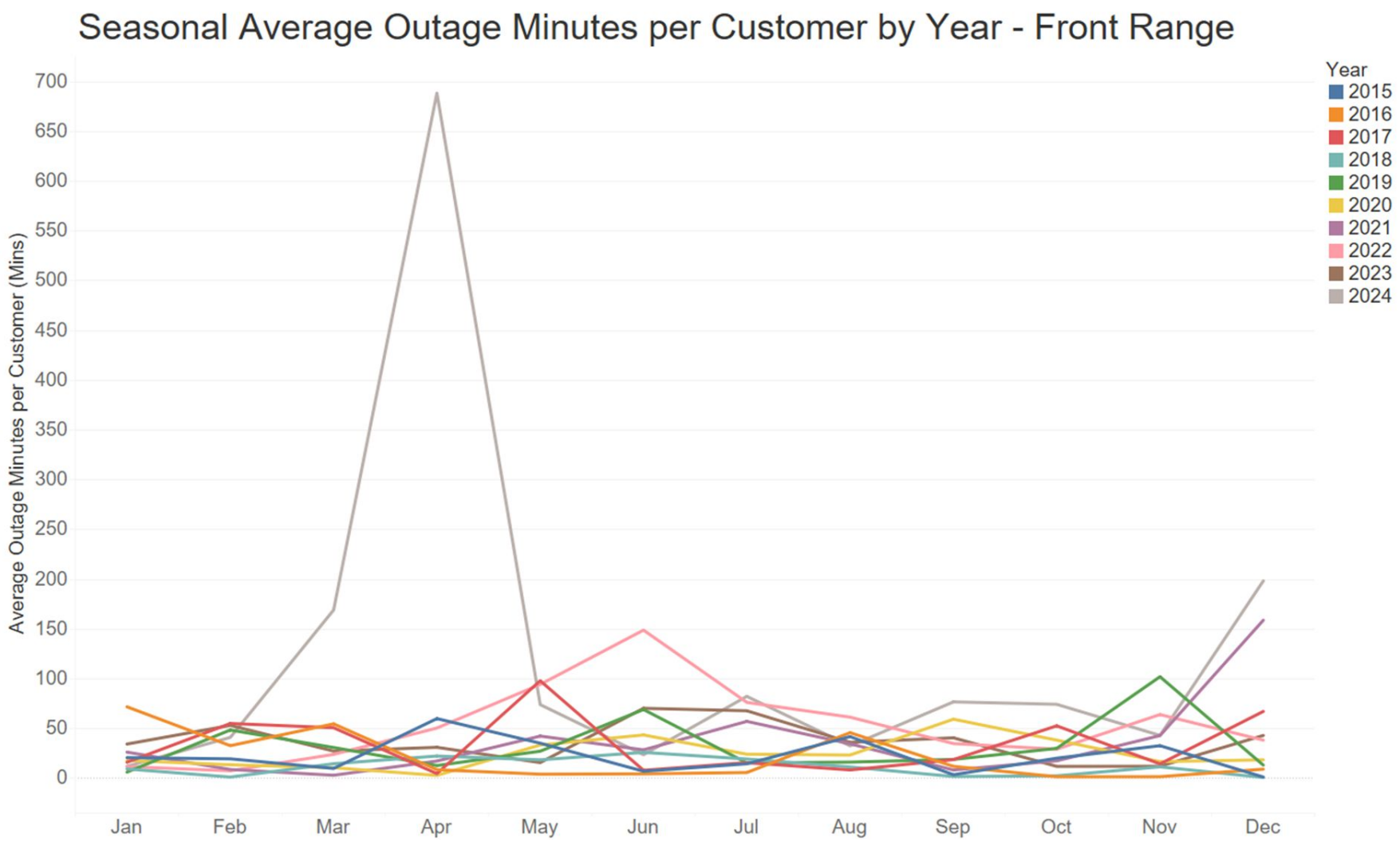
San Luis Valley Seasonal Trend by Year



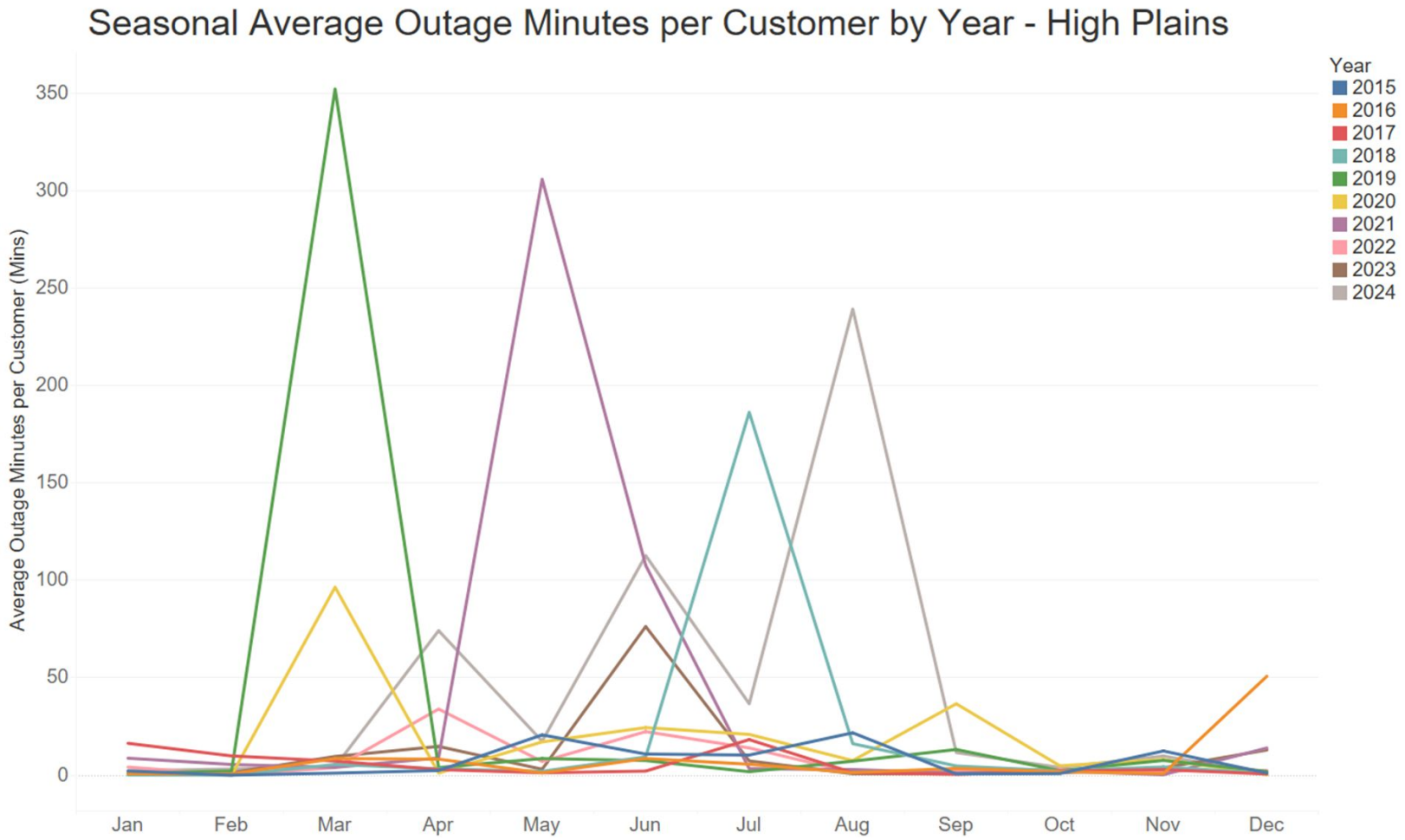
Denver Seasonal Trend by Year



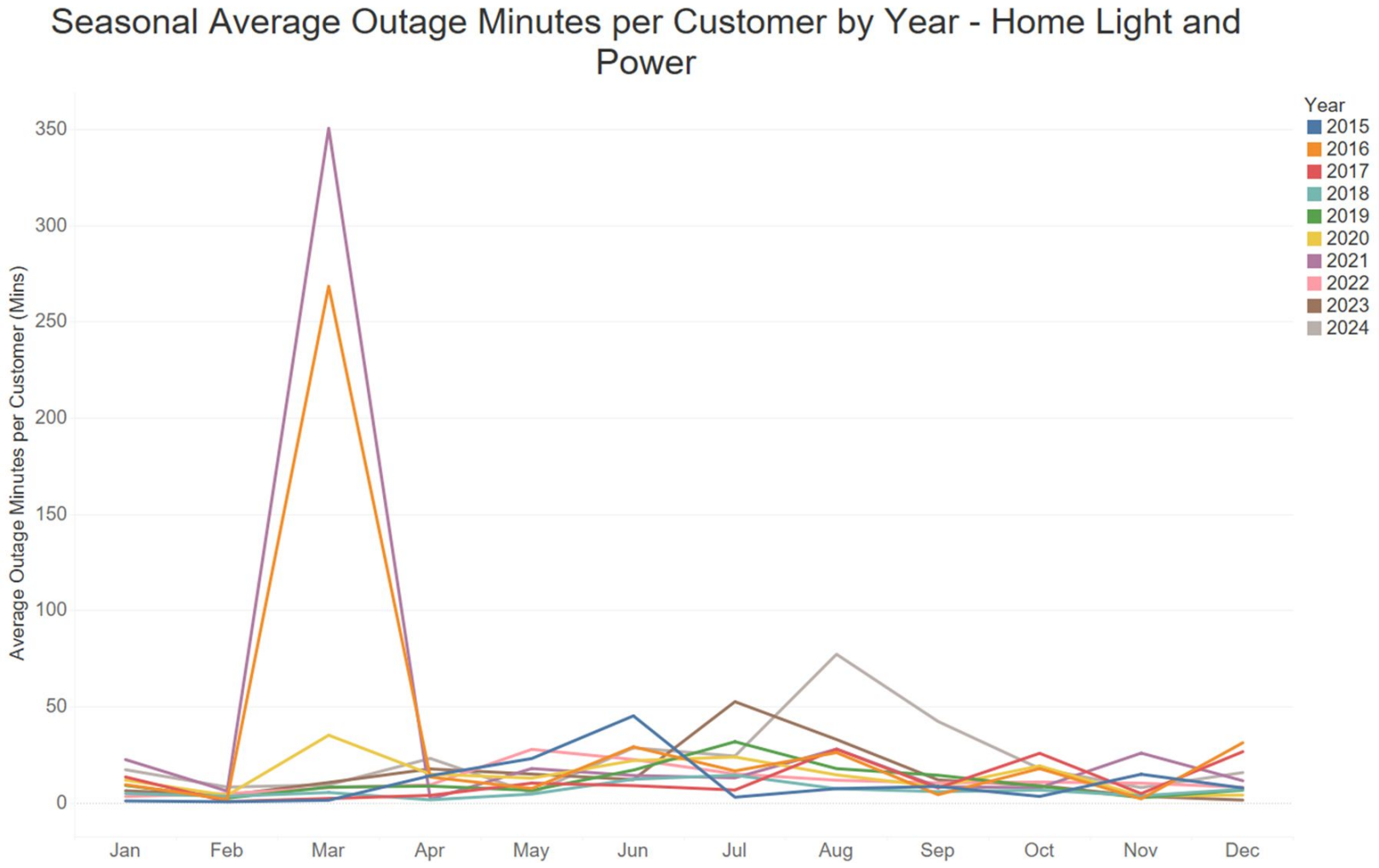
Front Range Seasonal Trend by Year



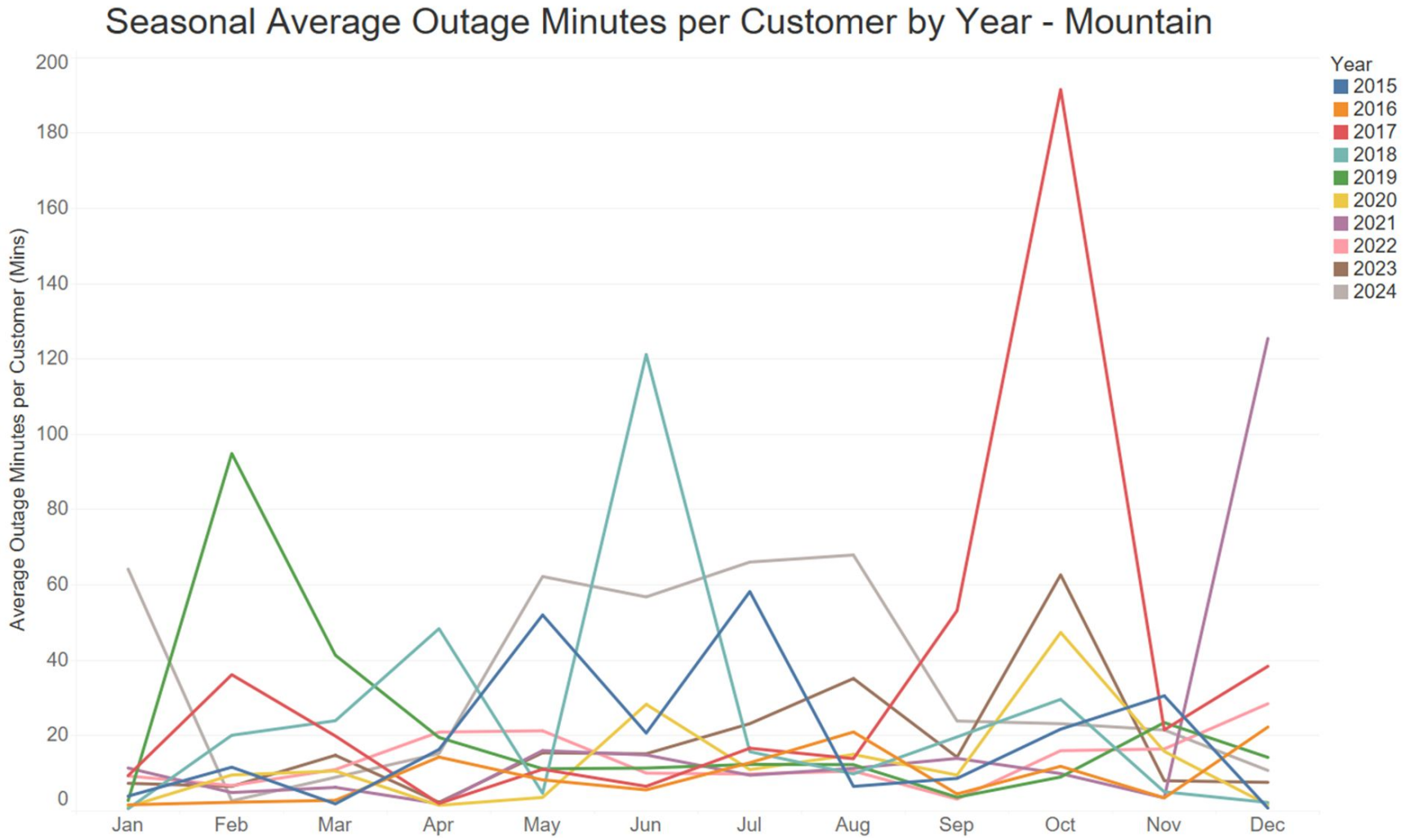
High Plains Seasonal Trend by Year



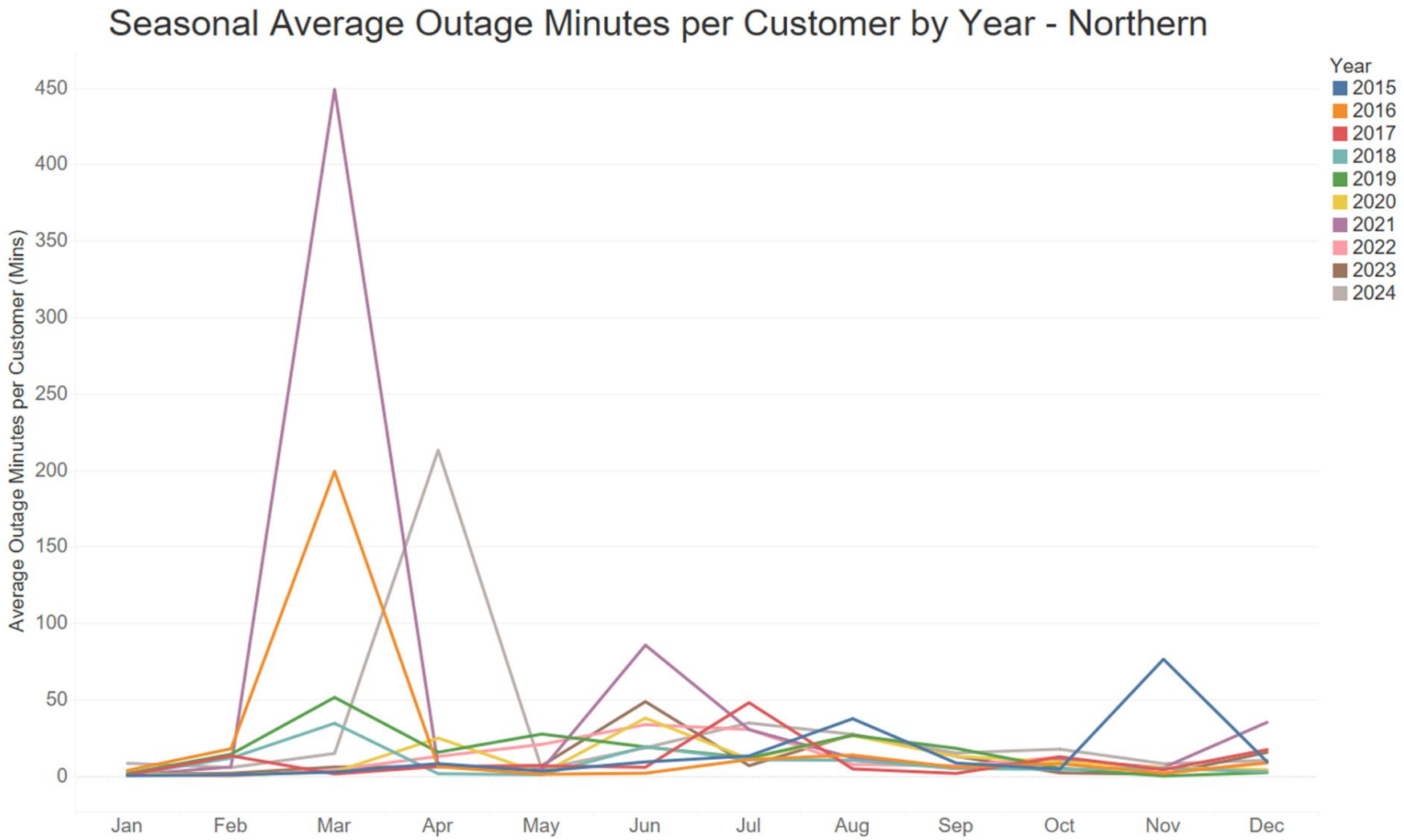
Home Light and Power Seasonal Trend by Year



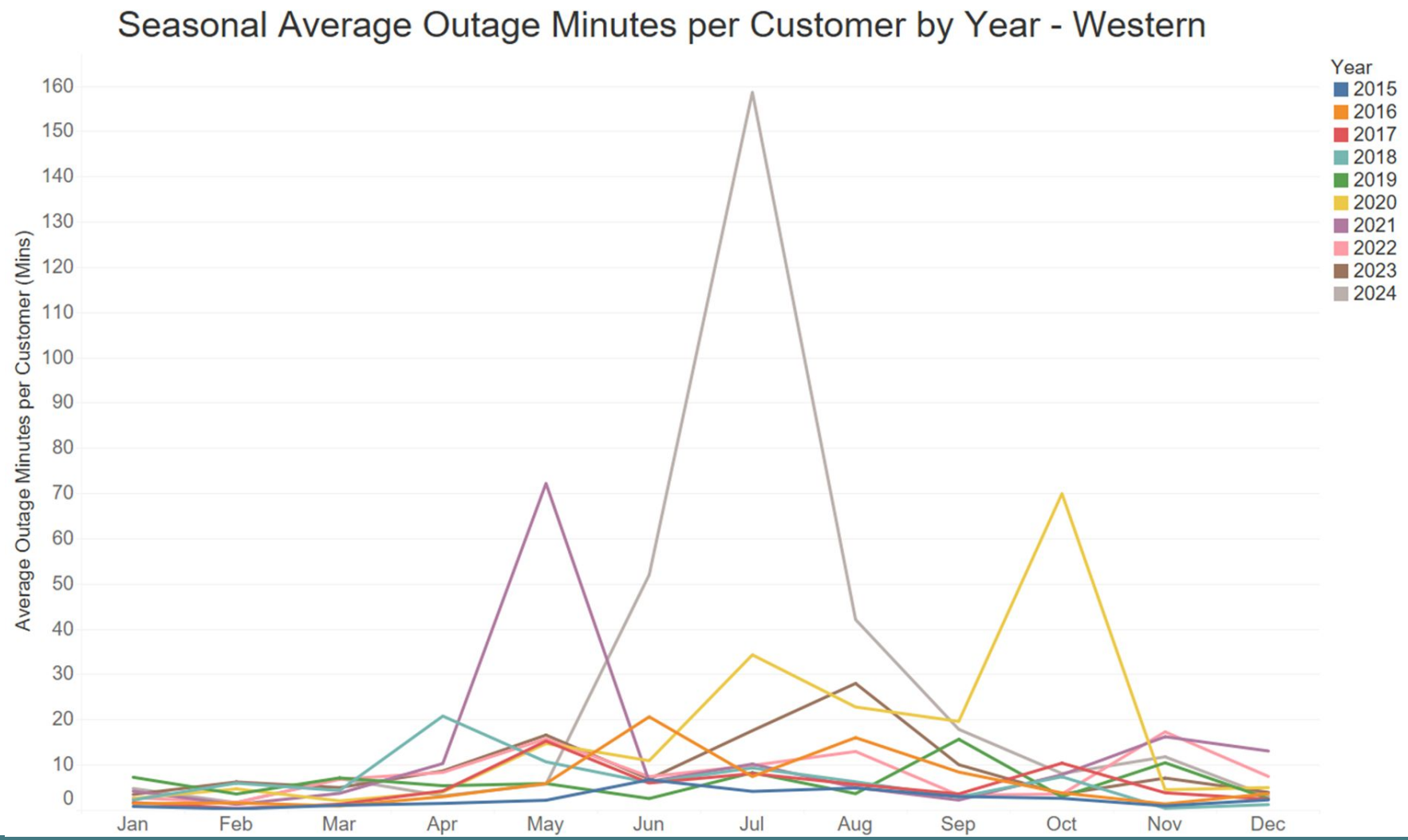
Mountain Seasonal Trend by Year



Northern Seasonal Trend by Year

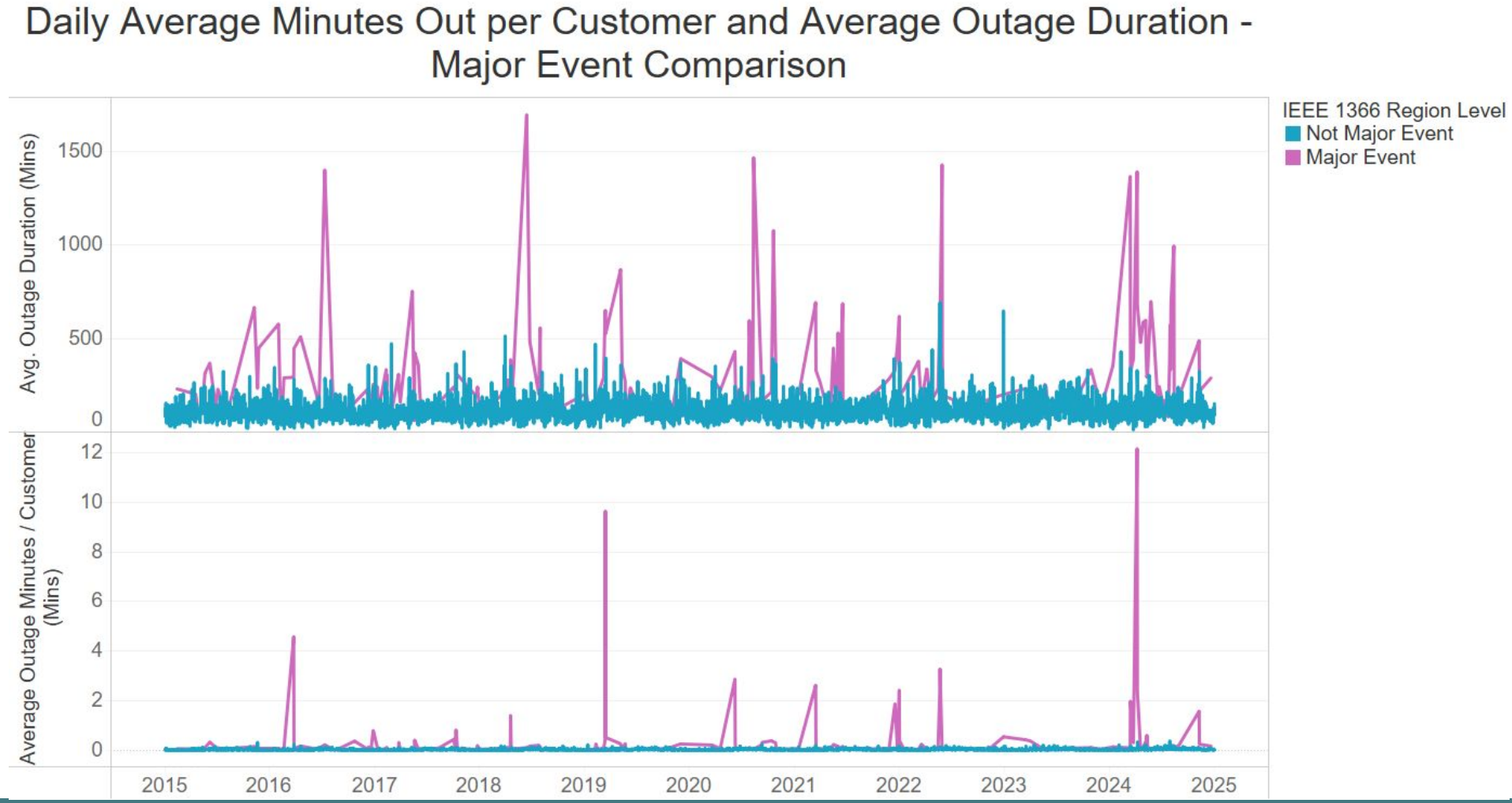


Western Seasonal Trend by Year

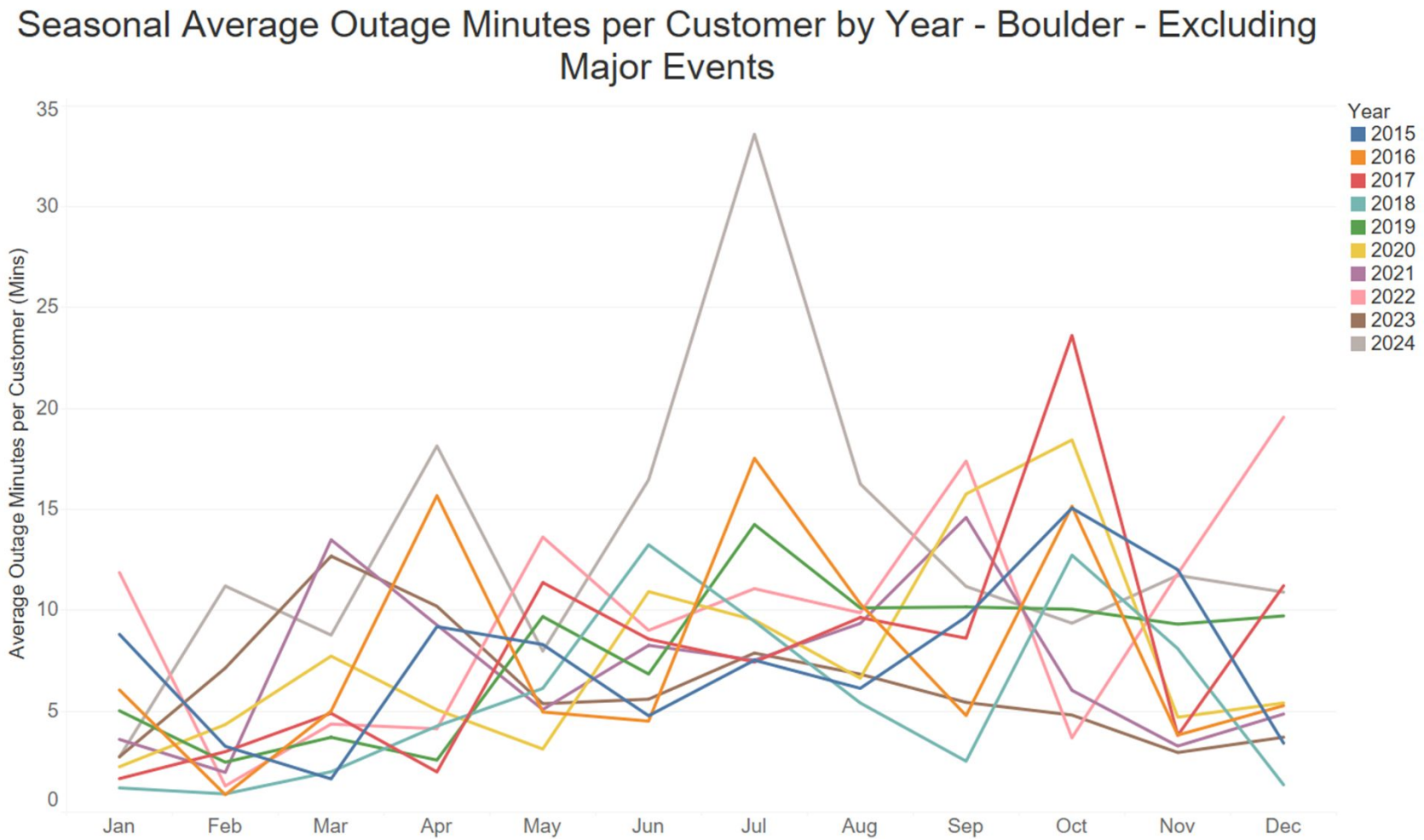


Appendix ??: Seasonal Outage Minutes per Customer by Region and Year - Excluding Major Events

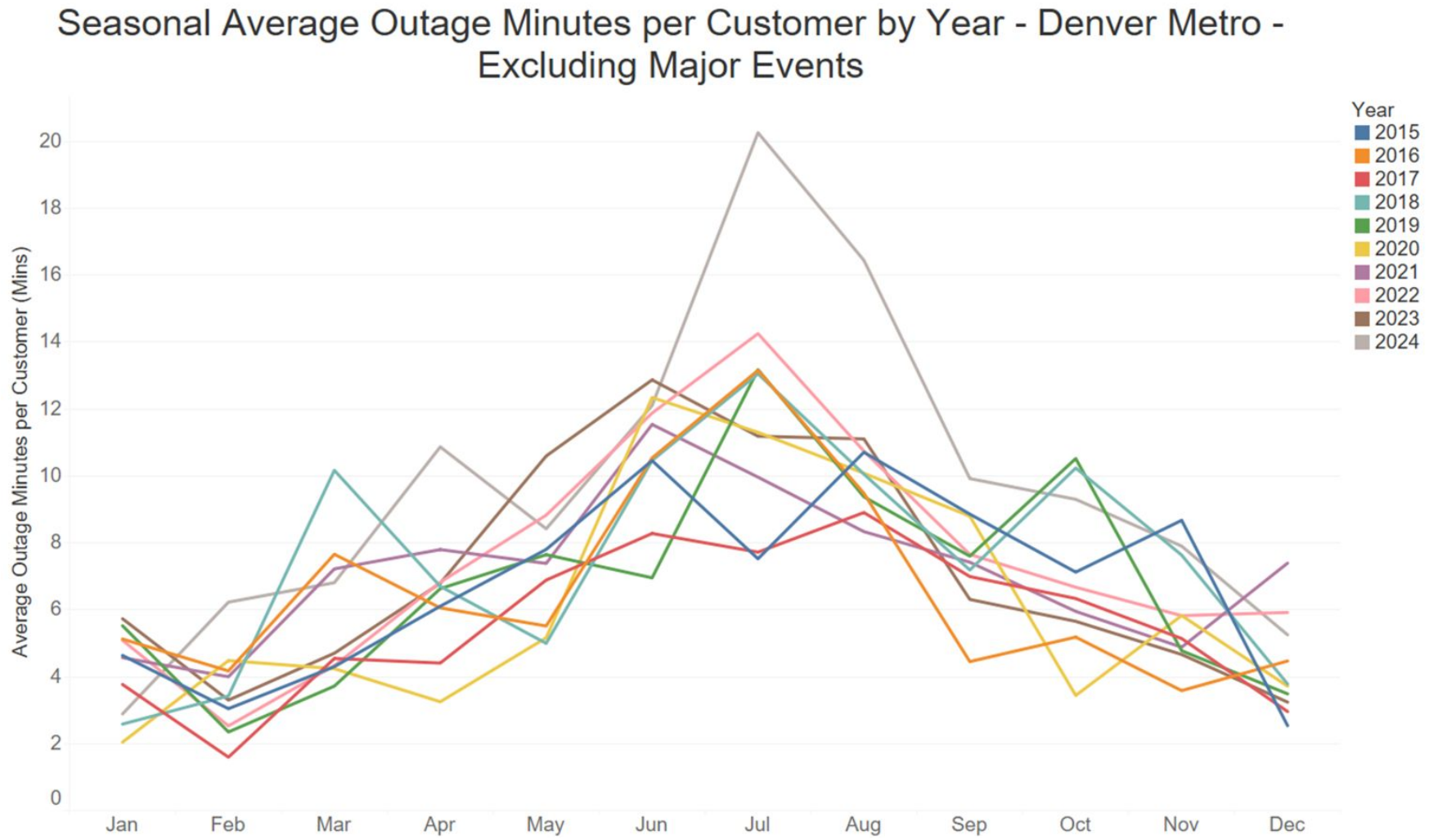
Daily Major events



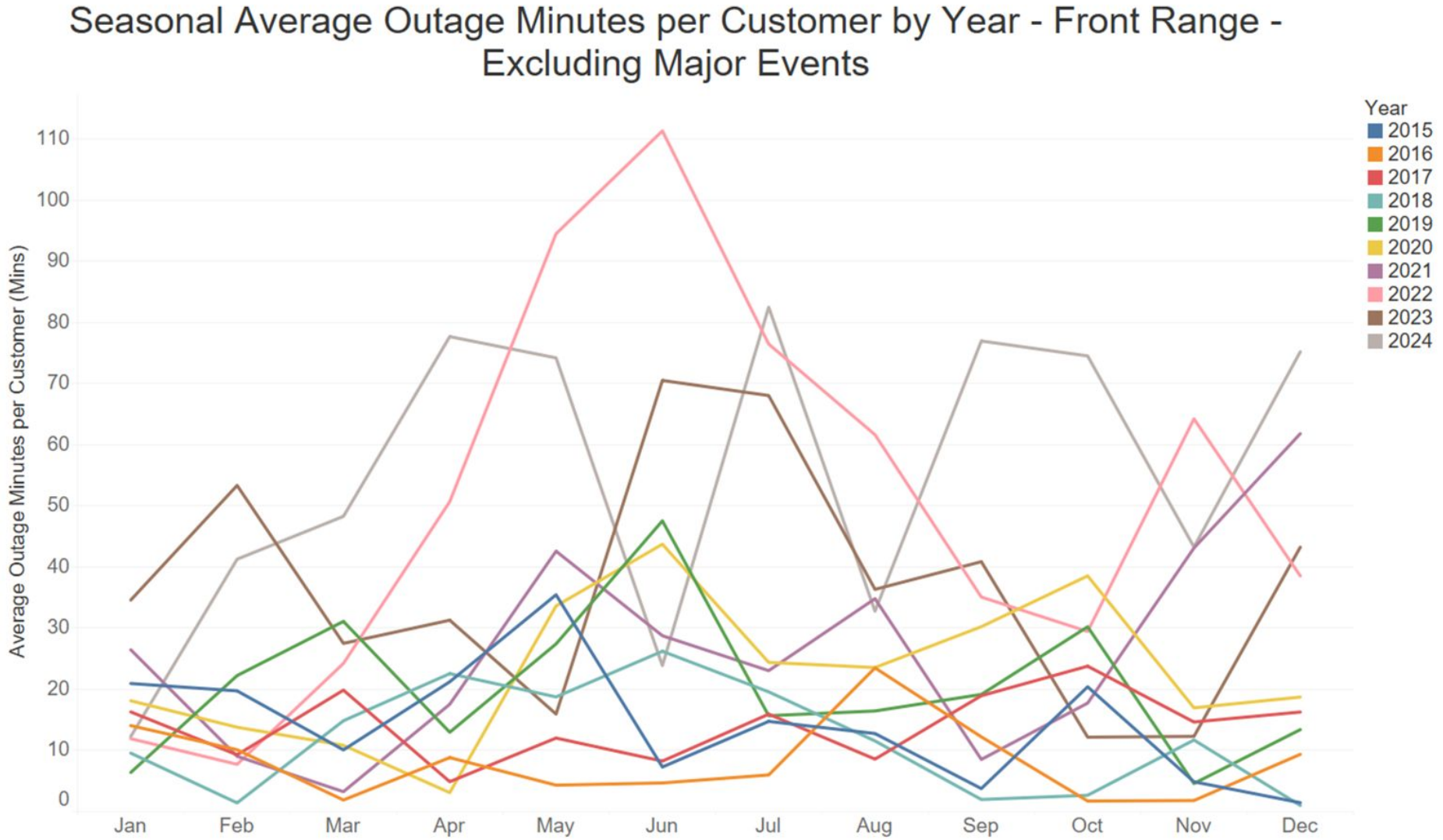
Boulder Seasonal Trend by Year - Excluding Major Events



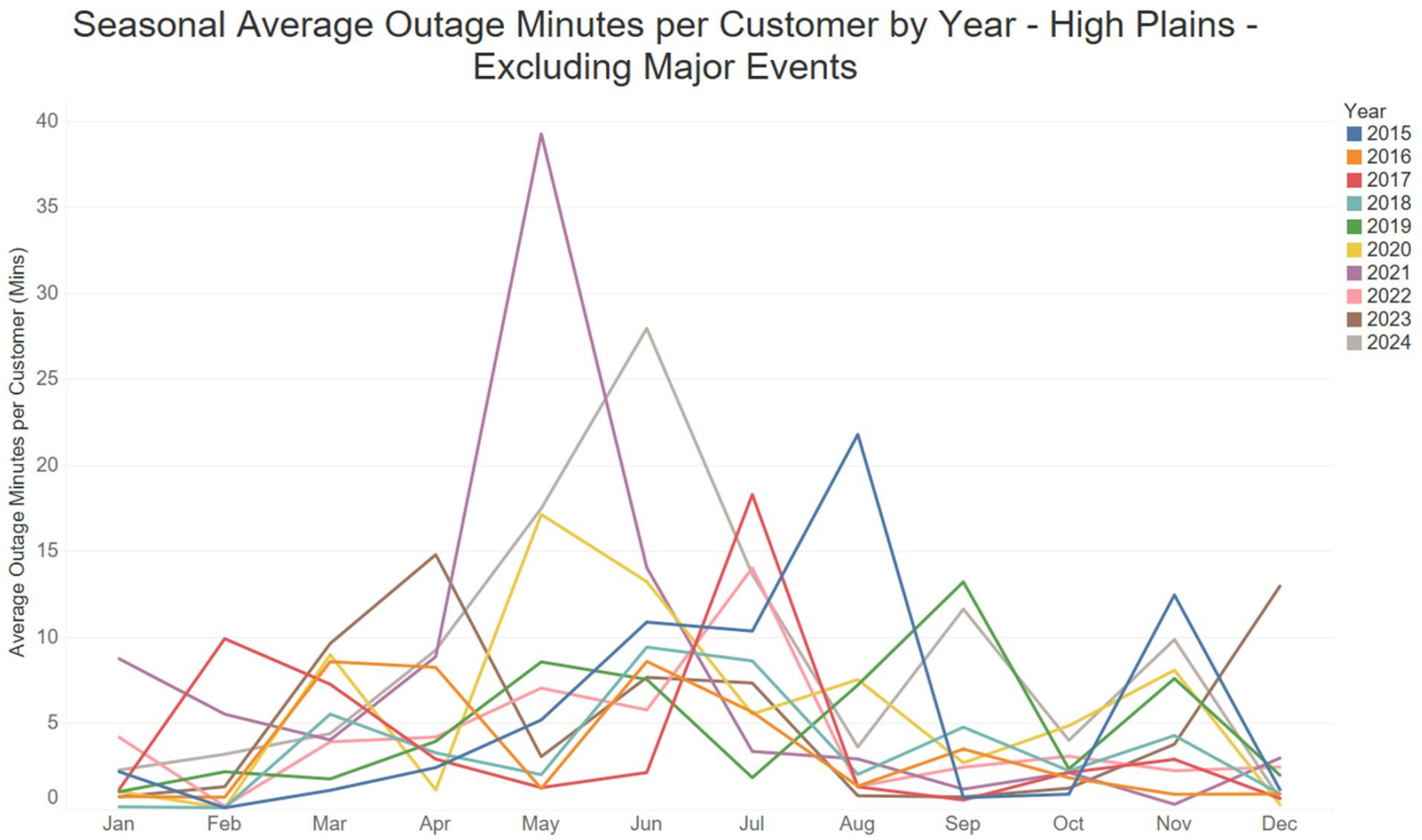
Denver Seasonal Trend by Year - Excluding Major Events



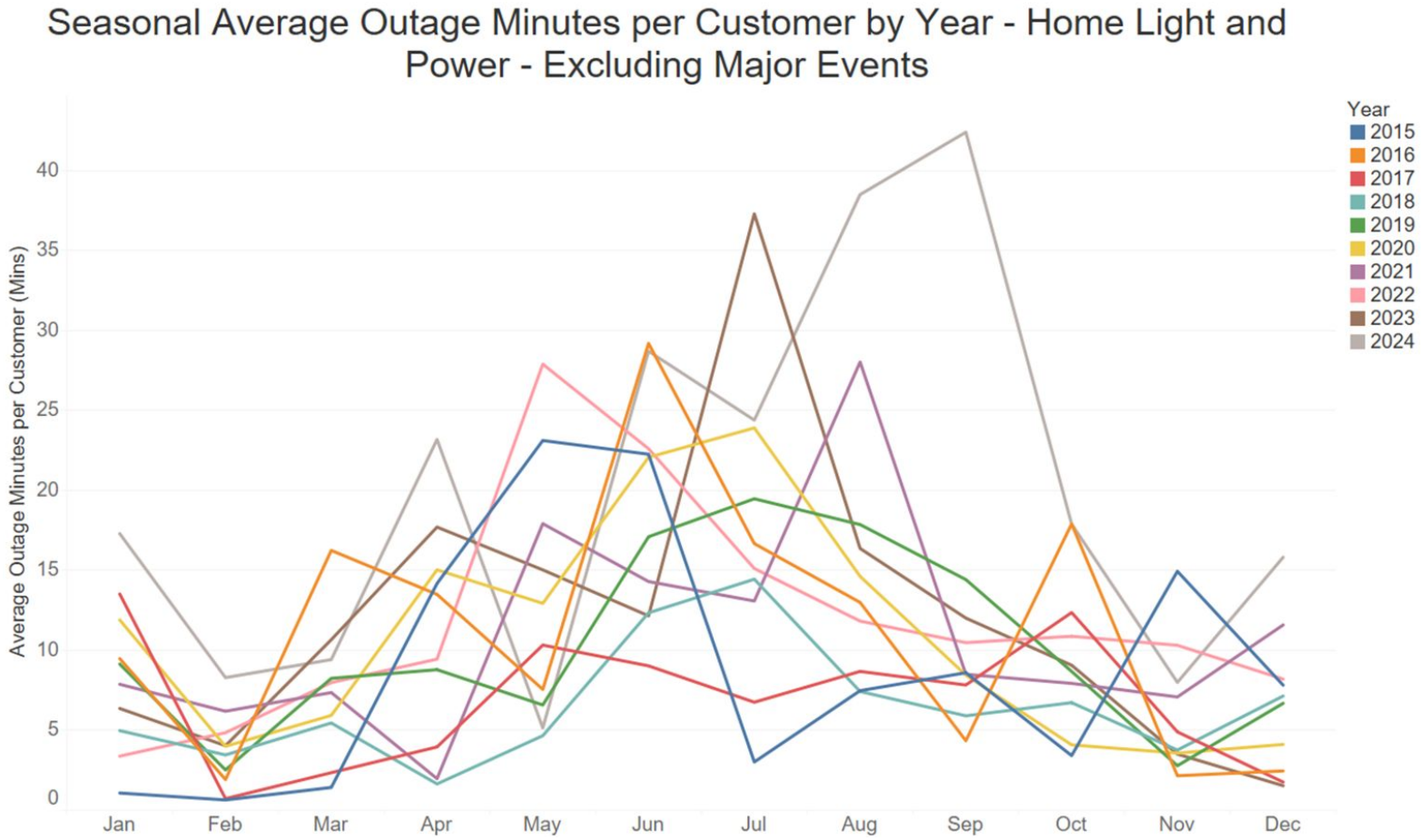
Front Range Seasonal Trend by Year - Excluding Major Events



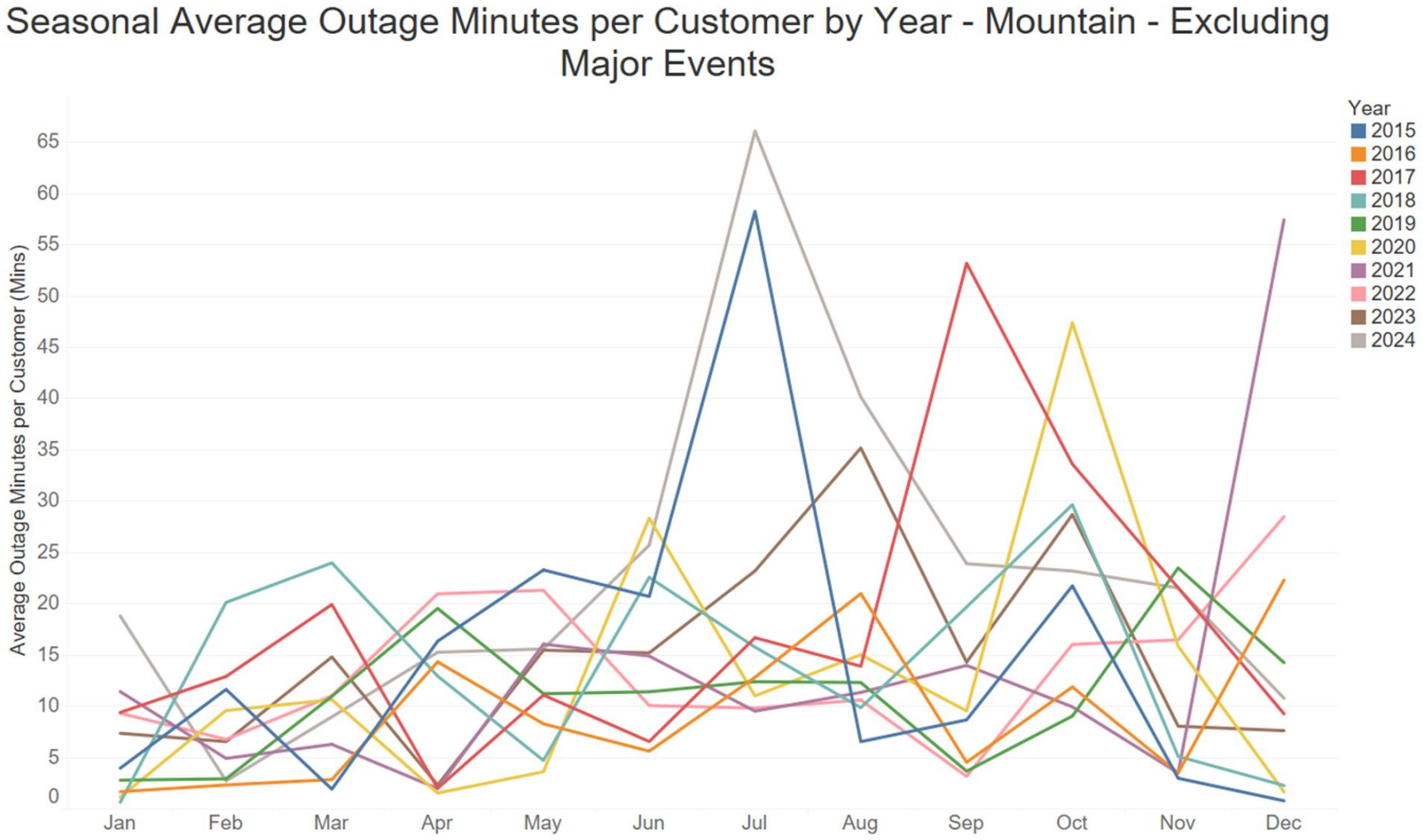
High Plains Seasonal Trend by Year - Excluding Major Events



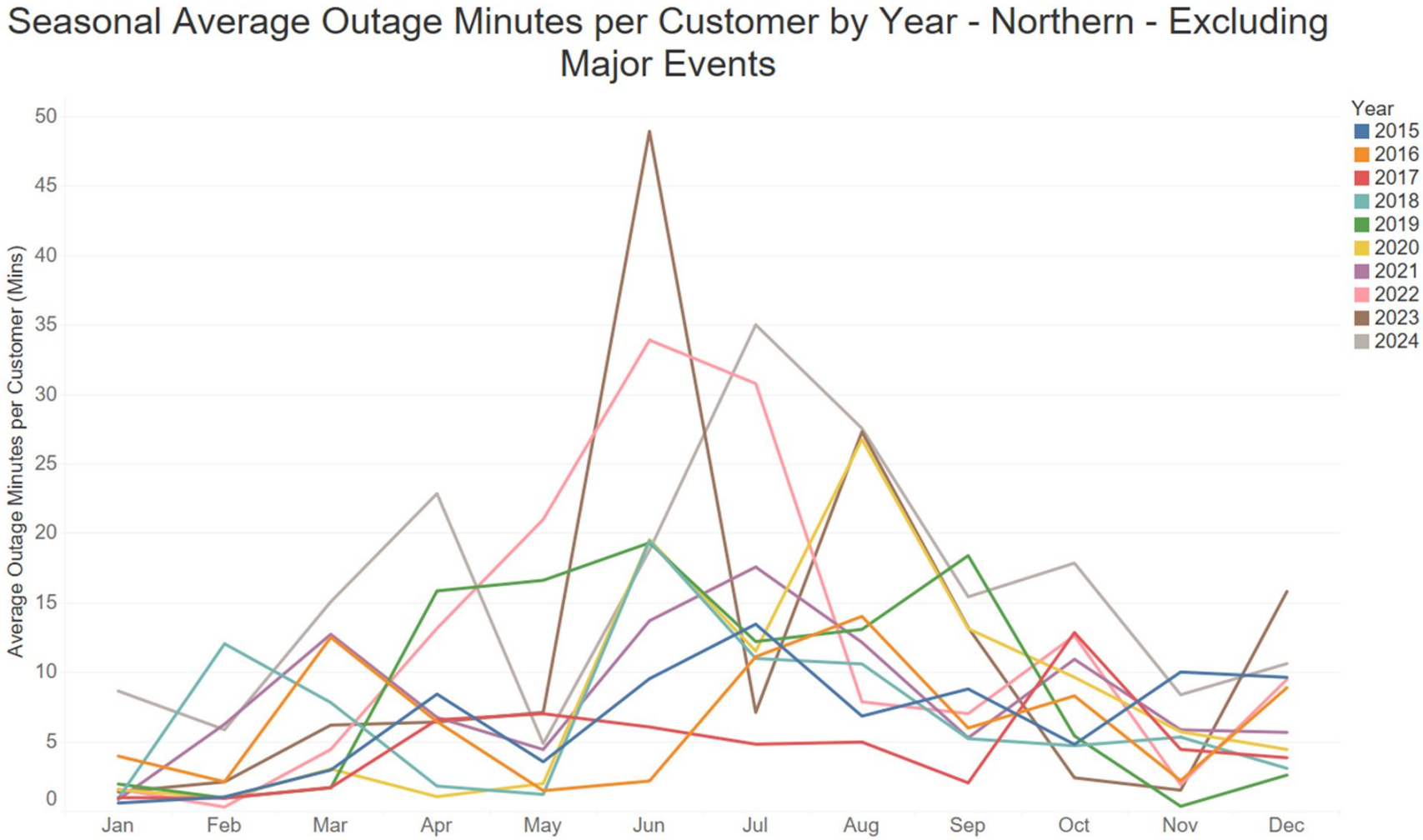
Home Light and Power Seasonal Trend by Year - Excluding Major Events



Mountain Seasonal Trend by Year - Excluding Major Events

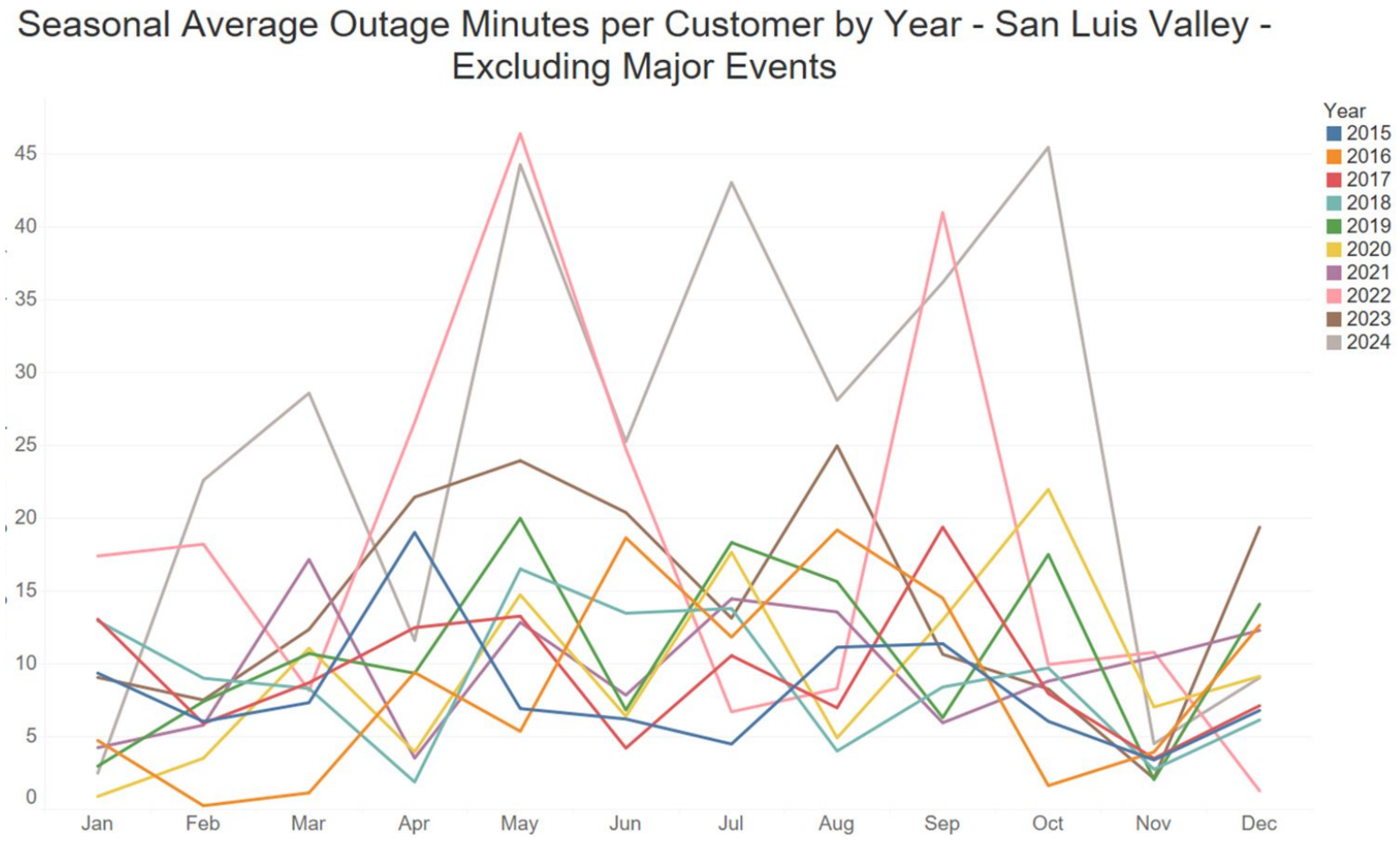


Northern Seasonal Trend by Year - Excluding Major Events



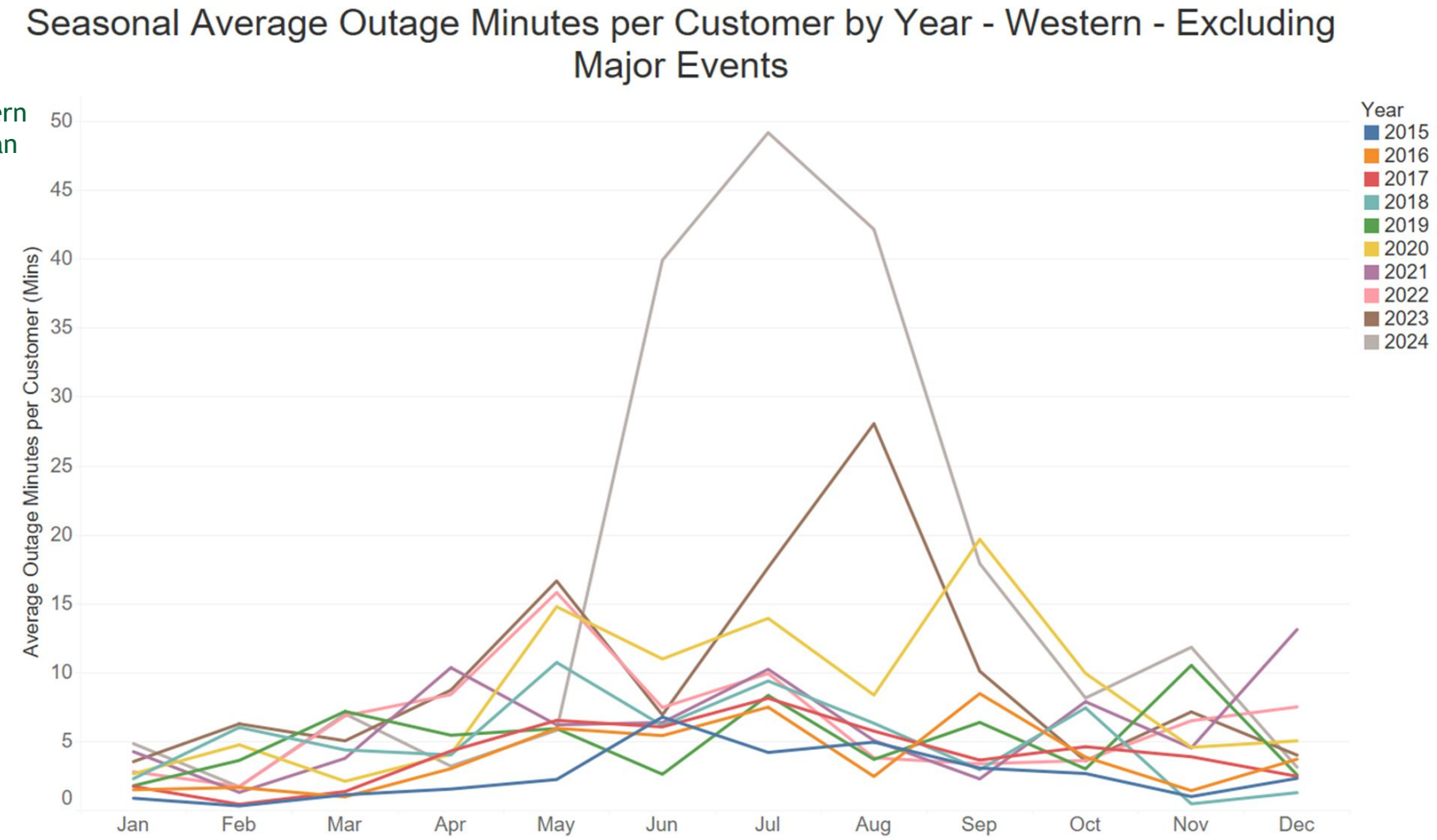
San Luis Valley Seasonal Trend by Year - Excluding Major Events

Outages in the San Luis Valley show less of a seasonal pattern than other regions



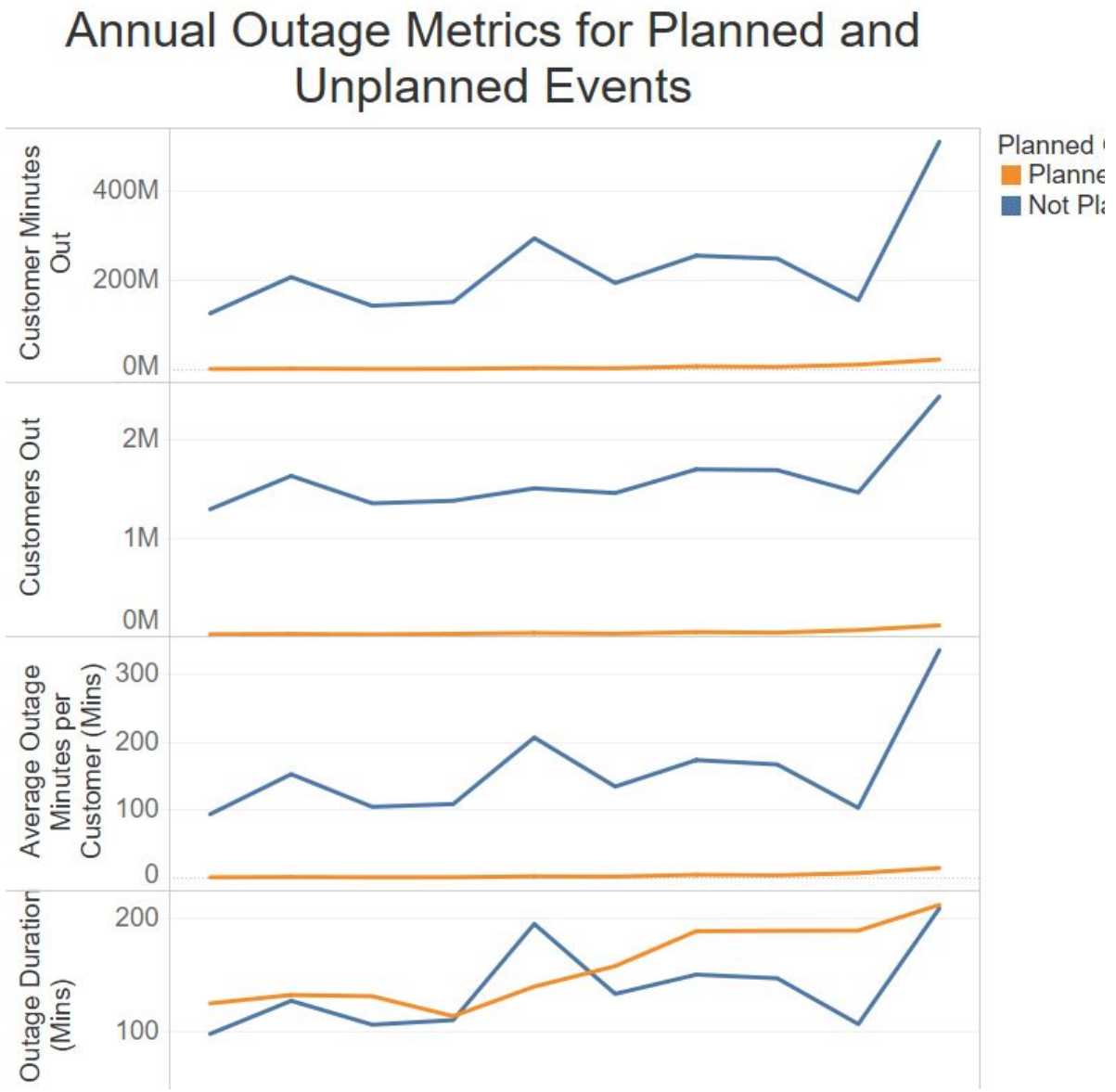
Western Seasonal Trend by Year - Excluding Major Events

Excluding major events, outage minutes per customer in the Western region were significantly worse than previous years



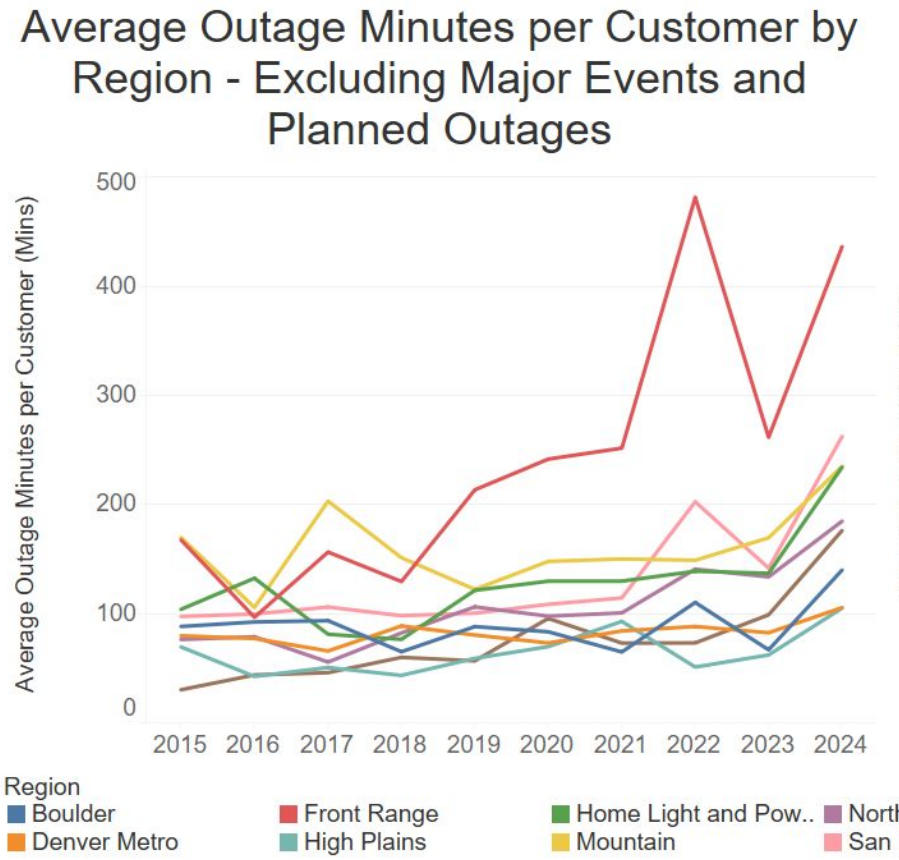
Appendix E: System-Wide Outage Metrics, Yearly and Seasonal - Excluding Major Events and Planned Outages

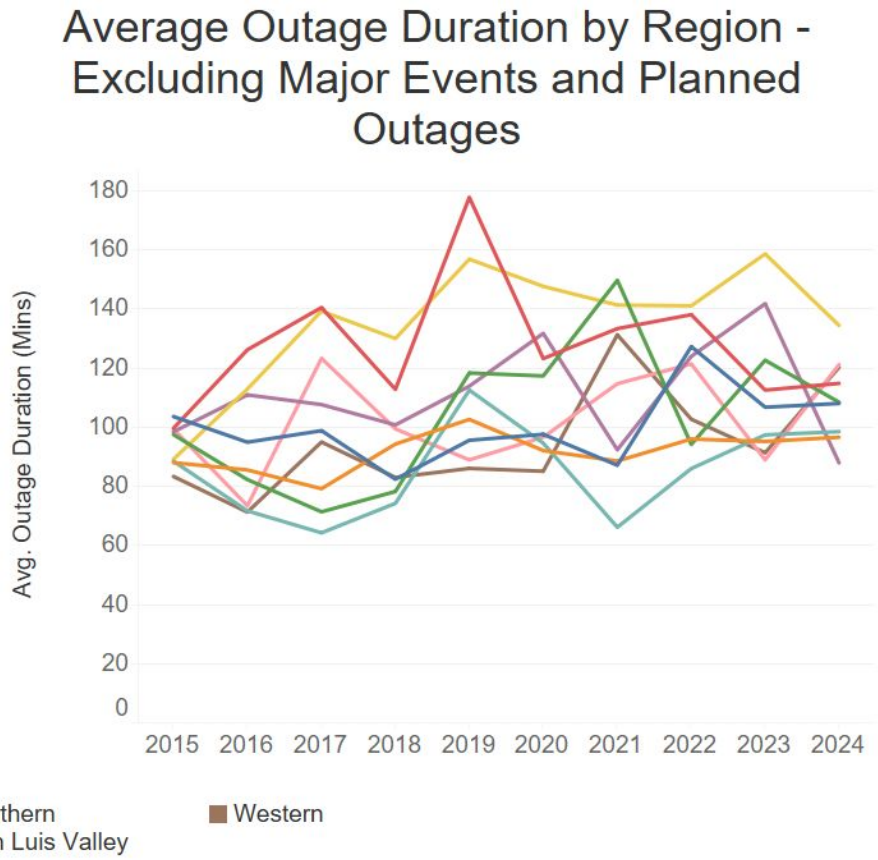
Annual Planned/Unplanned Outage Metric Comparison



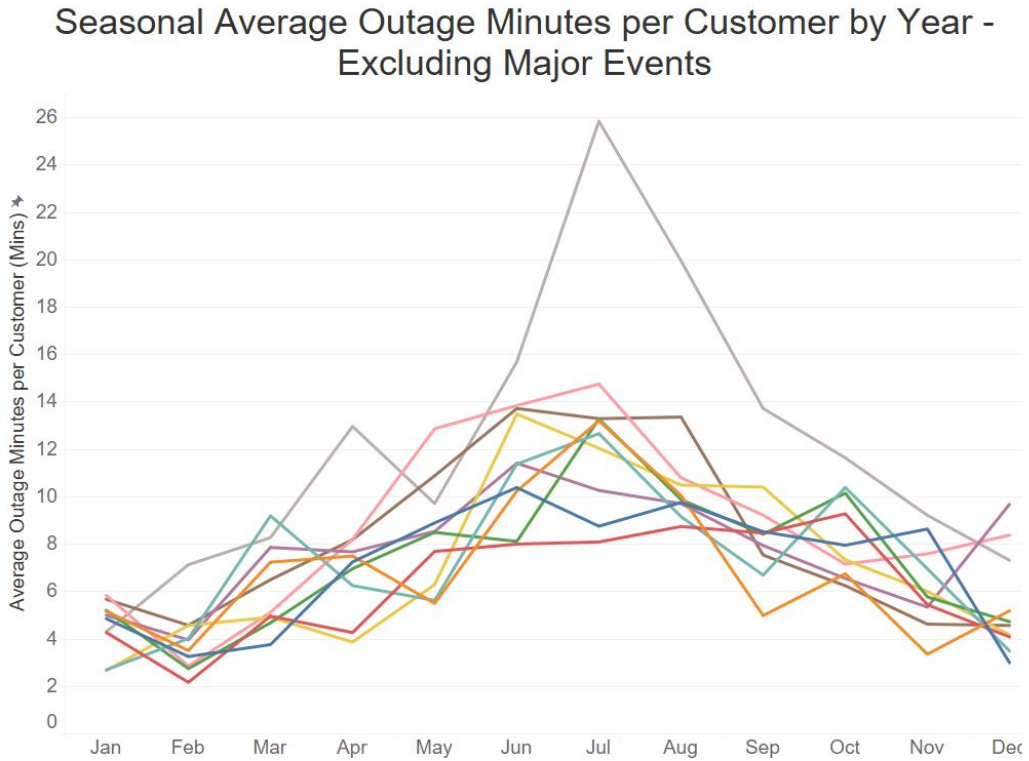
10 Year Annual Regional Trend - Excluding Major Events and Planned Outages

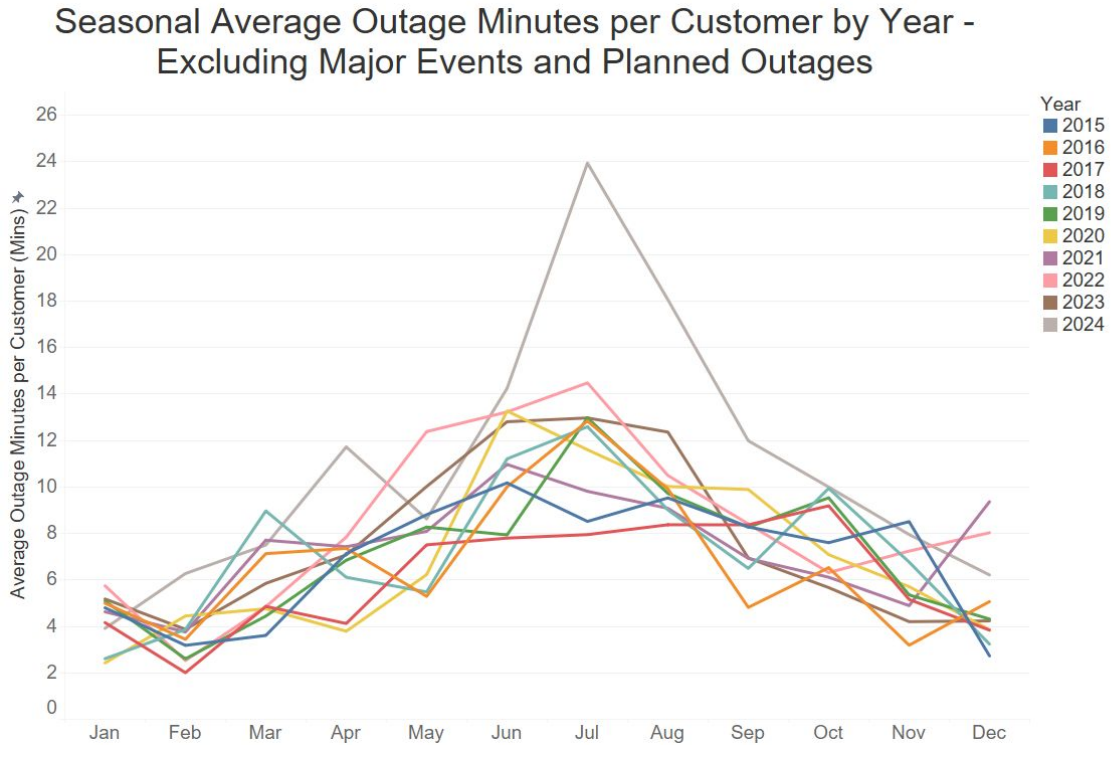
Excluding major events and planned outages, the average outage duration for 2024 is roughly the same as the duration in prior years





10 Year Seasonal Trend - Excluding Major Events and Planned Outages

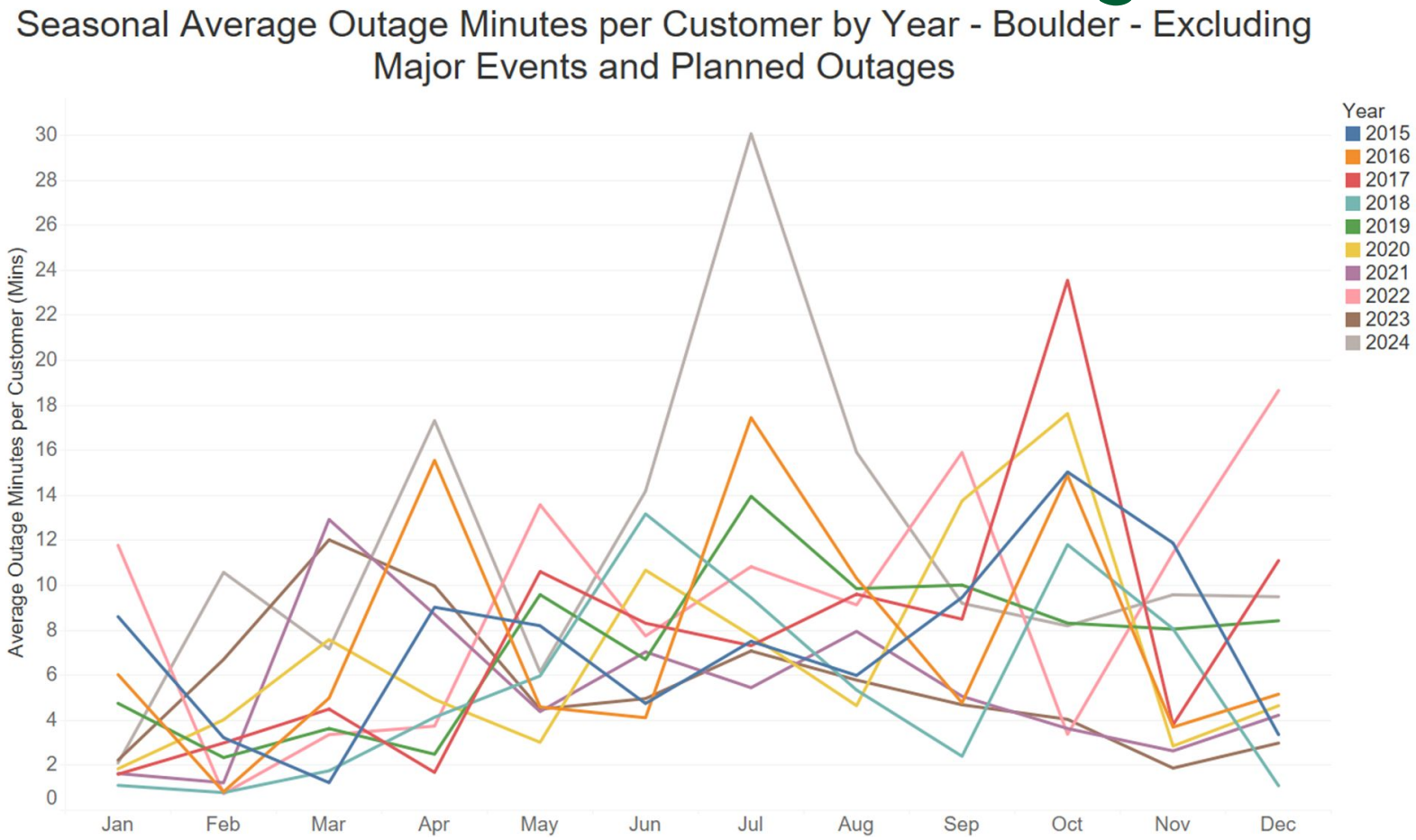




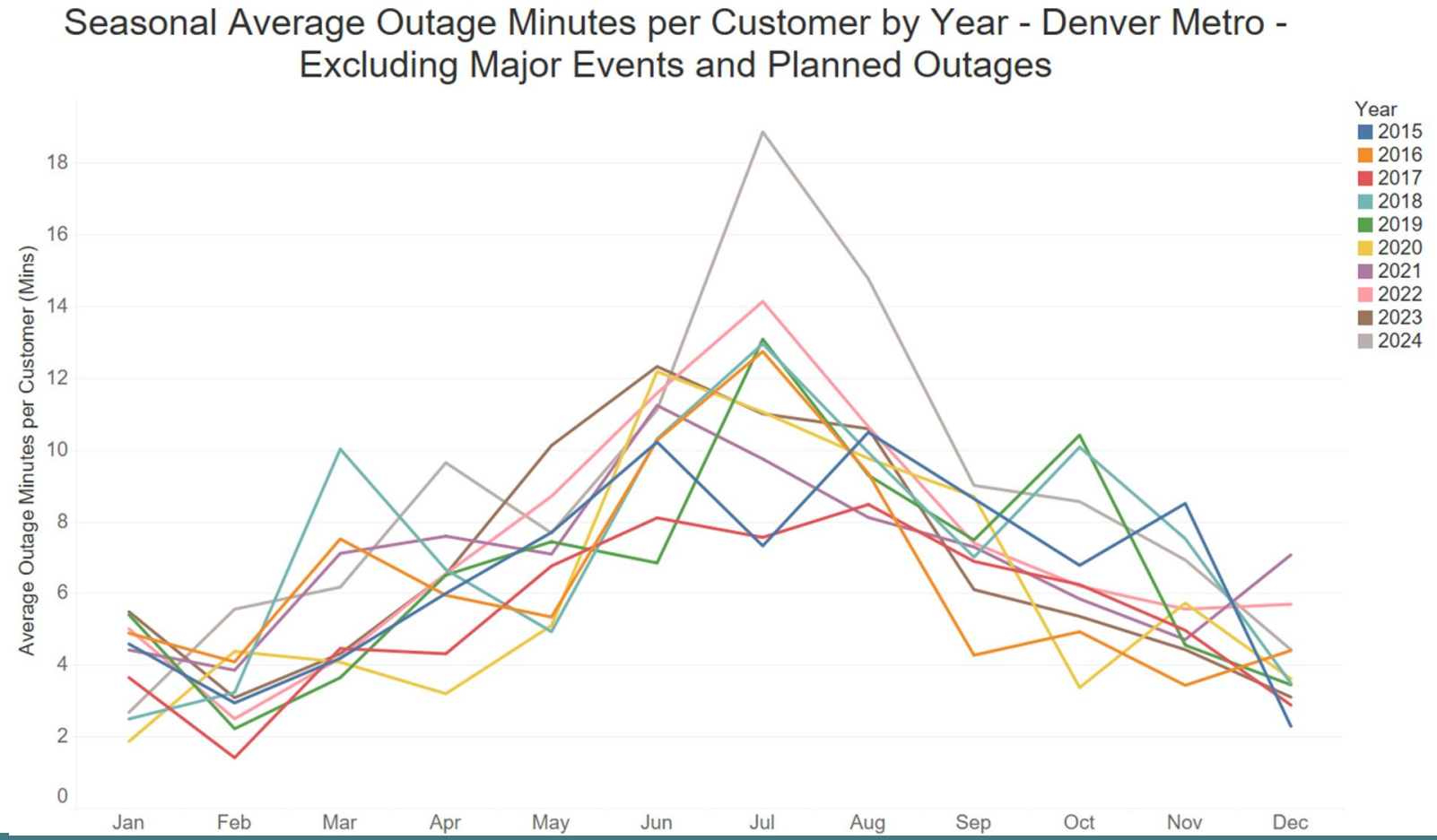
- Seasonal outage trends excluding major events appears to be quite similar when planned outages are also excluded.

Appendix F: Seasonal Outage Minutes per Customer by Region and Year - Excluding Major Events and Planned Outages

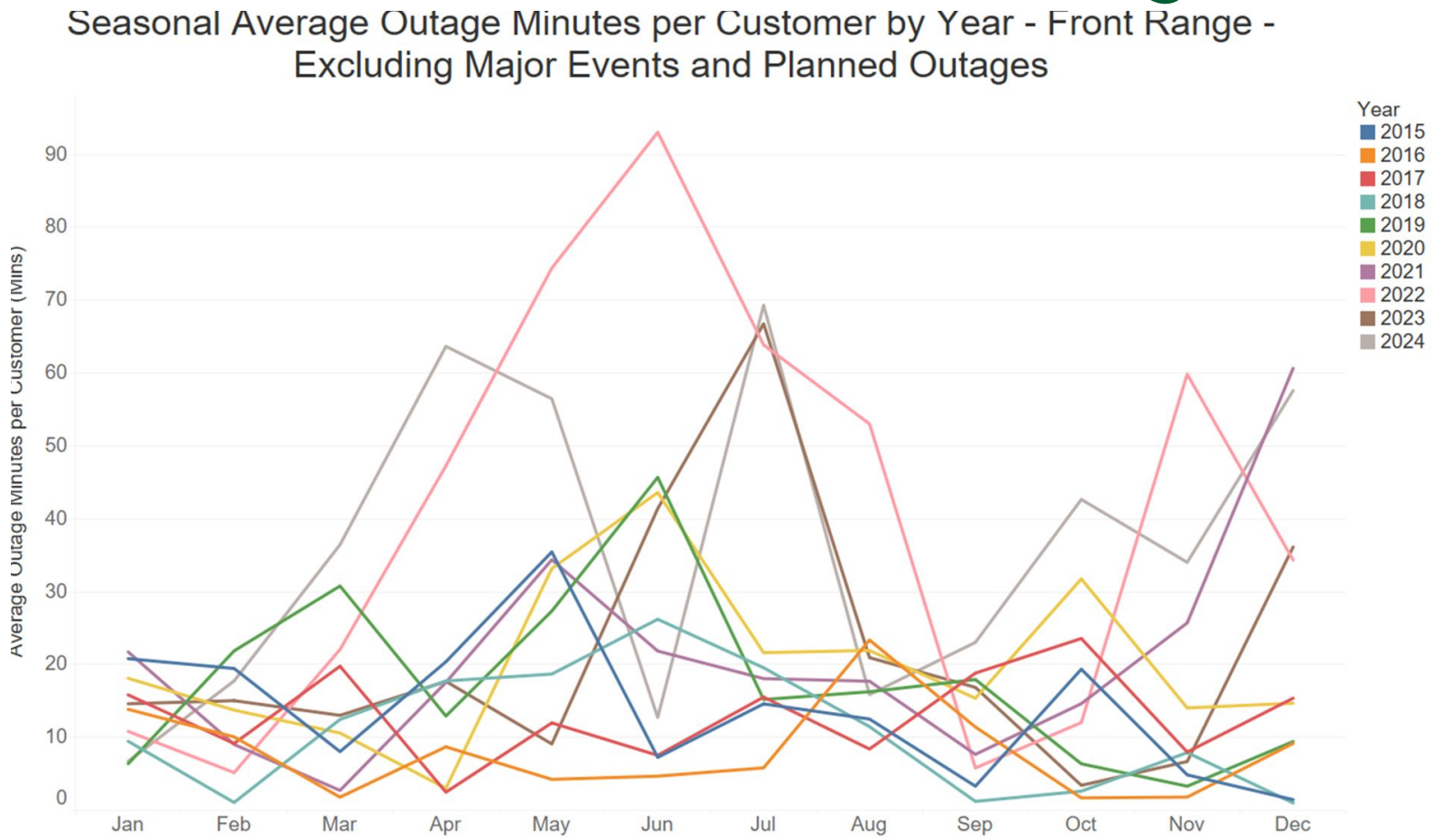
Boulder Seasonal Trend by Year - Excluding Major Events and Planned Outages



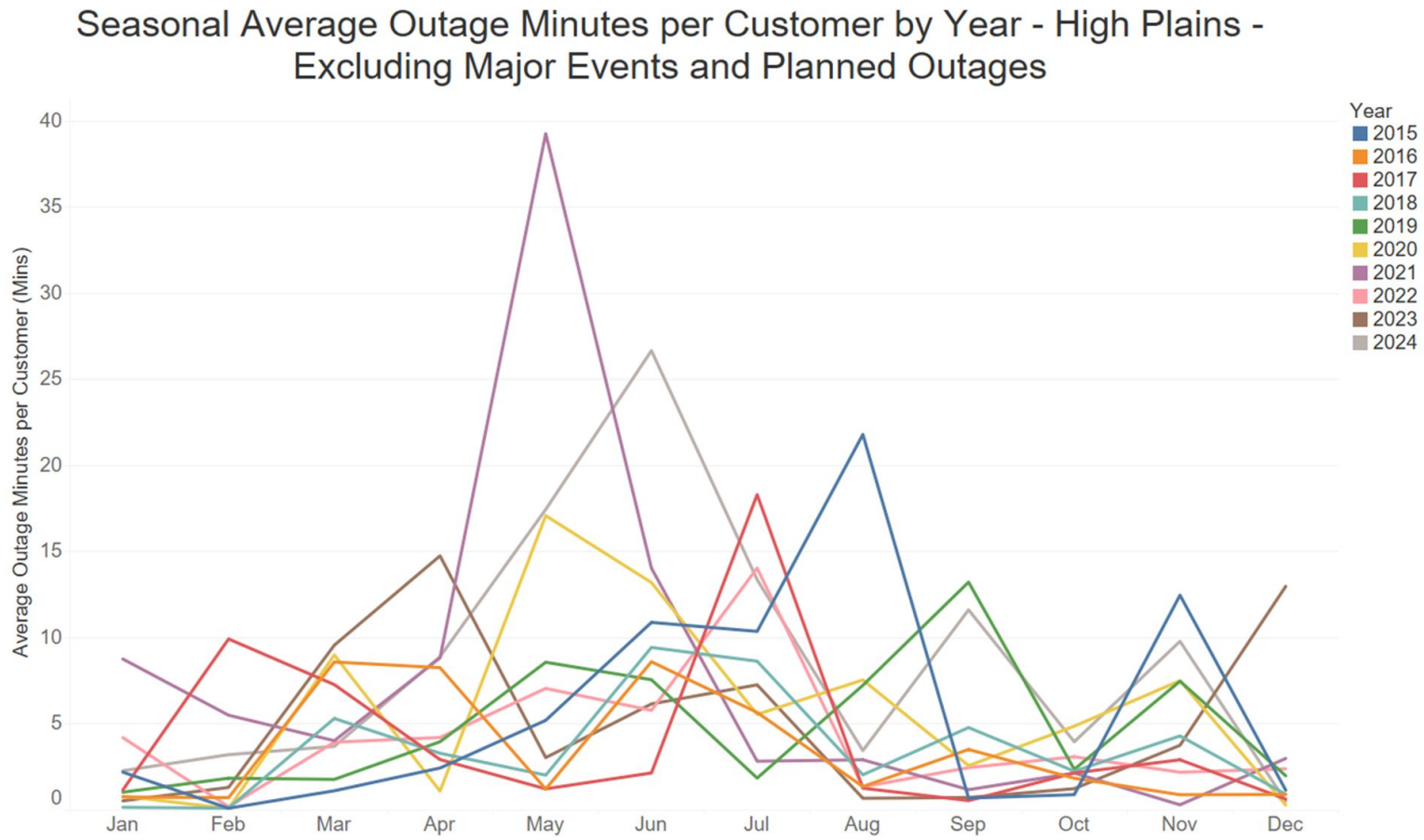
Denver Seasonal Trend by Year - Excluding Major Events and Planned Outages



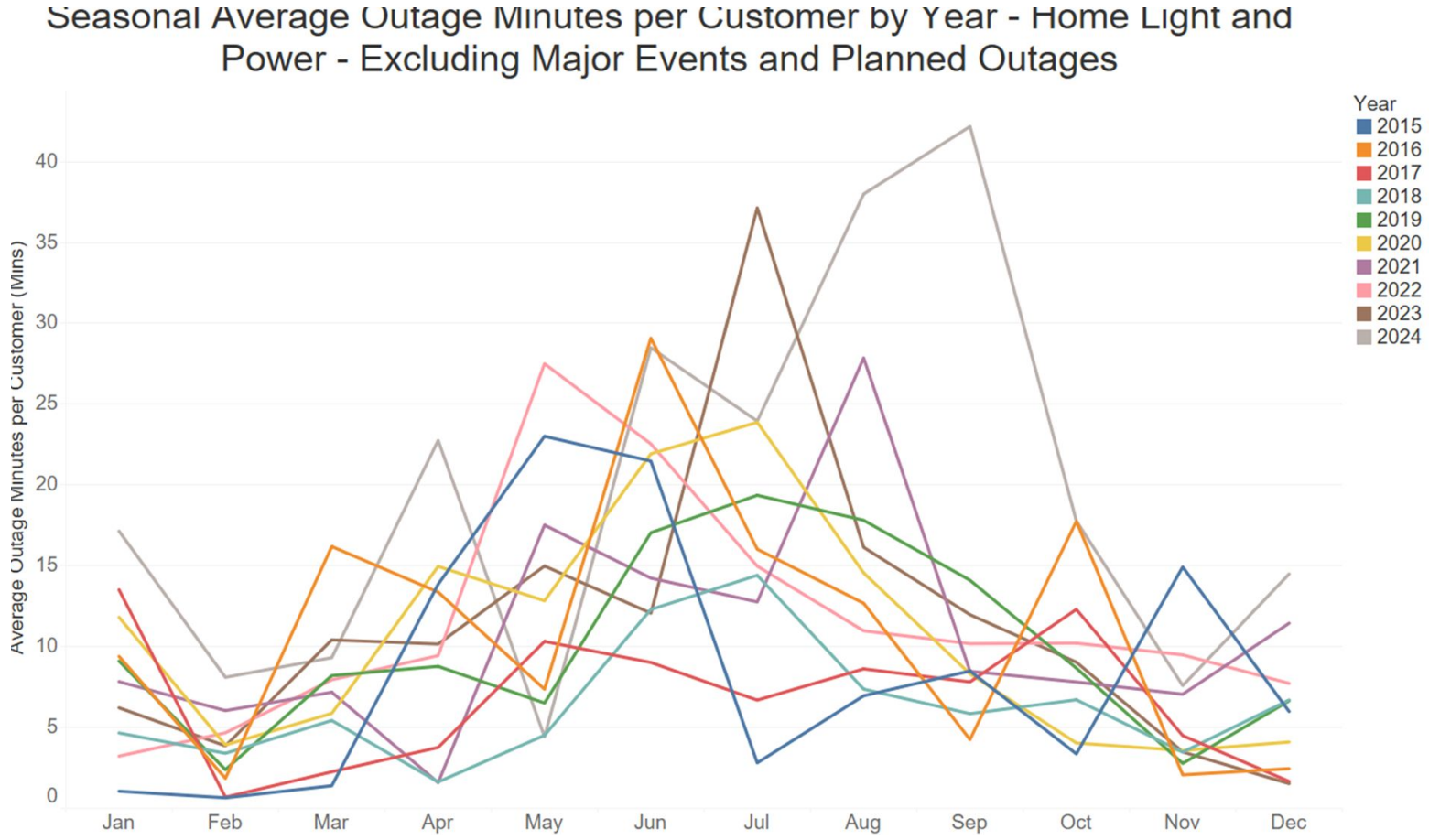
Front Range Seasonal Trend by Year - Excluding Major Events and Planned Outages



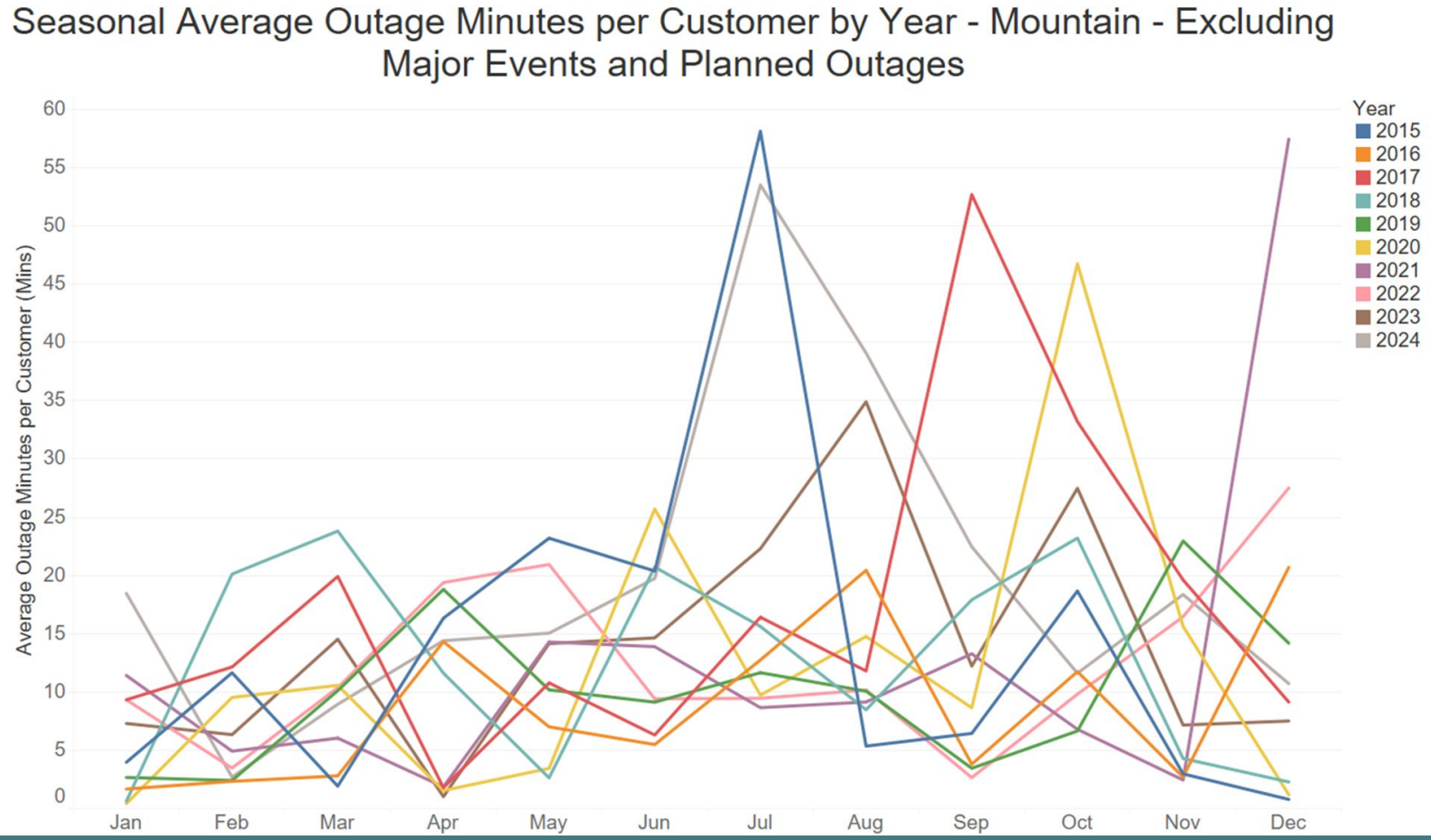
High Plains Seasonal Trend by Year - Excluding Major Events and Planned Outages



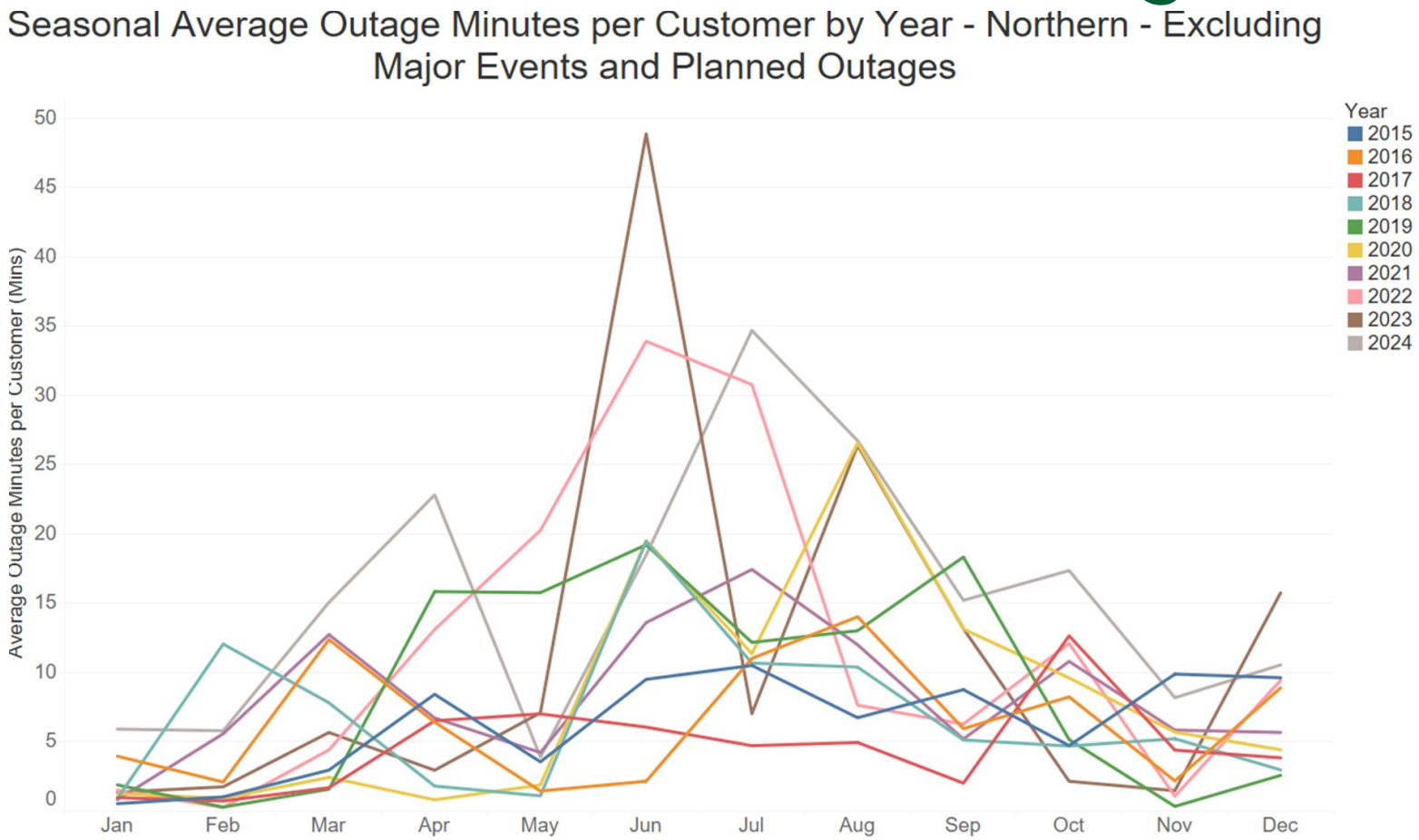
Home Light and Power Seasonal Trend by Year - Excluding Major Events and Planned Outages



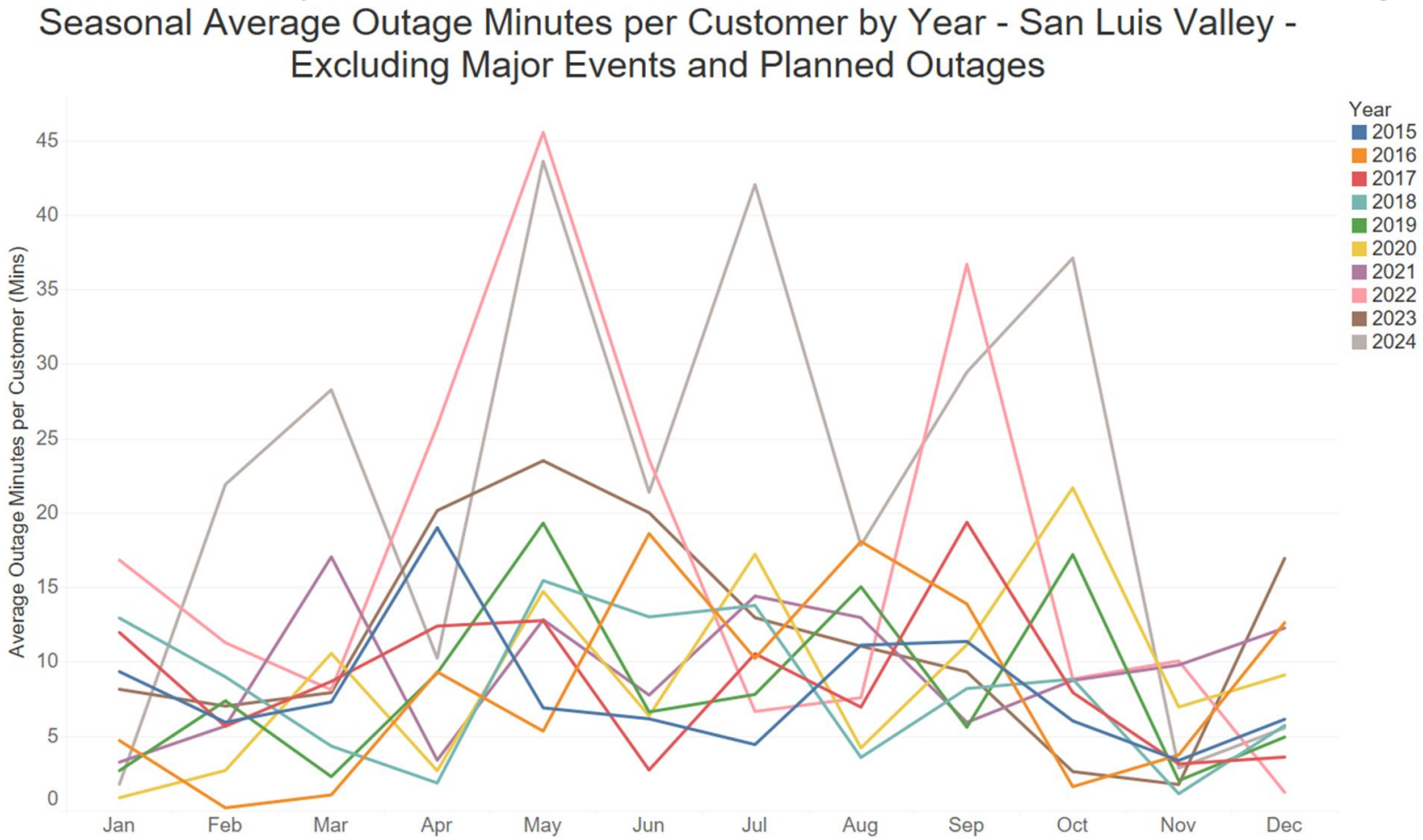
Mountain Seasonal Trend by Year - Excluding Major Events and Planned Outages



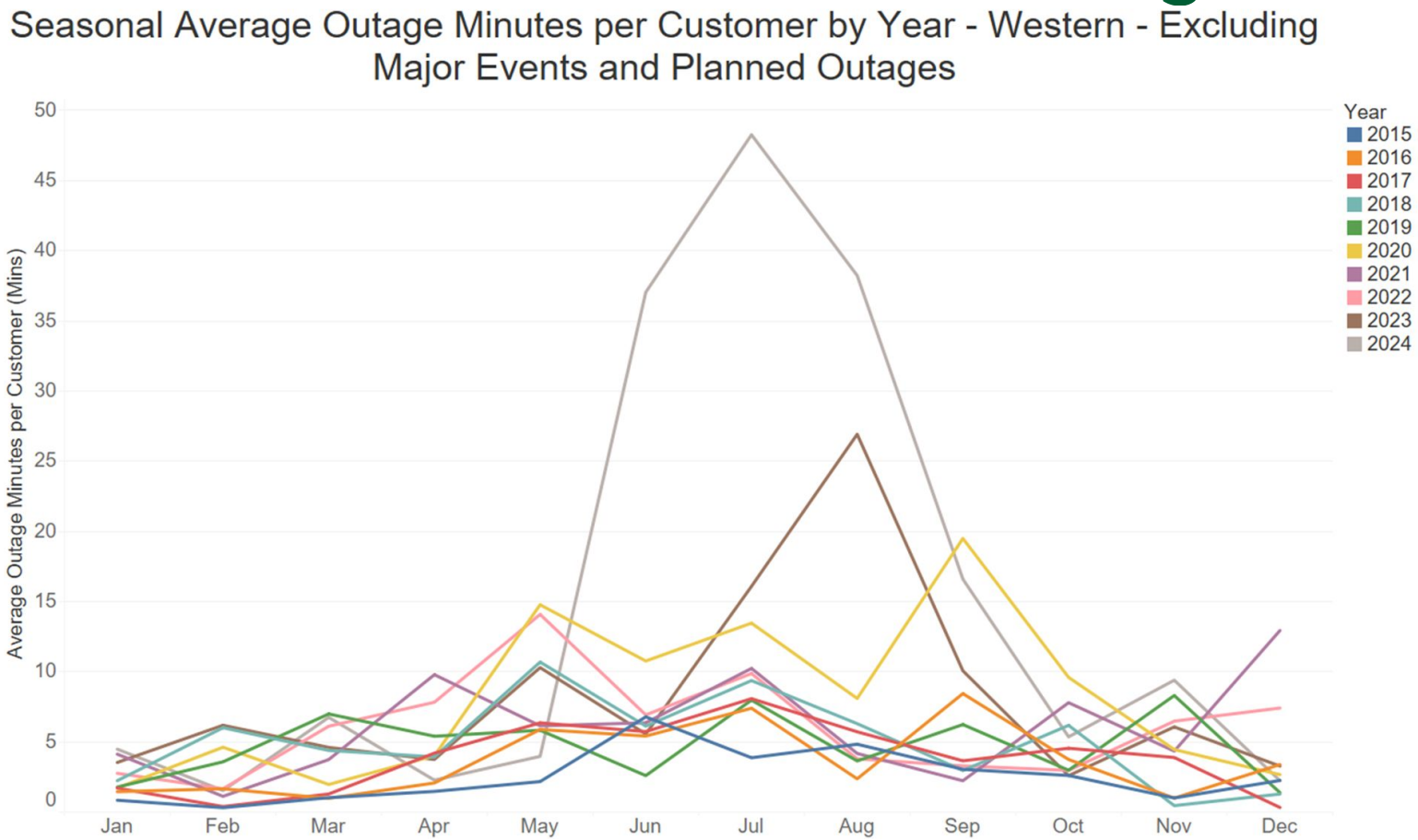
Northern Seasonal Trend by Year - Excluding Major Events and Planned Outages



San Luis Valley Seasonal Trend by Year - Excluding Major Events and Planned Outages



Western Seasonal Trend by Year - Excluding Major Events and Planned Outages



Appendix G: System-wide Outage Causation Categories, with and without Major Events

Whole Service Area: Excluding Major Events

Causation Categories: No Exclusions

	Average Outage Minutes/Customer									
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Transformer Issue	1.0	1.2	1.2	1.6	1.4	1.0	1.8	2.0	2.8	3.8
Conductor Issue	6.2	37.2	14.7	14.0	73.4	15.3	40.4	13.9	10.2	32.0
Unknown	9.6	7.9	7.6	10.4	8.9	8.1	9.3	15.2	11.5	51.6
Animal Contact	3.3	6.8	5.1	5.4	3.8	3.5	4.4	5.7	3.7	4.2
Intentional Clear	0.5	1.0	0.6	1.3	3.2	1.0	1.5	1.9	1.3	3.3
Cable Failure	19.3	17.8	16.6	15.5	16.3	17.6	18.2	23.8	20.5	22.1
Public Damage	12.1	15.8	8.4	12.4	9.0	12.7	19.8	16.4	12.0	11.4
Insulator Issue	1.6	3.5	2.4	0.6	2.5	1.8	0.4	1.8	1.9	2.6
Planned Outage	2.2	2.6	2.2	2.3	3.6	3.2	5.9	5.1	8.3	15.8
Overload	2.1	2.8	1.3	2.7	2.7	1.8	2.4	2.2	1.2	2.0
Pole Issue	3.4	7.5	6.3	8.0	12.2	10.8	11.7	5.5	8.5	10.5
Switch Issue	4.3	4.4	3.8	2.0	7.5	2.1	3.1	3.4	1.6	2.4
Lightning Impact	3.9	5.3	2.5	3.3	5.7	2.7	2.4	2.2	5.5	1.4
Fused Cutout Failure	0.6	1.1	0.6	0.9	1.5	0.6	0.8	1.4	0.7	8.0
Vegetation Initiated	8.0	11.6	17.8	14.2	22.5	34.0	30.6	51.1	7.0	55.7
Debris In Line	1.6	1.9	2.1	2.0	1.9	3.0	1.5	9.7	1.9	9.2
Splice Issue	2.5	3.5	3.5	2.0	2.2	2.3	0.3	0.2	0.1	0.0
Accidental	2.9	1.7	1.9	3.6	1.0	1.6	1.6	1.0	3.3	1.5
Ground Settling	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Road Spray	0.2	0.1	0.2	0.3	0.3	0.5	0.0	0.3	0.4	0.0
Industrial Contamination	0.6	0.0	0.1	0.1	2.3	0.3	0.7	0.8	0.6	0.2
Terminator Failure	2.7	1.9	1.0	2.5	3.2	2.4	2.4	1.6	1.4	1.7
Metering or Assoc Eq Failure	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushing Failure	0.3	0.7	0.4	0.4	0.5	0.4	0.3	0.5	0.5	0.4
Crossarm Issue	0.9	1.6	1.2	1.4	3.1	3.4	3.0	1.5	1.9	4.8
Environmental	3.4	13.2	2.9	1.3	15.5	2.1	3.1	1.0	2.1	0.2
Fuse Link Broken	0.1	0.0	0.1	0.1	2.0	0.2	0.2	0.2	0.0	0.3
Guy Wire Failure	0.0	0.1	0.0	0.0	0.0	0.0	0.6	0.0	0.2	0.1
Improper Install	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.3	0.1
Clear for Fire/Police/Etc.	0.0	0.1	0.3	0.2	0.1	3.5	0.3	0.2	0.2	0.1
Capacitor Bank Failure	0.1	0.2	0.0	0.0	0.2	0.2	0.1	0.2	0.1	0.0
Breaker Failure	0.5	1.5	1.1	1.8	2.3	0.0	2.4	0.4	0.7	0.0
Intentional Clear For PSPS	-	-	-	-	-	-	-	-	-	24.4
Clear for Public Safety	0.0	0.1	0.1	0.3	0.1	0.3	4.4	1.4	0.3	78.9

*A number of minor categories are not shown, they are included in Appendix ???.

Causation Categories: Excluding Major Events

The same categories emerge as in the Top 4 over time, with the exception of “Environmental” and “Clear for Public Safety”

Outage Causation, No Exclusions

Average Outage Minutes/Customer

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Transformer Issue	1.0	1.2	1.2	1.6	1.4	1.0	1.8	2.0	2.8	3.8
Conductor Issue	6.2	37.2	14.7	14.0	73.4	15.3	40.4	13.9	10.2	32.0
Unknown	9.6	7.9	7.6	10.4	8.9	8.1	9.3	15.2	11.5	51.6
Animal Contact	3.3	6.8	5.1	5.4	3.8	3.5	4.4	5.7	3.7	4.2
Intentional Clear	0.5	1.0	0.6	1.3	3.2	1.0	1.5	1.9	1.3	3.3
Cable Failure	19.3	17.8	16.6	15.5	16.3	17.6	18.2	23.8	20.5	22.1
Public Damage	12.1	15.8	8.4	12.4	9.0	12.7	19.8	16.4	12.0	11.4
Insulator Issue	1.6	3.5	2.4	0.6	2.5	1.8	0.4	1.8	1.9	2.6
Planned Outage	2.2	2.6	2.2	2.3	3.6	3.2	5.9	5.1	8.3	15.8
Overload	2.1	2.8	1.3	2.7	2.7	1.8	2.4	2.2	1.2	2.0
Pole Issue	3.4	7.5	6.3	8.0	12.2	10.8	11.7	5.5	8.5	10.5
Switch Issue	4.3	4.4	3.8	2.0	7.5	2.1	3.1	3.4	1.6	2.4
Lightning Impact	3.9	5.3	2.5	3.3	5.7	2.7	2.4	2.2	5.5	1.4
Fused Cutout Failure	0.6	1.1	0.6	0.9	1.5	0.6	0.8	1.4	0.7	8.0
Vegetation Initiated	8.0	11.6	17.8	14.2	22.5	34.0	30.6	51.1	7.0	55.7
Debris In Line	1.6	1.9	2.1	2.0	1.9	3.0	1.5	9.7	1.9	9.2
Splice Issue	2.5	3.5	3.5	2.0	2.2	2.3	0.3	0.2	0.1	0.0
Accidental	2.9	1.7	1.9	3.6	1.0	1.6	1.6	1.0	3.3	1.5
Ground Settling	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Road Spray	0.2	0.1	0.2	0.3	0.3	0.5	0.0	0.3	0.4	0.0
Industrial Contamination	0.6	0.0	0.1	0.1	2.3	0.3	0.7	0.8	0.6	0.2
Terminator Failure	2.7	1.9	1.0	2.5	3.2	2.4	2.4	1.6	1.4	1.7
Metering or Assoc Eq Failure	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushing Failure	0.3	0.7	0.4	0.4	0.5	0.4	0.3	0.5	0.5	0.4
Crossarm Issue	0.9	1.6	1.2	1.4	3.1	3.4	3.0	1.5	1.9	4.8
Environmental	3.4	13.2	2.9	1.3	15.5	2.1	3.1	1.0	2.1	0.2
Fuse Link Broken	0.1	0.0	0.1	0.1	2.0	0.2	0.2	0.2	0.0	0.3
Guy Wire Failure	0.0	0.1	0.0	0.0	0.0	0.0	0.6	0.0	0.2	0.1
Improper Install	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.3	0.1
Clear for Fire/Police/Etc.	0.0	0.1	0.3	0.2	0.1	3.5	0.3	0.2	0.2	0.1
Capacitor Bank Failure	0.1	0.2	0.0	0.0	0.2	0.2	0.1	0.2	0.1	0.0
Breaker Failure	0.5	1.5	1.1	1.8	2.3	0.0	2.4	0.4	0.7	0.0
Intentional Clear For PSPS	-	-	-	-	-	-	-	-	-	24.4
Clear for Public Safety	0.0	0.1	0.1	0.3	0.1	0.3	4.4	1.4	0.3	78.9
Intentional to Clear Pole Fire	0.0	0.0	0.0	-	0.0	0.1	0.1	0.0	0.1	0.1
Recloser Issue	0.5	0.6	0.2	0.1	0.6	0.3	0.7	0.3	0.2	0.8
Relay Failure	1.2	0.7	0.2	0.5	0.6	0.9	3.9	-	0.1	0.3
Other Utility	0.4	0.1	-	0.0	0.0	0.1	0.1	0.2	0.1	0.1
Reactor Failure	0.0	-	-	-	-	-	-	-	-	-
Load Relief	0.6	0.3	0.1	-	-	0.0	0.4	0.0	0.2	0.1
Clear for Xcel Personnel Safety	0.0	0.0	0.0	0.0	0.2	0.3	0.3	0.9	0.9	0.3
Intentional Relieve Overload	0.0	0.0	-	0.0	0.0	-	0.4	-	0.0	-
Intentional Install Squirrel Gd	0.0	0.0	-	0.0	-	0.0	0.0	0.0	0.0	-
Guy Anchor Failure	0.1	-	0.0	0.0	-	-	0.0	0.0	0.0	0.0
Sectionalizer Failure	-	0.0	0.1	-	0.2	0.0	0.0	-	-	0.0
Network Protector Failure	-	0.0	0.6	-	-	-	-	0.0	-	0.0
Voltage Regulator Failure	-	0.4	0.1	0.2	-	0.0	-	0.1	0.1	-
Connector Wrong Size	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
Unselected	-	-	-	-	-	0.0	-	-	-	-
Parallel Fdrs-Fail on other Fdr	-	-	-	-	-	-	-	0.0	-	0.0
Local Catastrophe	-	-	-	-	-	-	-	-	0.0	-

Number of Customers Impacted (includes repeats)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Transformer Issue	0.006	0.005	0.006	0.007	0.006	0.005	0.012	0.011	0.014	0.015
Conductor Issue	0.056	0.151	0.094	0.084	0.182	0.076	0.166	0.077	0.071	0.108
Unknown	0.120	0.123	0.122	0.123	0.097	0.110	0.116	0.177	0.166	0.290
Animal Contact	0.043	0.076	0.057	0.075	0.050	0.042	0.066	0.069	0.044	0.053
Intentional Clear	0.023	0.025	0.009	0.022	0.033	0.013	0.020	0.015	0.017	0.025
Cable Failure	0.186	0.169	0.158	0.136	0.138	0.164	0.188	0.238	0.204	0.196
Public Damage	0.119	0.133	0.108	0.123	0.088	0.133	0.137	0.152	0.123	0.120
Insulator Issue	0.016	0.032	0.018	0.005	0.024	0.017	0.003	0.015	0.019	0.018
Planned Outage	0.018	0.020	0.017	0.020	0.026	0.020	0.031	0.027	0.044	0.074
Overload	0.015	0.018	0.010	0.019	0.018	0.014	0.023	0.014	0.011	0.015
Pole Issue	0.032	0.040	0.042	0.052	0.057	0.048	0.043	0.034	0.041	0.041
Switch Issue	0.045	0.052	0.043	0.023	0.065	0.033	0.034	0.035	0.018	0.025
Lightning Impact	0.036	0.056	0.025	0.040	0.049	0.020	0.026	0.025	0.044	0.020
Fused Cutout Failure	0.005	0.009	0.004	0.005	0.006	0.004	0.006	0.010	0.004	0.015
Vegetation Initiated	0.037	0.053	0.092	0.056	0.067	0.131	0.076	0.120	0.036	0.121
Debris In Line	0.015	0.011	0.016	0.018	0.009	0.022	0.013	0.025	0.017	0.026
Splice Issue	0.039	0.050	0.052	0.032	0.022	0.031	0.006	0.002	0.001	0.000
Accidental	0.054	0.033	0.052	0.070	0.011	0.025	0.031	0.019	0.045	0.030
Ground Settling	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Road Spray	0.001	0.000	0.000	0.002	0.002	0.006	0.000	0.002	0.002	0.000
Industrial Contamination	0.006	0.001	0.001	0.002	0.004	0.004	0.008	0.004	0.004	0.001
Terminator Failure	0.031	0.025	0.012	0.024	0.034	0.030	0.036	0.023	0.017	0.020
Metering or Assoc Eq Failure	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bushing Failure	0.002	0.007	0.002	0.002	0.002	0.004	0.002	0.003	0.002	0.003
Crossarm Issue	0.009	0.008	0.007	0.014	0.016	0.022	0.011	0.008	0.012	0.011
Environmental	0.015	0.061	0.014	0.009	0.021	0.010	0.016	0.005	0.013	0.001
Fuse Link Broken	0.001	0.000	0.001	0.001	0.002	0.003	0.001	0.002	0.000	0.002
Guy Wire Failure	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.002	0.000
Improper Install	0.000	0.000	0.004	0.001	0.000	0.000	0.001	0.000	0.002	0.001
Clear for Fire/Police/Etc.	0.000	0.005	0.002	0.003	0.001	0.004	0.004	0.000	0.001	0.001
Capacitor Bank Failure	0.002	0.005	0.001	0.000	0.003	0.002	0.001	0.002	0.002	0.000
Breaker Failure	0.013	0.024	0.016	0.022	0.026	0.000	0.015	0.007	0.012	0.003
Intentional Clear For PSPS	-	-	-	-	-	-	-	-	-	0.016
Clear for Public Safety	0.000	0.004	0.001	0.006	0.002	0.002	0.016	0.015	0.002	0.394
Intentional to Clear Pole Fire	0.005	0.000	0.000	-	0.000	0.001	0.001	0.000	0.002	0.000
Recloser Issue	0.004	0.003	0.003	0.003	0.009	0.005	0.006	0.001	0.002	0.008
Relay Failure	0.008	0.012	0.013	0.009	0.007	0.019	0.041	-	0.002	0.006
Other Utility	0.004	0.000	-	0.000	0.000	0.001	0.005	0.001	0.001	0.000
Reactor Failure	0.000	-	-	-	-	-	-	-	-	-
Load Relief	0.014	0.003	0.001	-	-	0.000	0.009	0.001	0.002	0.004
Clear for Xcel Personnel Safety	0.000	0.004	0.001	0.002	0.007	0.011	0.006	0.021	0.015	0.008
Intentional Relieve Overload	0.000	0.000	-	0.000	0.000	-	0.005	-	0.000	-
Intentional Install Squirrel Gd	0.000	0.000	-	0.000	-	0.000	0.000	0.000	0.000	-
Guy Anchor Failure	0.001	-	0.000	0.000	-	-	0.000	0.000	0.000	0.000
Sectionalizer Failure	-	0.000	0.001	-	0.001	0.000	0.000	-	-	0.000
Network Protector Failure	-	0.000	0.001	-	-	-	-	0.000	-	0.000
Voltage Regulator Failure	-	0.001	0.001	0.002	-	0.001	-	0.000	0.000	-
Connector Wrong Size	-	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-
Unselected	-	-	-	-	-	0.000	-	-	-	-
Parallel Fdrs-Fail on other Fdr	-	-	-	-	-	-	-	0.001	-	0.000
Local Catastrophe	-	-	-	-	-	-	-	-	0.000	-

Average Duration

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Transformer Issue	166	239	199	237	238	192	146	192	195	248
Conductor Issue	110	246	156	167	404	202	244	180	145	297
Unknown	80	64	63	85	92	73	80	86	69	178
Animal Contact	78	89	90	72	75	85	68	83	83	79
Intentional Clear	21	39	69	60	100	74	74	124	81	134
Cable Failure	104	105	105	114	118	107	97	100	101	113
Public Damage	102	119	78	101	102	96	144	108	97	95
Insulator Issue	100	110	129	110	108	105	107	121	98	149
Planned Outage	125	132	131	114	140	158	189	189	189	212
Overload	139	158	129	140	152	124	102	157	114	130
Pole Issue	105	186	149	155	212	224	274	161	208	256
Switch Issue	95	85	87	90	114	63	92	97	86	95
Lightning Impact	109	93	100	84	115	138	94	87	126	71
Fused Cutout Failure	139	127	140	173	250	162	137	143	177	541
Vegetation Initiated	213	219	194	252	337	260	402	426	191	460
Debris In Line	107	179	130	113	218	134	115	380	107	349
Splice Issue	64	70	67	62	99	73	50	79	136	157
Accidental	54	53	37	51	87	63	51	52	72	50
Ground Settling	375	484	147	191	197	207	128	163	319	127
Road Spray	143	139	504	145	187	83	203	149	181	180
Industrial Contamination	101	24	53	45	571	75	86	209	152	179
Terminator Failure	86	76	78	105	93	82	67	72	83	82
Metering or Assoc Eq Failure	161	149	122	233	197	147	87	202	128	458
Bushing Failure	143	106	160	201	189	97	168	181	204	159
Crossarm Issue	105	199	186	100	193	158	265	202	152	435
Environmental	226	217	207	146	749	216	195	204	158	377
Fuse Link Broken	114	119	70	212	882	88	143	83	138	164
Guy Wire Failure	39	223	90	161	96	171	176	468	97	456
Improper Install	188	92	64	57	123	126	128	131	174	102
Clear for Fire/Police/Etc.	152	18	152	73	116	977	65	691	318	49
Capacitor Bank Failure	62	41	25	56	84	79	82	90	44	73
Breaker Failure	41	64	65	82	87	78	166	54	55	15
Intentional Clear For PSPS	-	-	-	-	-	-	-	-	-	1,559
Clear for Public Safety	52	15	87	50	53	186	273	95	107	200
Intentional to Clear Pole Fire	7	44	21	-	125	90	39	20	52	2,955
Recloser Issue	120	213	81	39	62	61	119	251	93	96
Relay Failure	143	55	12	55	85	48	95	-	22	46
Other Utility	93	1,055	-	36	85	86	19	199	140	214
Reactor Failure	291	-	-	-	-	-	-	-	-	-
Load Relief	41	112	87	-	-	6	44	17	117	24
Clear for Xcel Personnel Safety	124	8	27	8	26	26	44	45	56	33
Intentional Relieve Overload	19	10	-	13	80	-	79	-	43	-
Intentional Install Squirrel Gd	40	20	-	67	-	90	52	176	38	-
Guy Anchor Failure	68	-	39	175	-	-	841	607	180	158
Sectionalizer Failure	-	81	150	-	242	171	60	-	-	103
Network Protector Failure	-	333	538	-	-	-	-	160	-	739
Voltage Regulator Failure	-	482	99	135	-	37	-	185	320	-
Connector Wrong Size	-	99	12	130	260	110	143	-	-	-
Unselected	-	-	-	-	-	131	-	-	-	-
Parallel Fdrs-Fail on other Fdr	-	-	-	-	-	-	-	32	-	362
Local Catastrophe	-	-	-	-	-	-	-	-	232	-

Outage Causation, Excluding Major Events

Average Outage Minutes/Customer

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Transformer Issue	1.0	1.2	1.0	1.5	1.3	1.0	1.3	1.8	2.8	2.8
Conductor Issue	6.1	7.9	5.4	8.4	8.4	6.5	11.6	8.8	6.7	7.7
Unknown	9.4	6.6	6.2	9.7	7.8	7.4	8.1	11.8	10.2	16.8
Animal Contact	3.3	3.7	4.5	5.2	3.7	3.5	4.0	5.7	3.4	3.9
Intentional Clear	0.5	0.9	0.5	1.3	0.7	1.0	1.5	1.6	1.3	2.7
Cable Failure	17.9	17.1	16.4	15.4	16.1	17.2	17.9	23.5	20.5	20.5
Public Damage	9.9	10.3	8.3	9.8	8.7	11.5	13.9	14.6	11.0	11.1
Insulator Issue	1.5	1.4	1.6	0.5	1.7	1.1	0.3	1.6	1.5	2.0
Planned Outage	2.2	2.1	2.2	2.3	3.1	3.2	5.2	5.1	8.0	15.4
Overload	1.7	2.7	1.1	2.6	2.6	1.7	2.2	2.1	1.2	1.7
Pole Issue	3.2	2.0	3.6	6.7	3.7	4.0	3.9	3.9	5.9	3.0
Switch Issue	4.3	3.5	3.3	2.0	4.6	2.0	3.0	3.4	1.5	2.4
Lightning Impact	3.6	3.6	2.5	2.7	4.9	1.4	2.4	2.1	4.7	1.3
Fused Cutout Failure	0.6	0.8	0.5	0.6	0.9	0.6	0.5	0.9	0.7	1.7
Vegetation Initiated	4.3	4.8	7.7	4.6	7.0	9.6	5.7	8.6	5.8	9.2
Debris In Line	1.6	0.8	0.6	1.7	0.6	1.7	1.2	2.9	1.4	1.6
Splice Issue	2.5	3.5	3.1	2.0	2.2	2.3	0.3	0.2	0.1	0.0
Accidental	2.9	1.7	1.9	3.6	1.0	1.6	1.6	0.9	3.3	1.5
Ground Settling	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Road Spray	0.2	0.0	0.0	0.3	0.3	0.5	0.0	0.0	0.0	0.0
Industrial Contamination	0.6	0.0	0.1	0.1	0.2	0.3	0.7	0.3	0.6	0.2
Terminator Failure	2.5	1.8	1.0	2.5	3.2	2.2	2.4	1.6	1.4	1.3
Metering or Assoc Eq Failure	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushing Failure	0.3	0.7	0.4	0.4	0.5	0.4	0.3	0.4	0.5	0.3
Crossarm Issue	0.8	0.9	0.5	1.3	1.2	2.1	0.9	1.3	1.8	1.4
Environmental	1.7	1.6	0.4	1.1	1.1	0.8	1.8	0.1	2.1	0.2
Fuse Link Broken	0.1	0.0	0.1	0.1	0.2	0.2	0.1	0.2	0.0	0.3
Guy Wire Failure	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Improper Install	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.3	0.1
Clear for Fire/Police/Etc.	0.0	0.1	0.2	0.2	0.1	0.5	0.3	0.1	0.0	0.1
Capacitor Bank Failure	0.1	0.2	0.0	0.0	0.2	0.2	0.1	0.2	0.1	0.0
Breaker Failure	0.5	0.9	1.1	1.1	1.1	0.0	0.3	0.1	0.7	0.0
Intentional Clear For PSPS	-	-	-	-	-	-	-	-	-	0.1
Clear for Public Safety	0.0	0.1	0.1	0.0	0.1	0.3	0.1	1.4	0.3	35.8
Intentional to Clear Pole Fire	0.0	0.0	0.0	-	0.0	0.1	0.1	-	0.1	0.0
Recloser Issue	0.5	0.2	0.2	0.1	0.6	0.3	0.6	0.2	0.2	0.8
Relay Failure	0.3	0.7	0.2	0.5	0.2	0.9	0.4	-	0.1	0.3
Other Utility	-	-	-	0.0	0.0	0.1	0.1	0.2	0.1	0.1
Reactor Failure	0.0	-	-	-	-	-	-	-	-	-
Load Relief	0.6	0.2	-	-	-	0.0	0.4	0.0	0.2	0.1
Clear for Xcel Personnel Safety	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.8	0.8	0.2
Intentional Relieve Overload	0.0	0.0	-	0.0	0.0	-	0.4	-	0.0	-
Intentional Install Squirrel Gd	0.0	0.0	-	0.0	-	0.0	0.0	0.0	0.0	-
Guy Anchor Failure	0.1	-	0.0	0.0	-	-	0.0	0.0	0.0	0.0
Sectionalizer Failure	-	0.0	0.1	-	0.2	-	0.0	-	-	0.0
Network Protector Failure	-	0.0	0.6	-	-	-	-	0.0	-	0.0
Voltage Regulator Failure	-	0.4	0.1	0.2	-	0.0	-	0.1	0.1	-
Connector Wrong Size	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-
Unselected	-	-	-	-	-	0.0	-	-	-	-
Parallel Fdrs-Fail on other Fdr	-	-	-	-	-	-	-	0.0	-	0.0
Local Catastrophe	-	-	-	-	-	-	-	-	0.0	-

Number of Customers Impacted (includes repeats)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Transformer Issue	0.006	0.005	0.006	0.007	0.006	0.005	0.007	0.010	0.014	0.014
Conductor Issue	0.056	0.057	0.057	0.066	0.074	0.051	0.111	0.064	0.052	0.053
Unknown	0.118	0.115	0.113	0.120	0.088	0.097	0.092	0.141	0.157	0.214
Animal Contact	0.043	0.053	0.052	0.074	0.050	0.041	0.061	0.069	0.041	0.050
Intentional Clear	0.023	0.022	0.009	0.021	0.010	0.013	0.020	0.015	0.017	0.024
Cable Failure	0.176	0.168	0.158	0.136	0.137	0.163	0.185	0.237	0.204	0.188
Public Damage	0.115	0.112	0.106	0.119	0.085	0.123	0.128	0.145	0.118	0.120
Insulator Issue	0.015	0.019	0.015	0.005	0.020	0.012	0.003	0.014	0.013	0.016
Planned Outage	0.018	0.018	0.017	0.020	0.021	0.020	0.026	0.027	0.043	0.073
Overload	0.014	0.018	0.008	0.019	0.017	0.014	0.022	0.014	0.011	0.012
Pole Issue	0.031	0.022	0.030	0.046	0.038	0.035	0.026	0.030	0.036	0.031
Switch Issue	0.045	0.050	0.039	0.022	0.059	0.033	0.033	0.035	0.017	0.025
Lightning Impact	0.034	0.047	0.025	0.035	0.046	0.015	0.026	0.024	0.037	0.017
Fused Cutout Failure	0.004	0.008	0.004	0.005	0.005	0.004	0.005	0.009	0.004	0.011
Vegetation Initiated	0.028	0.034	0.054	0.033	0.041	0.062	0.036	0.055	0.033	0.052
Debris In Line	0.015	0.008	0.009	0.017	0.005	0.017	0.012	0.018	0.014	0.015
Splice Issue	0.039	0.050	0.047	0.032	0.022	0.031	0.006	0.002	0.001	0.000
Accidental	0.054	0.033	0.052	0.070	0.011	0.025	0.031	0.016	0.045	0.030
Ground Settling	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Road Spray	0.001	0.000	0.000	0.002	0.001	0.006	0.000	0.000	0.000	0.000
Industrial Contamination	0.006	0.001	0.001	0.002	0.002	0.003	0.008	0.002	0.004	0.001
Terminator Failure	0.029	0.024	0.012	0.024	0.034	0.028	0.036	0.023	0.017	0.017
Metering or Assoc Eq Failure	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bushing Failure	0.002	0.007	0.002	0.002	0.002	0.004	0.002	0.003	0.002	0.002
Crossarm Issue	0.008	0.007	0.004	0.014	0.014	0.016	0.010	0.007	0.012	0.009
Environmental	0.009	0.011	0.004	0.007	0.007	0.009	0.014	0.000	0.013	0.001
Fuse Link Broken	0.001	0.000	0.001	0.000	0.001	0.003	0.001	0.002	0.000	0.002
Guy Wire Failure	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Improper Install	0.000	0.000	0.004	0.001	0.000	0.000	0.001	0.000	0.002	0.001
Clear for Fire/Police/Etc.	0.000	0.005	0.002	0.003	0.001	0.002	0.004	0.000	0.000	0.001
Capacitor Bank Failure	0.002	0.005	0.001	0.000	0.003	0.002	0.001	0.002	0.002	0.000
Breaker Failure	0.013	0.017	0.016	0.019	0.012	0.000	0.010	0.004	0.012	0.003
Intentional Clear For PSPS	-	-	-	-	-	-	-	-	-	0.001
Clear for Public Safety	0.000	0.004	0.001	0.002	0.002	0.002	0.003	0.015	0.002	0.337
Intentional to Clear Pole Fire	0.005	0.000	0.000	-	0.000	0.001	0.001	-	0.002	0.000
Recloser Issue	0.004	0.001	0.003	0.003	0.009	0.005	0.004	0.001	0.002	0.008
Relay Failure	0.004	0.012	0.013	0.009	0.004	0.019	0.006	-	0.002	0.006
Other Utility	-	-	-	0.000	0.000	0.001	0.005	0.001	0.001	0.000
Reactor Failure	0.000	-	-	-	-	-	-	-	-	-
Load Relief	0.014	0.002	-	-	-	0.000	0.009	0.001	0.002	0.004
Clear for Xcel Personnel Safety	0.000	0.004	0.001	0.002	0.006	0.011	0.006	0.021	0.015	0.005
Intentional Relieve Overload	0.000	0.000	-	0.000	0.000	-	0.005	-	0.000	-
Intentional Install Squirrel Gd	0.000	0.000	-	0.000	-	0.000	0.000	0.000	0.000	-
Guy Anchor Failure	0.001	-	0.000	0.000	-	-	0.000	0.000	0.000	0.000
Sectionalizer Failure	-	0.000	0.001	-	0.001	-	0.000	-	-	0.000
Network Protector Failure	-	0.000	0.001	-	-	-	-	0.000	-	0.000
Voltage Regulator Failure	-	0.001	0.001	0.002	-	0.001	-	0.000	0.000	-
Connector Wrong Size	-	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-
Unselected	-	-	-	-	-	0.000	-	-	-	-
Parallel Fdrs-Fail on other Fdr	-	-	-	-	-	-	-	0.001	-	0.000
Local Catastrophe	-	-	-	-	-	-	-	-	0.000	-

Average Duration

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Transformer Issue	167	232	183	227	226	182	186	178	195	199
Conductor Issue	109	138	96	127	113	128	104	136	129	146
Unknown	79	57	55	81	88	76	89	84	65	75
Animal Contact	77	70	87	70	75	84	67	82	82	77
Intentional Clear	21	41	54	60	70	72	74	109	79	114
Cable Failure	102	102	104	113	117	105	97	99	100	109
Public Damage	86	92	78	82	102	94	109	101	94	93
Insulator Issue	97	72	110	107	81	90	96	112	118	120
Planned Outage	125	121	131	114	149	158	198	189	188	209
Overload	127	153	140	137	151	118	99	153	114	141
Pole Issue	104	92	119	146	98	114	150	132	162	95
Switch Issue	95	71	82	89	78	61	91	97	89	95
Lightning Impact	107	77	99	78	108	94	93	87	126	76
Fused Cutout Failure	145	96	136	143	173	160	100	109	172	155
Vegetation Initiated	153	142	143	138	171	155	158	157	174	176
Debris In Line	107	101	68	98	127	102	98	156	100	104
Splice Issue	64	70	65	62	99	73	50	79	136	157
Accidental	54	53	37	51	87	63	51	59	72	50
Ground Settling	375	171	147	191	197	207	128	163	304	127
Road Spray	143	110	276	145	187	83	201	241	165	203
Industrial Contamination	101	24	53	45	151	76	86	206	152	212
Terminator Failure	88	74	78	105	93	79	66	72	83	75
Metering or Assoc Eq Failure	157	149	122	233	197	147	87	174	93	458
Bushing Failure	143	98	160	202	189	97	168	129	264	145
Crossarm Issue	105	125	116	93	87	132	92	174	153	159
Environmental	193	144	95	150	165	92	131	256	157	373
Fuse Link Broken	111	118	69	205	165	88	103	83	138	164
Guy Wire Failure	39	126	90	161	96	58	74	468	178	143
Improper Install	184	92	64	57	123	126	128	131	174	97
Clear for Fire/Police/Etc.	152	18	110	73	116	210	65	247	109	49
Capacitor Bank Failure	62	41	25	56	84	79	82	90	44	73
Breaker Failure	41	53	65	59	96	78	27	30	55	15
Intentional Clear For PSPS	-	-	-	-	-	-	-	-	-	80
Clear for Public Safety	52	15	90	18	53	186	50	95	107	106
Intentional to Clear Pole Fire	7	44	21	-	125	90	39	-	52	39
Recloser Issue	120	158	76	39	61	61	127	169	93	96
Relay Failure	61	55	12	55	66	48	68	-	22	46
Other Utility	-	-	-	36	85	86	19	199	140	214
Reactor Failure	291	-	-	-	-	-	-	-	-	-
Load Relief	41	117	-	-	-	6	44	17	117	24
Clear for Xcel Personnel Safety	124	8	27	8	22	26	45	41	53	37
Intentional Relieve Overload	19	10	-	13	80	-	79	-	43	-
Intentional Install Squirrel Gd	40	20	-	67	-	90	52	176	38	-
Guy Anchor Failure	68	-	39	175	-	-	841	607	180	158
Sectionalizer Failure	-	81	164	-	242	-	60	-	-	103
Network Protector Failure	-	333	538	-	-	-	-	160	-	739
Voltage Regulator Failure	-	482	99	135	-	37	-	185	320	-
Connector Wrong Size	-	99	12	130	260	110	143	-	-	-
Unselected	-	-	-	-	-	131	-	-	-	-
Parallel Fdrs-Fail on other Fdr	-	-	-	-	-	-	-	32	-	362
Local Catastrophe	-	-	-	-	-	-	-	-	237	-

Appendix H: Outage Cause Categories List

- We grouped the 169 outage cause categories from the Company's outage log into the 51 categories in the table below

Remapped Cause Categories		
Accidental	Guy Anchor Failure	Planned Outage
Animal Contact	Guy Wire Failure	Pole Issue
Breaker Failure	Improper Install	Public Damage
Bushing Failure	Industrial Contamination	Public Safety Power Shutoff
Cable Failure	Insulator Issue	Reactor Failure
Capacitor Bank Failure	Intentional Clear	Recloser Issue
Clear for Fire/Police/Etc.	Intentional Install Squirrel Gd	Relay Failure
Clear for Public Safety	Intentional Relieve Overload	Road Spray
Clear for Xcel Personnel Safety	Intentional to Clear Pole Fire	Sectionalizer Failure
Conductor Issue	Lightning Impact	Splice Issue
Connector Wrong Size	Load Relief	Switch Issue
Crossarm Issue	Local Catastrophe	Terminator Failure
Debris In Line	Metering or Assoc Eq Failure	Transformer Issue
Environmental	Network Protector Failure	Unknown
Fuse Link Broken	Other Utility	Unselected
Fused Cutout Failure	Overload	Vegetation Initiated
Ground Settling	Parallel Fdrs-Fail on other Fdr	Voltage Regulator Failure

Categorized Causes

Cause Category	Cause
Accidental	Accidental Coordination Error
	Accidental Dig In Bad Locate
	Accidental Dig In by Xcel
	Accidental Dig In by Xcel Elec
	Accidental Dig In by Xcel Gas
	Accidental Maint Err Field Ops
	Accidental OH Line Contact Xcel
	Accidental Process/Design Flaw
	Accidental Protection Misop
	Accidental Switch Error by Xcel
	Accidental Tree Trim by Xcel
	Accidental Under Investigation
Animal Contact	Animal Contact OH Switch
	Animal Contact OH Transformer
	Animal Contact Other
	Animal Contact Terminal Pole
	Animal Contact UG Equipment
Breaker Failure	Breaker Fail Vacuum Circuit Bkr
	Breaker Failure Air Circuit Bkr
	Breaker Failure Gas Circuit Bkr
	Breaker Failure Oil Circuit Bkr
Bushing Failure	Bushing Failure Dist Transf
	Bushing Failure Sub Transf
Cable Failure	Cable Failure Pri Jacketed
	Cable Failure Pri Unjacketed
	Cable Failure Primary LC
	Cable Failure Primary Overloaded
	Cable Failure Primary P&L
	Cable Failure Secondary Cable
	Cable Pri UG Under Investigation
	Cable Sec UG Under Investigation

Cause Category	Cause
Capacitor Bank Failure	Capacitor Bank Failure OH
	Capacitor Bank Failure Pad
Clear for Fire/Police/Etc.	Clear for Fire/Police/Etc.
Clear for Public Safety	Clear for Public Safety
Clear for Xcel Personnel Safety	Clear for Xcel Personnel Safety
Conductor Issue	Conductor Contact - Floating
	Conductor Contact - Galloping
	Conductor Contact - Poor Sag
	Conductor Fatigue Aluminum
	Conductor Fatigue Copper
	Connector Failure Auto Splice
	Connector Failure Bolted
	Connector Failure Compr Sleeve
	Connector Failure Crimped
	Connector Failure HL Clamp
	Connector Failure Other
	Connector Failure Set Screw Type
	Connector Failure Shoot On
	Connector Failure Spade
	Connector Failure Stirrup
	Connector Wrong Size
	Crossarm Arm Broken
	Crossarm Brace Broken
Debris In Line	Debris In Line
Environmental	Environment Avalanche
	Environment Flooding
	Environment Forest Fire
	Environment Grass Fire
	Environment Ice Falling
	Environment Landslide
Fuse Link Broken	Fuse Link Broken

Cause Category	Cause
Fused Cutout Failure	Fused Cutout Failure
Ground Settling	Ground Settling Pri Equipment
	Ground Settling Sec Equipment
Guy Anchor Failure	Guy Anchor Failure
Guy Wire Failure	Guy Wire Failure
Improper Install	Improper Install Bushing
	Improper Install Connector
	Improper Install Elbow Term
	Improper Install Other
	Improper Install Overhead SW
	Improper Install Pothead
	Improper Install Pri Cable
	Improper Install Sec Cable
	Improper Install UG Sec Splice
Industrial Contamination	Ind Contam P-Fire Arrestor Track
	Ind Contam P-Fire Insulator Trck
	Ind Contam Pole Fire
	Ind Contam Pole Fire Term Track
	Ind Contam Pole Fire Unknown Eq
	Ind Contam SW Gear Flash Over
Insulator Issue	Insulator Flash
	Insulator Glass/Porc Deadend
	Insulator Glass/Porc Line
	Insulator Polymer Deadend
	Insulator Polymer Line
Intentional Clear	Intentional Clear for Construct
	Intentional Clear for Trbl/Emer
Intentional Install Squirrel Gd	Intentional Install Squirrel Gd
Intentional Relieve Overload	Intentional Relieve Overload
Intentional to Clear Pole Fire	Intentional to Clear Pole Fire

Categorized Causes Continued

Cause Category	Cause
Lightning Impact	Lightning Arrester Elbow
	Lightning Arrester Polymer
	Lightning Arrester Porcelain
	Lightning Arrester Switch Gear
	Lightning Arrester Transmission
	Lightning Strike
Load Relief	Load Relief for Dist Equip
	Load Relief for Dist Sub Eq
	Load Relief for Trans Lines
	Load Relief for Trans Sub Eq
Local Catastrophe	Local Catastrophe
Metering or Assoc Eq Failure	Metering or Assoc Eq Failure
Network Protector Failure	Network Protector Failure
Other Utility	Other Utility
Overload	Overload Recloser/Sectionalizer
	Overloaded Fuse
	Overloaded Transformer
Parallel Fdrs-Fail on other Fdr	Parallel Fdrs-Fail on other Fdr
Planned Outage	Properly Planned Const Outage
	Properly Planned Tr Trim Outage
	Xcel Planned Construction Outage
	Xcel Planned Tree Trim Outage
Pole Issue	Pole Broken / Good condition
	Pole Fire
	Pole Rotten
	Pole Steel Tower
Public Safety Power Shutoff (PSPS)	Intentional Clear For PSPS

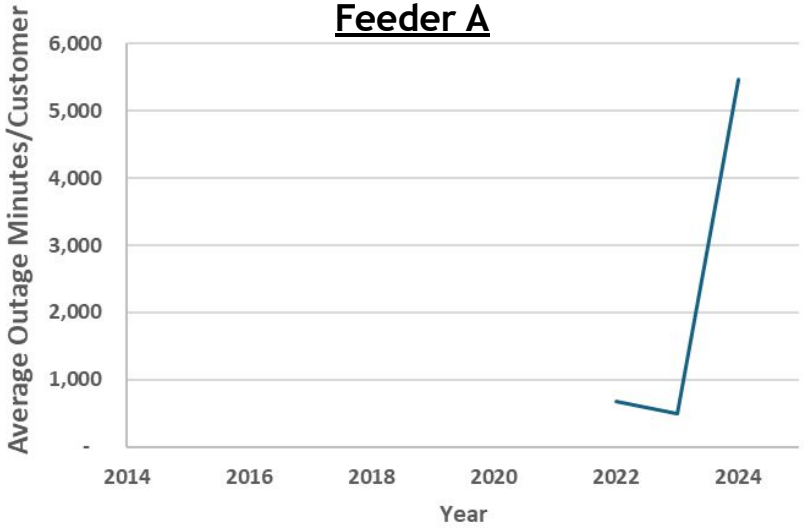
Cause Category	Cause
Public Damage	Public Damage Broken Pole
	Public Damage Deliberate/Vandal
	Public Damage Dig-In
	Public Damage Fire
	Public Damage Guy Wire Broken
	Public Damage Non-Xcel Tree Trim
	Public Damage OH Line Contact
	Public Damage Other/Unknown
	Public Damage Padmnt vs Vehic
Reactor Failure	Reactor Failure
Recloser Issue	Recloser Bushing Failure
	Recloser Electronic Battery Fail
	Recloser Fail to Close & Latch
	Recloser Failure to Open
Relay Failure	Relay Failure
Road Spray	Rd Spray OH SW Flash Over
	Rd Spray P-Fire Arrestor Track
	Rd Spray P-Fire Insulator Track
	Rd Spray Pole Fire
	Rd Spray Pole Fire Term Track
	Rd Spray Pole Fire Unknown Eq
	Rd Spray SW Gear Flash Over
Sectionalizer Failure	Sectionalizer Failure
Splice Issue	Splice UG Primary Cold Shrink
	Splice UG Primary Hand Taped
	Splice UG Primary Heat Shrink
	Splice UG Primary Other
	Splice UG Primary Paper & Lead
	Splice UG Primary Premolded
	UG Secondary Splice

Cause Category	Cause
Switch Issue	Switch OH Gang Operated
	Switch OH Motor Op/Auto
	Switch OH Single Blade Disc
	Switch UG or Load Center
Terminator Failure	Terminator Failure Elbow
	Terminator Failure PH P&L
	Terminator Failure PH Polymer
	Terminator Failure PH Porcelain
	Terminator Failure Pole
	Terminator Failure SWG
Transformer Issue	Transformer Dist CSP
	Transformer Dist Non-CSP
	Transformer Sub LTC
	Transformer Sub Non-LTC
Unknown	Unknown Cause Not Determined
	Unknown Cause Under Invest
Unselected	Unselected
Vegetation Initiated	Veg Tree Inside Maint Corridor
	Veg Tree Outside Main Corridor
Voltage Regulator Failure	Voltage Regulator Failure

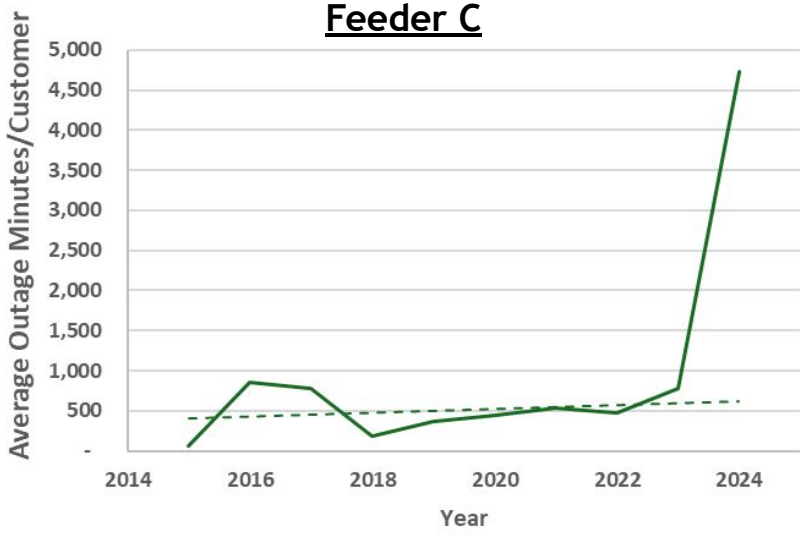
Appendix I: 15 Worst Feeders 10-year trend, Outage Minutes per Customer - No Exclusions

Solid Line = Feeder outage data, Dashed line = 2025-2023 Trendline

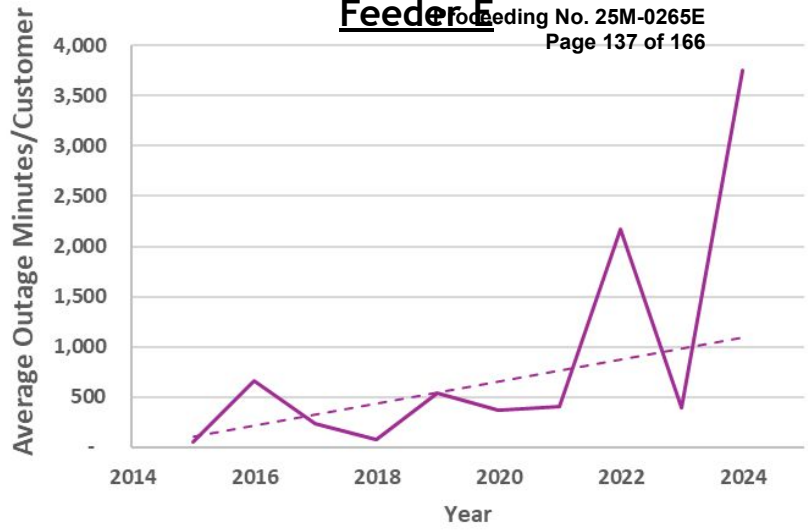
Feeder A



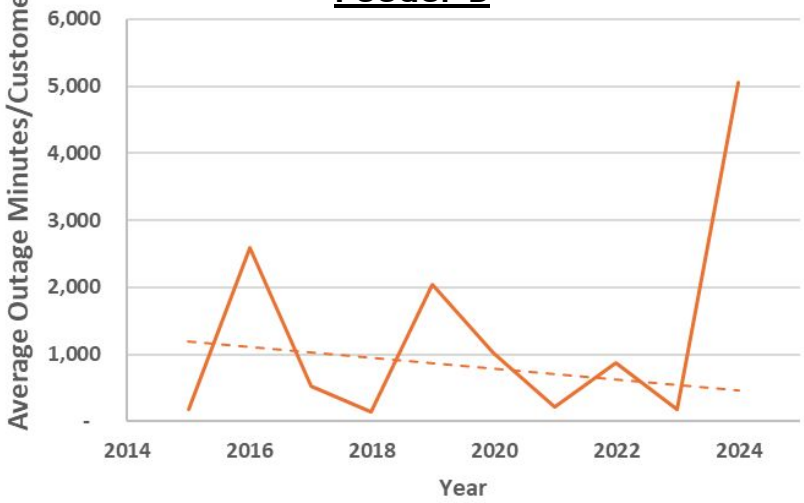
Feeder C



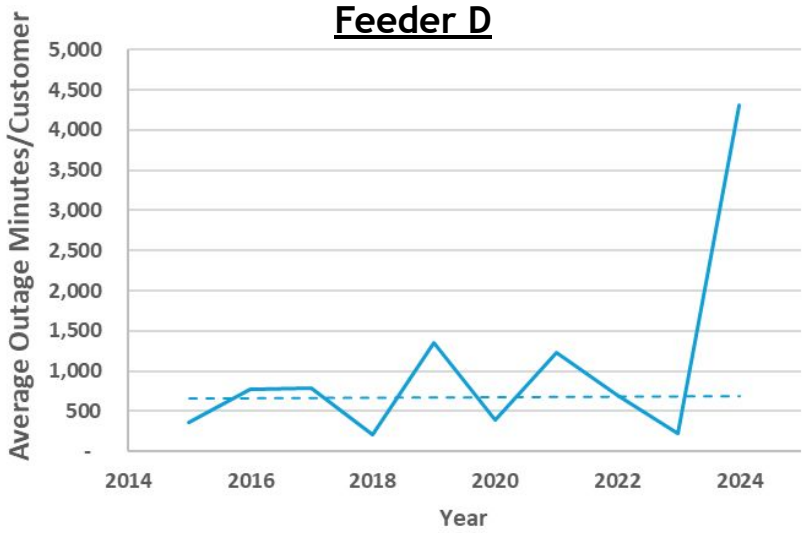
Feeder E



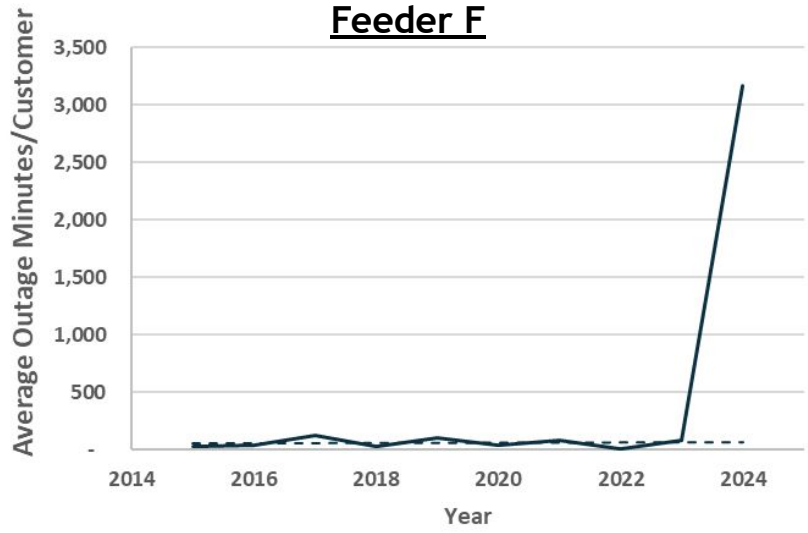
Feeder B



Feeder D

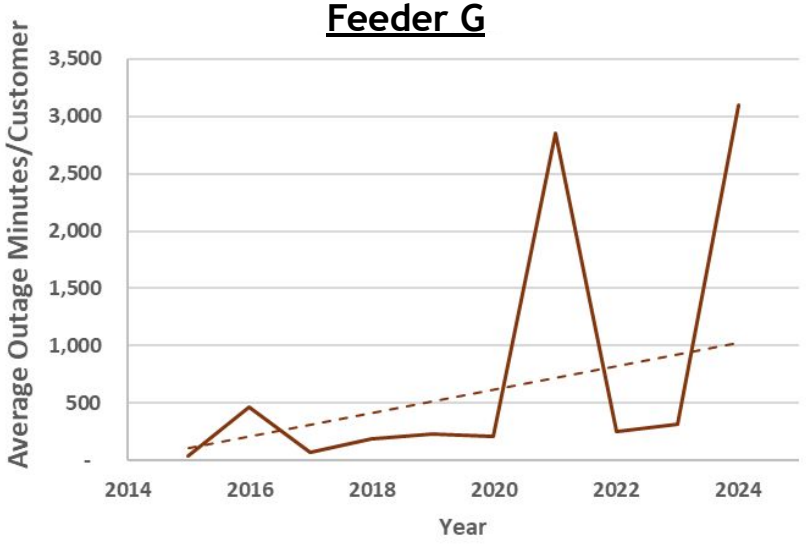


Feeder F

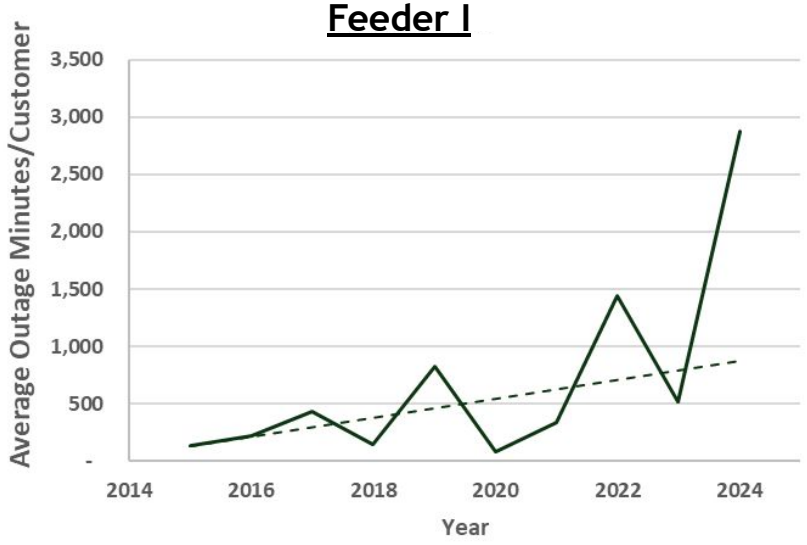


Solid Line = Feeder outage data, Dashed line = 2025-2023 Trendline

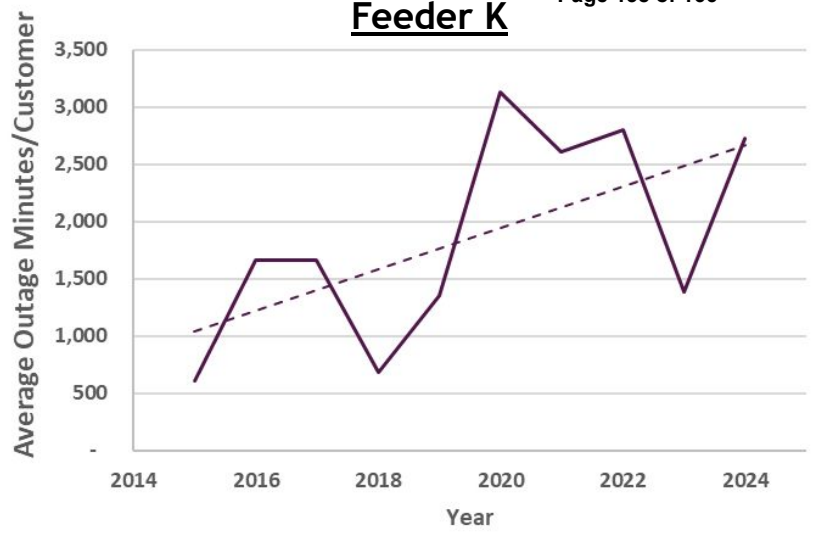
Feeder G



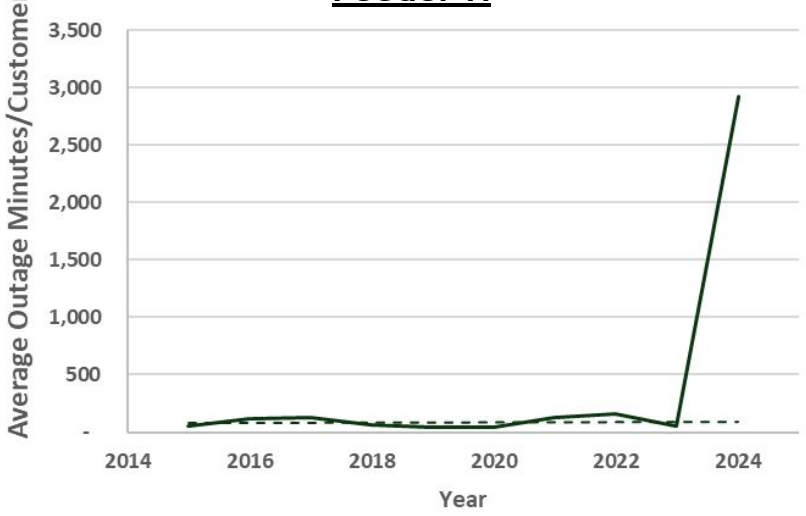
Feeder I



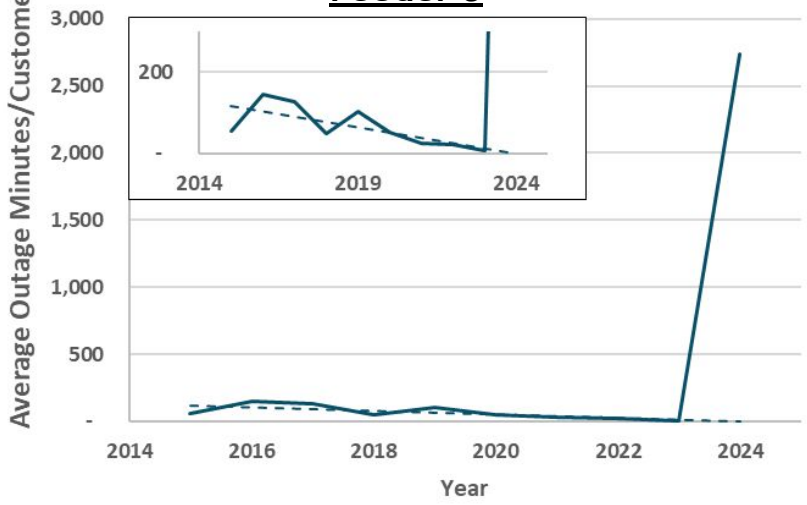
Feeder K



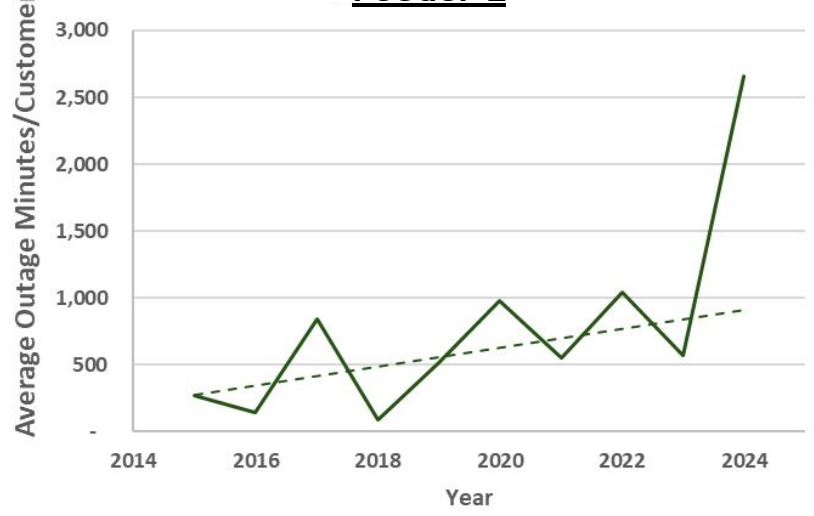
Feeder H



Feeder J

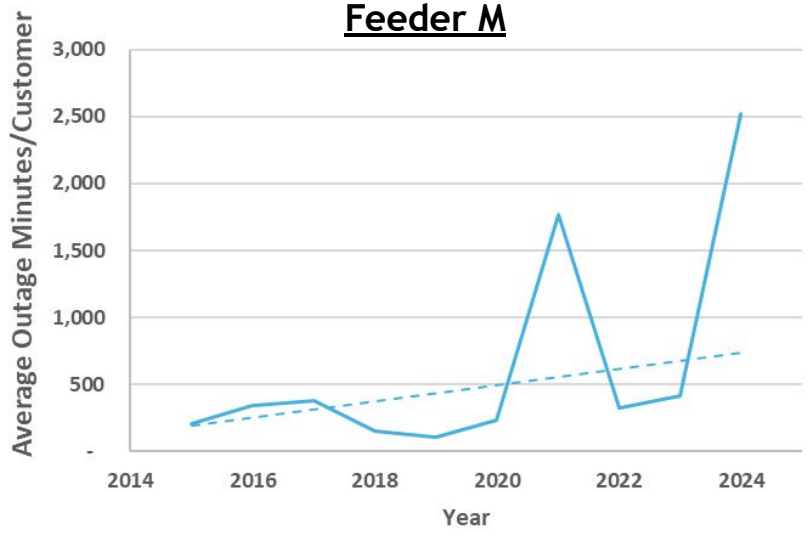


Feeder L

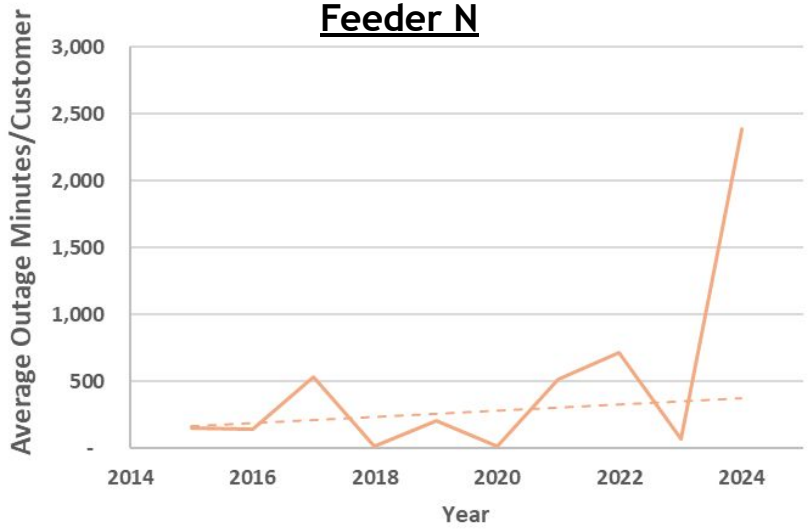


Solid Line = Feeder outage data, Dashed line = 2025-2023 Trendline

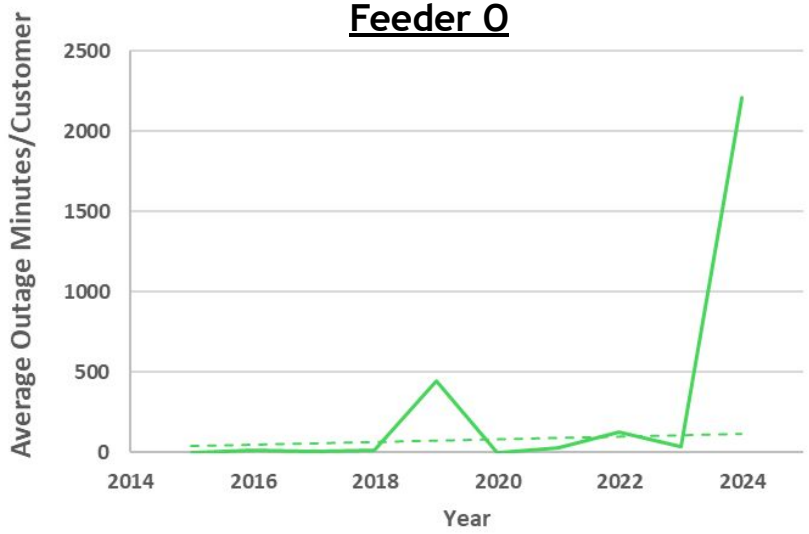
Feeder M



Feeder N



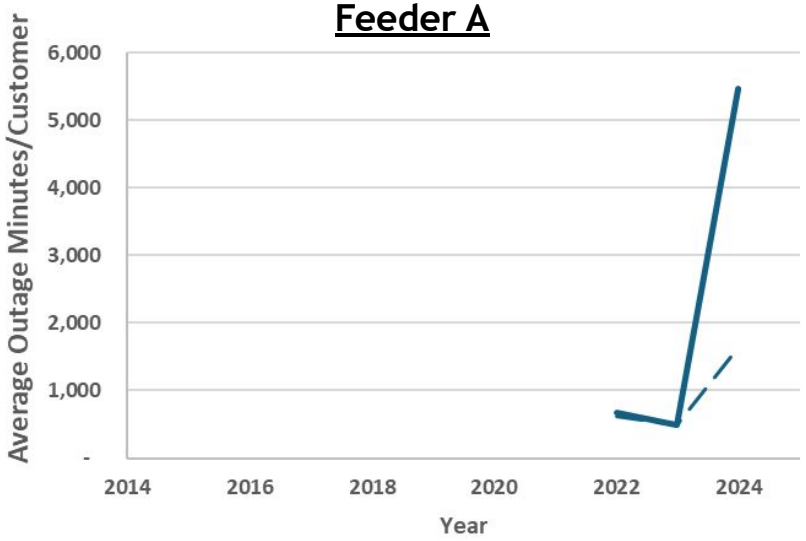
Feeder O



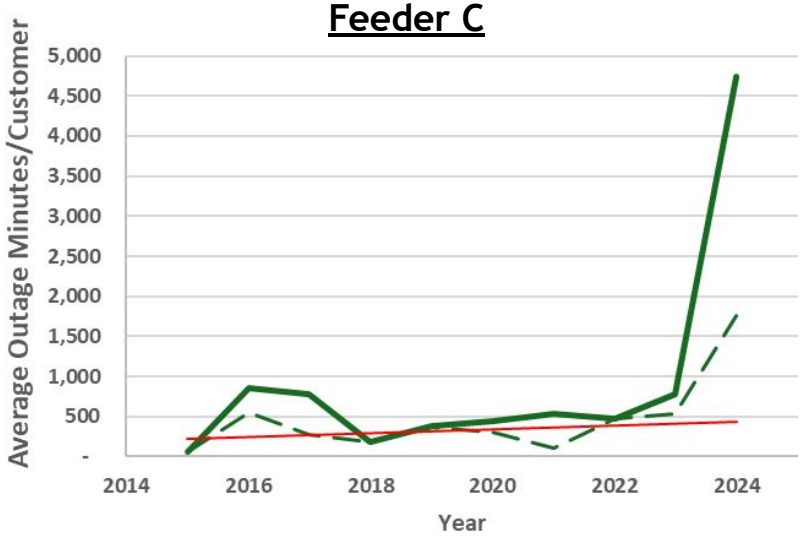
Appendix J: 15 Worst Feeders 10-year trend, Outage Minutes per Customer - Comparisons with and without Major Events

Solid Line = Feeder outage data, Dashed line = Excluding Major Events, Red line = 2015-2023 Trend (Excluding ME)

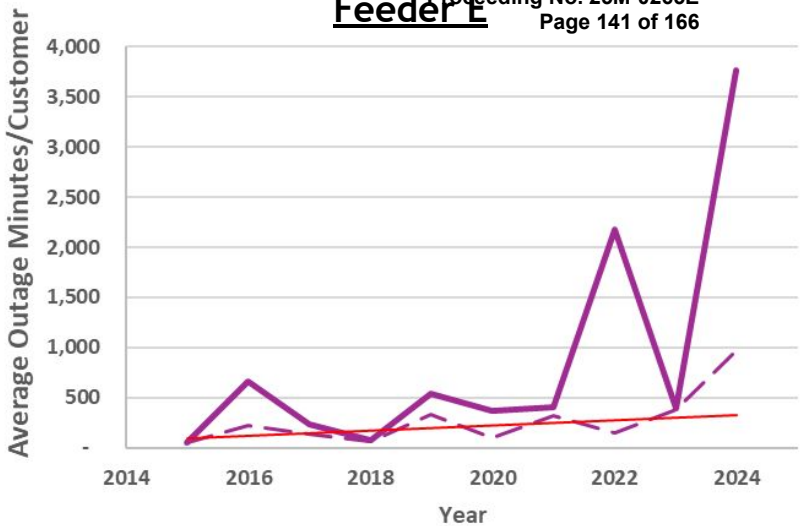
Feeder A



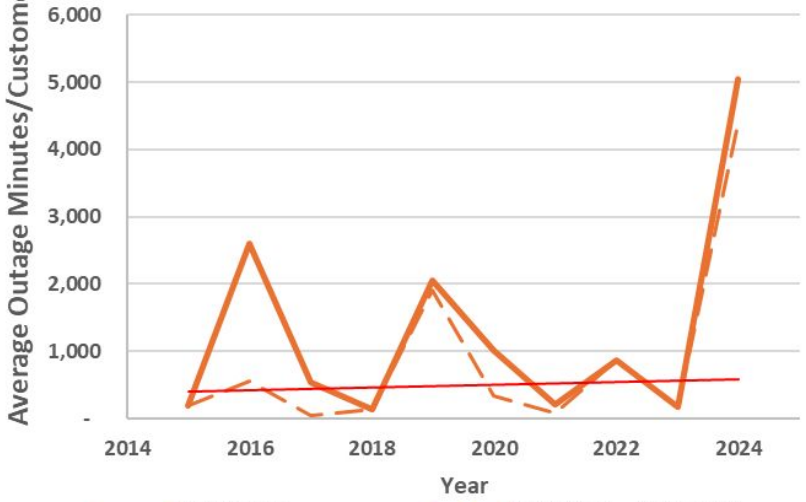
Feeder C



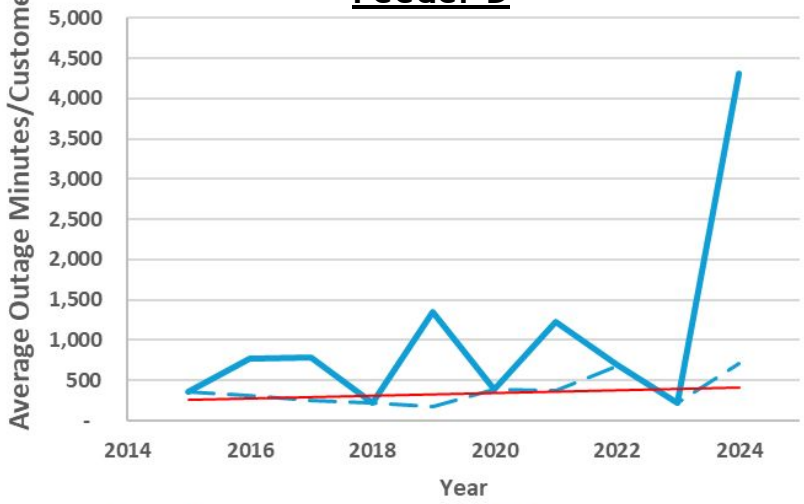
Feeder E



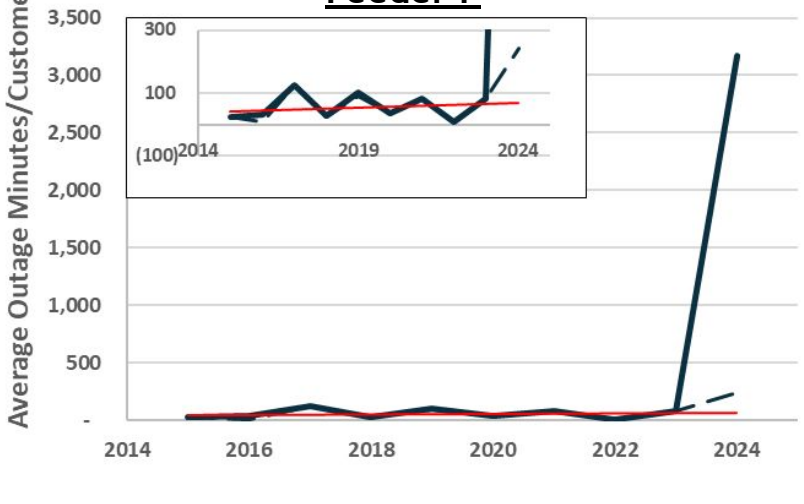
Feeder B



Feeder D

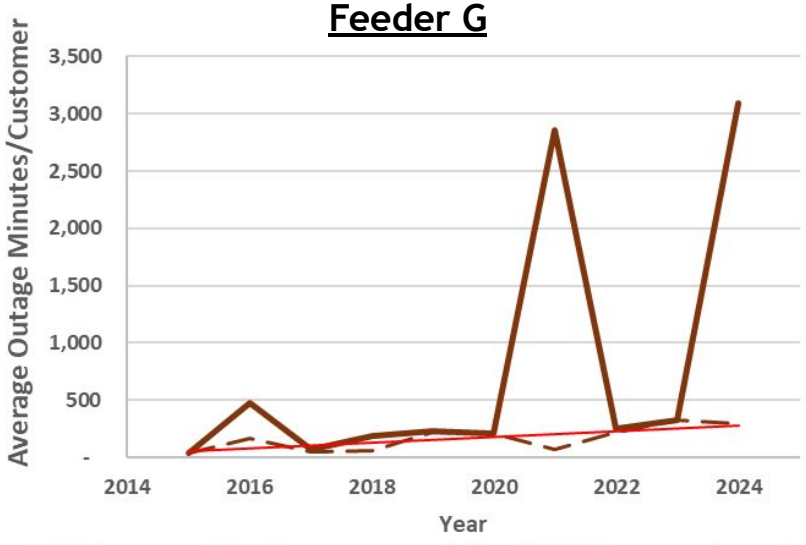


Feeder F

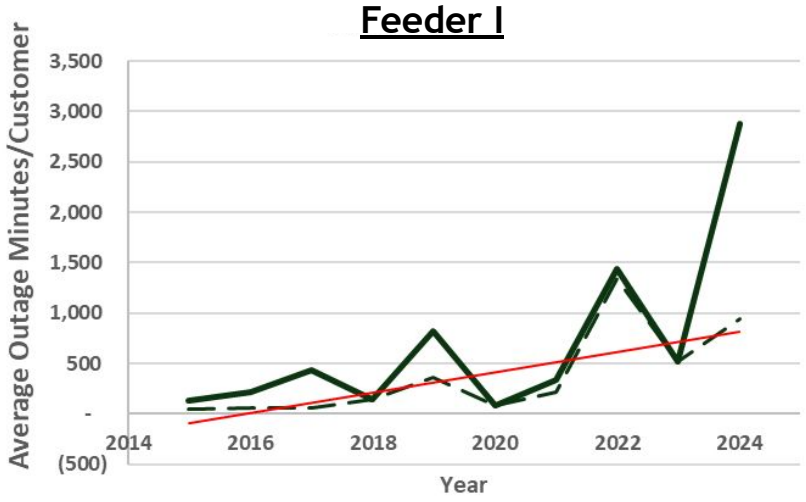


Solid Line = Feeder outage data, Dashed line = Excluding Major Events, Red line = 2015-2023 Trend (Excluding ME)

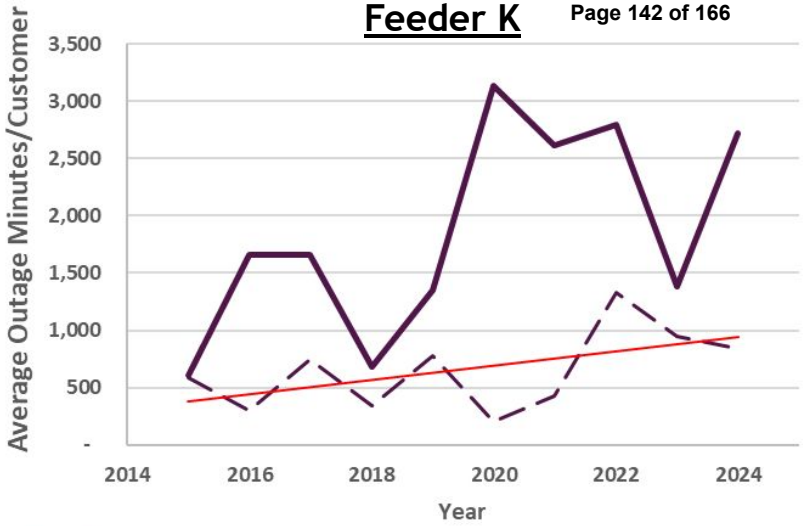
Feeder G



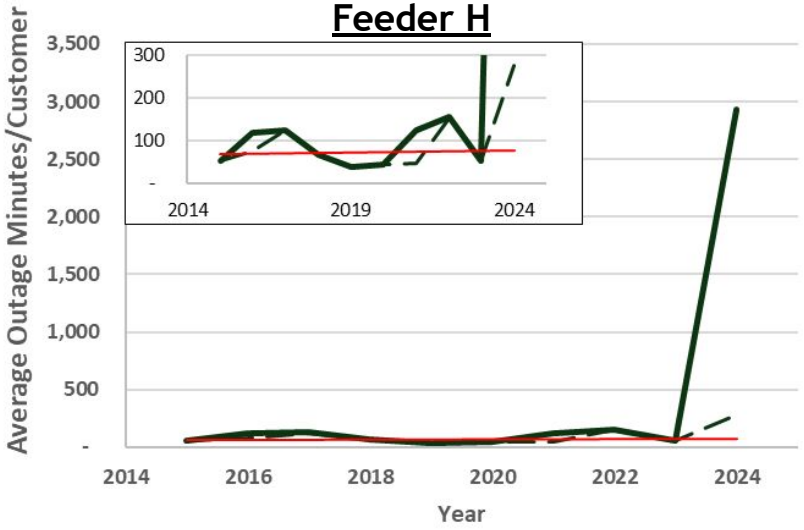
Feeder I



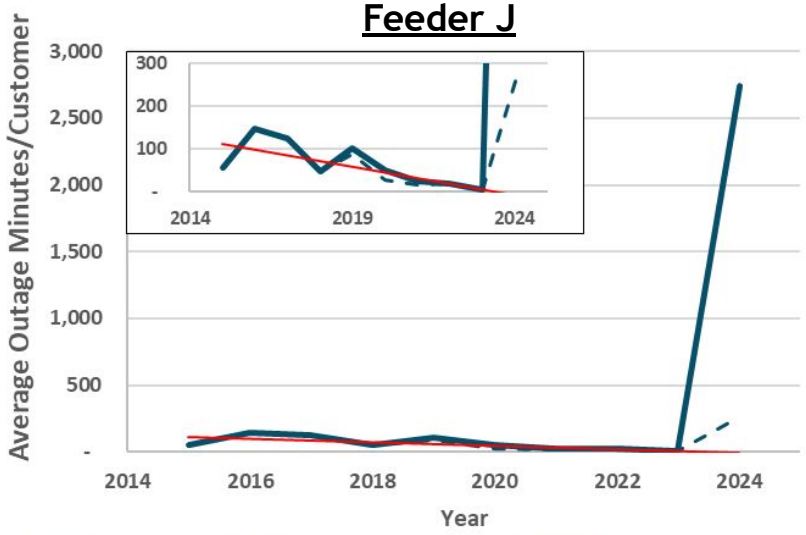
Feeder K



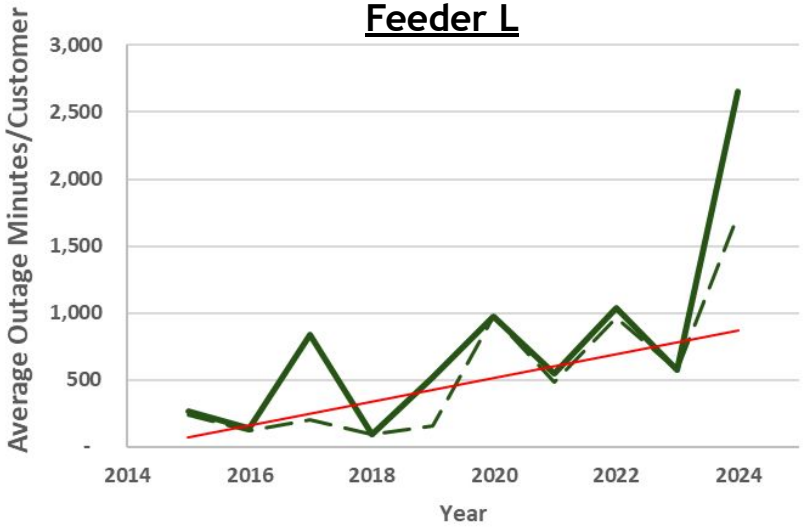
Feeder H



Feeder J

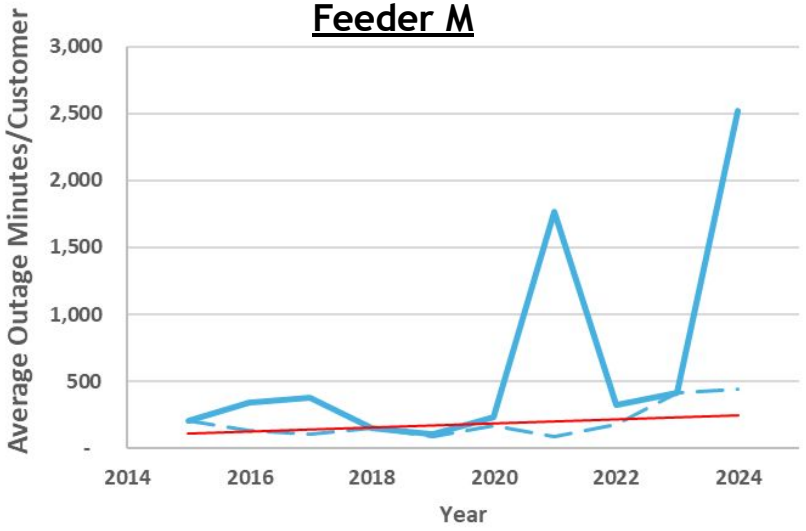


Feeder L

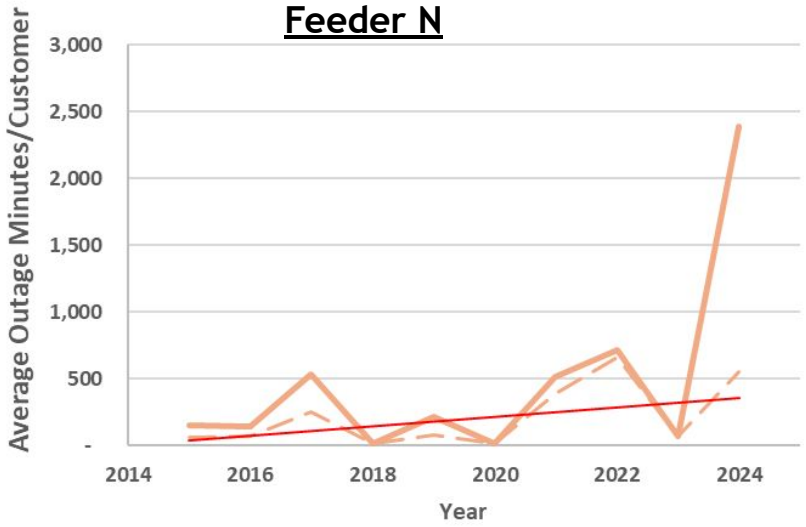


Solid Line = Feeder outage data, Dashed line = Excluding Major Events, Red line = 2015-2023 Trend (Excluding ME)

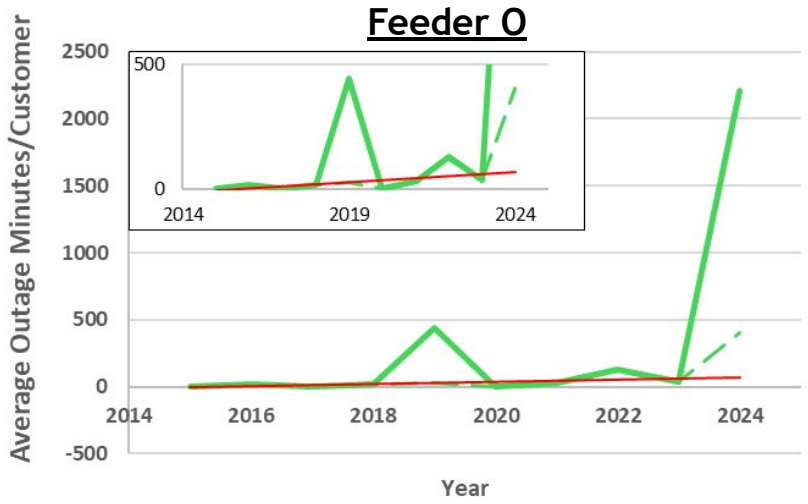
Feeder M



Feeder N

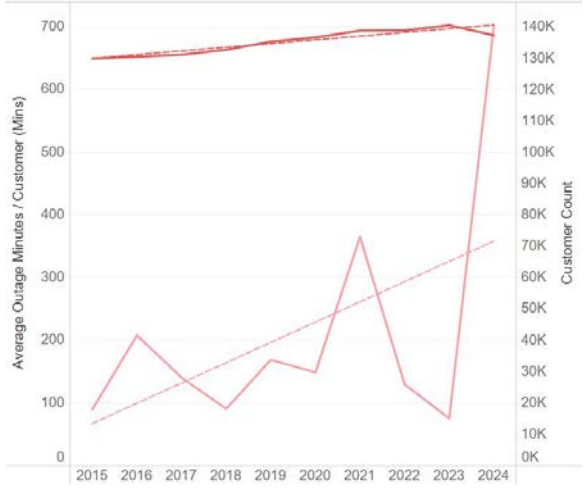


Feeder O

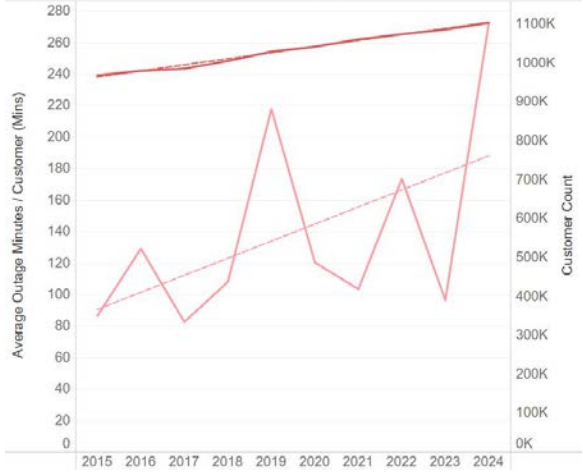


Appendix K: Customer Count and Average Outage Minutes Per Customer by Region

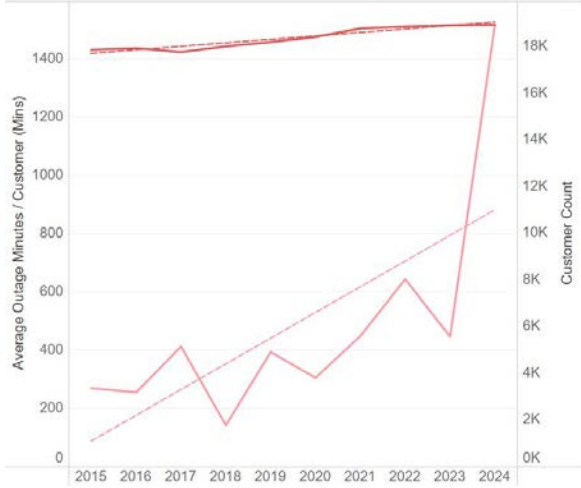
Customer Count and Average Outage Mintues per Customer: Boulder Region



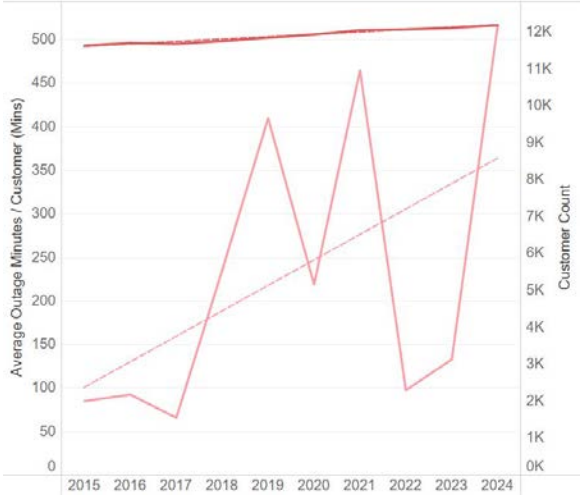
Customer Count and Average Outage Mintues per Customer: Denver Metro Region



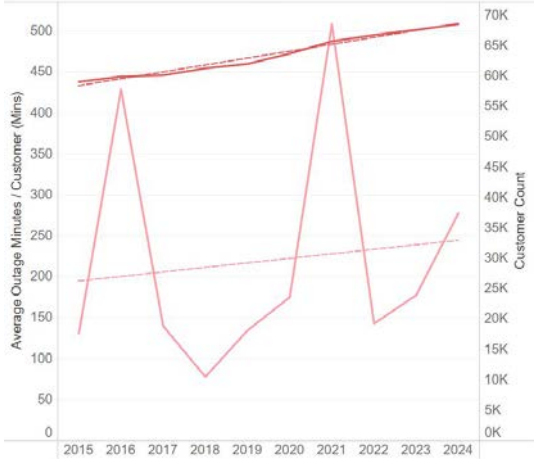
Customer Count and Average Outage Mintues per Customer: Front Range Region



Customer Count and Average Outage Mintues per Customer: High Plains Region

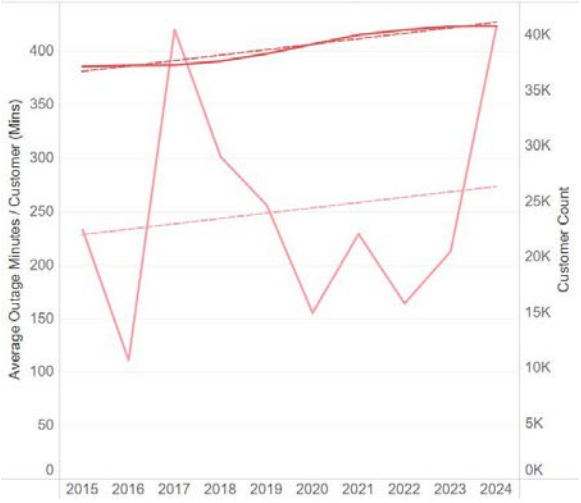


Customer Count and Average Outage Mintues per Customer: Home Light and Power Region

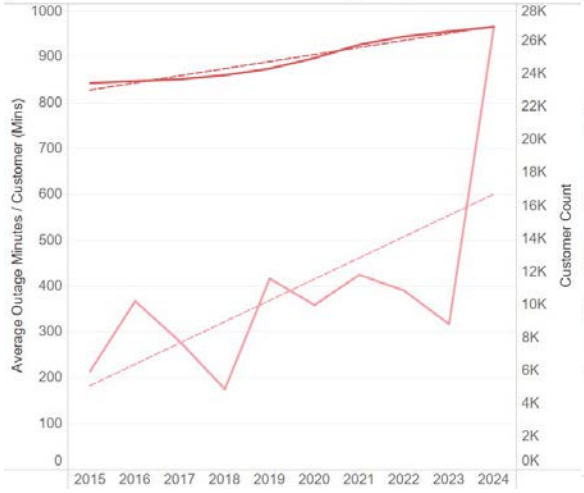


Legend
- Average Outage Minutes / Customer (Mins)
- Customer Count - Exclude filters

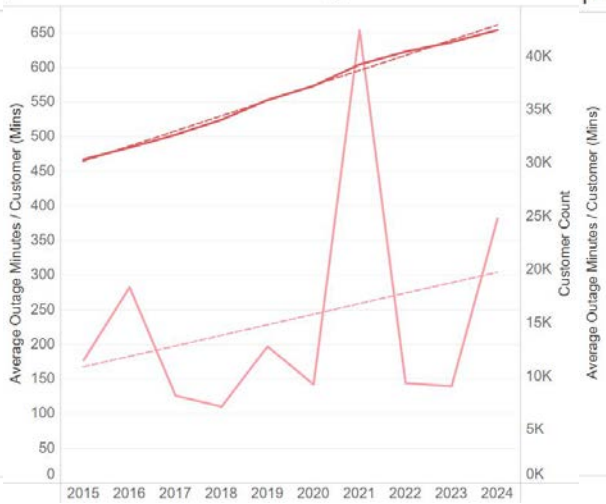
Customer Count and Average Outage Mintues per Customer: Mountain Region



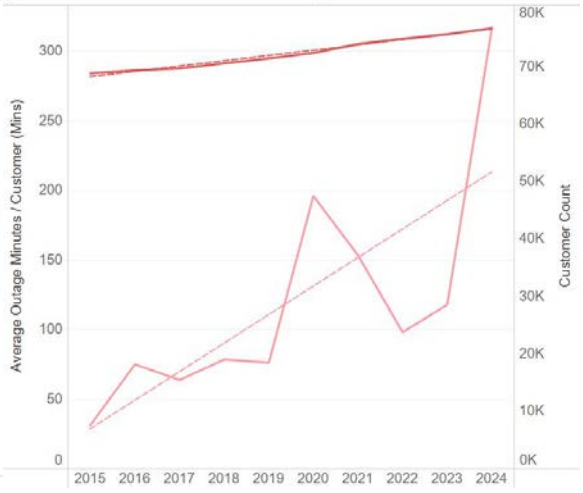
Customer Count and Average Outage Mintues per Customer: San Luis Valley Region



Customer Count and Average Outage Mintues per Customer: Northern Region



Customer Count and Average Outage Mintues per Customer: Western Region

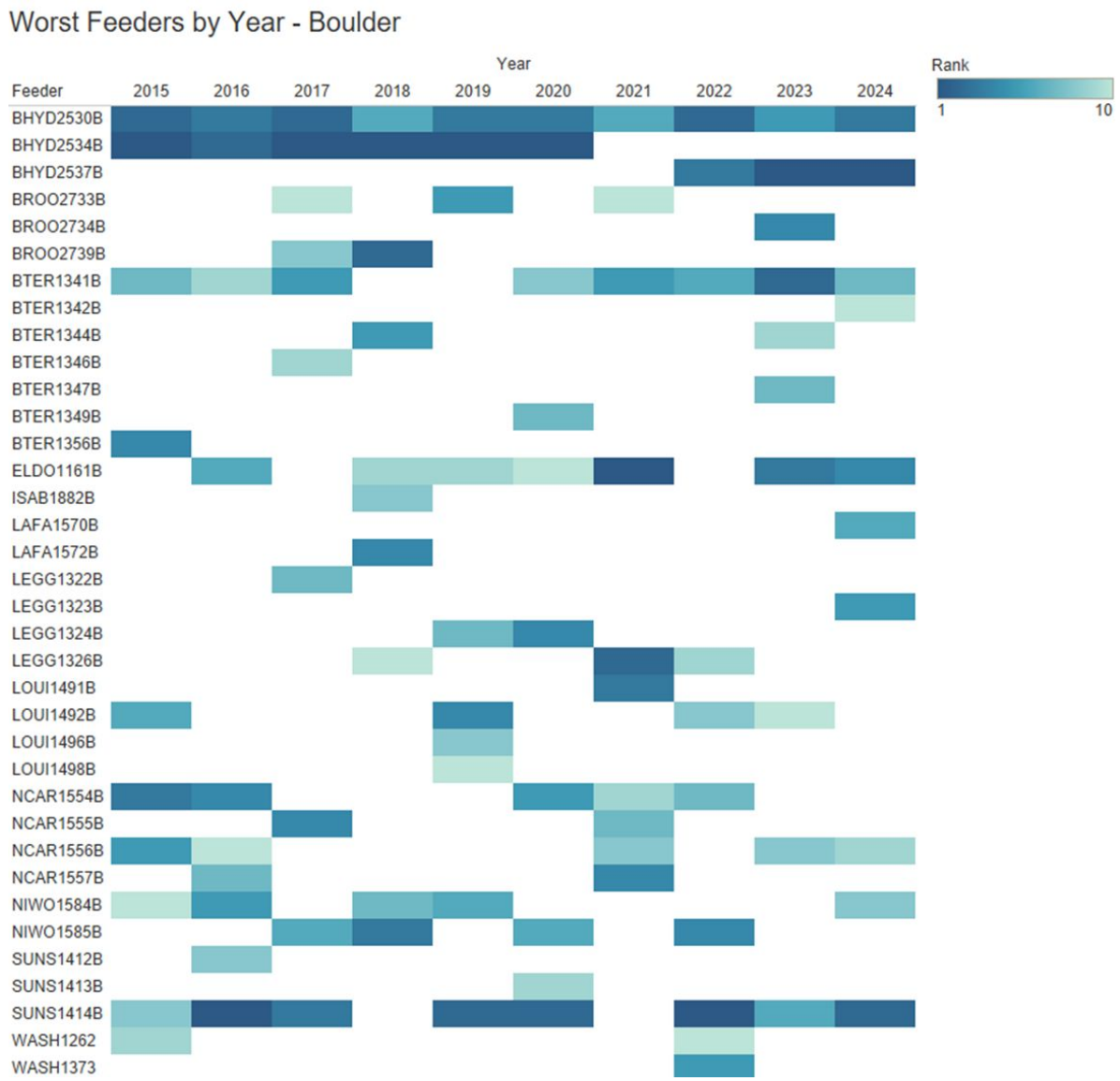


Legend
Average Outage Minutes / Customer (Mins)
Customer Count - Exclude filters

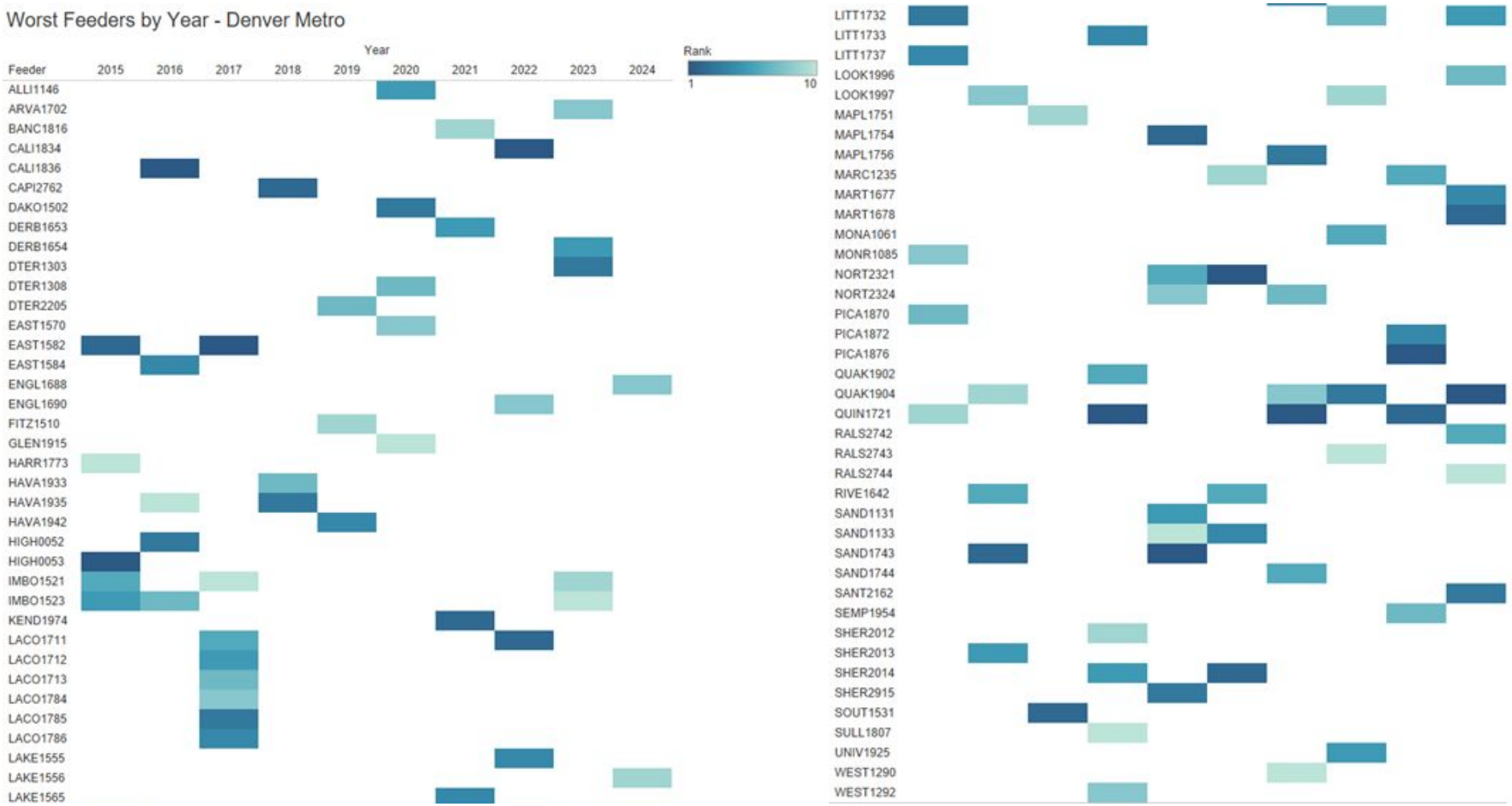
Appendix L: 10 Worst Ranked Feeders by Region

Worst Ranked Feeders - Boulder

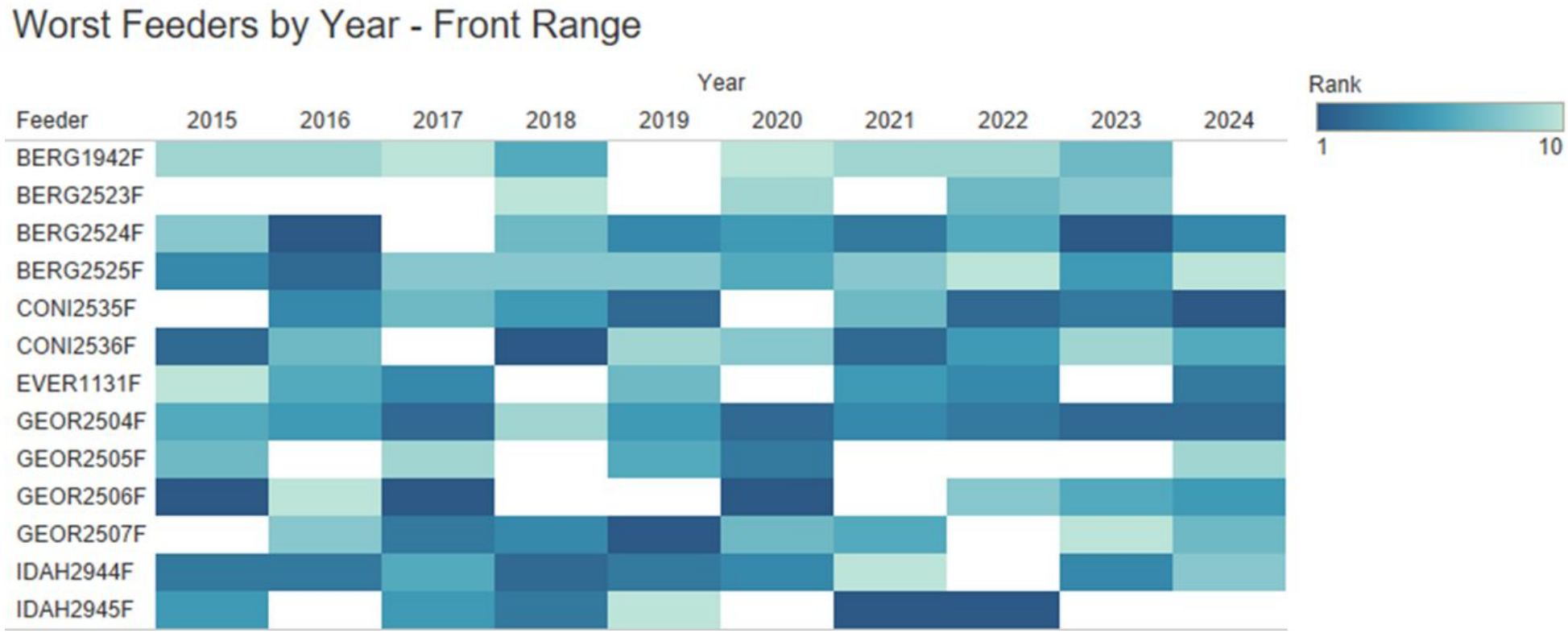
- Click to add text



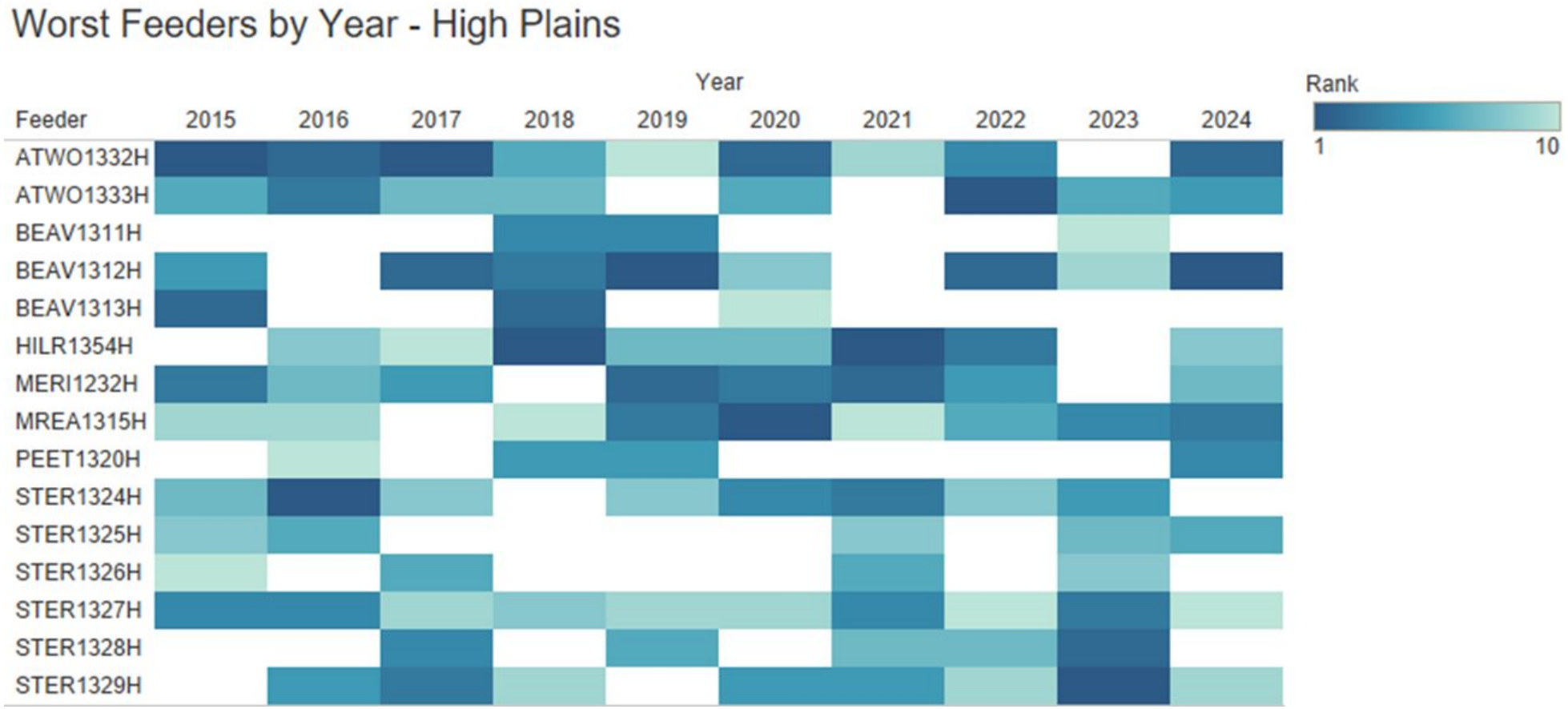
Worst Ranked Feeders - Denver Metro Area



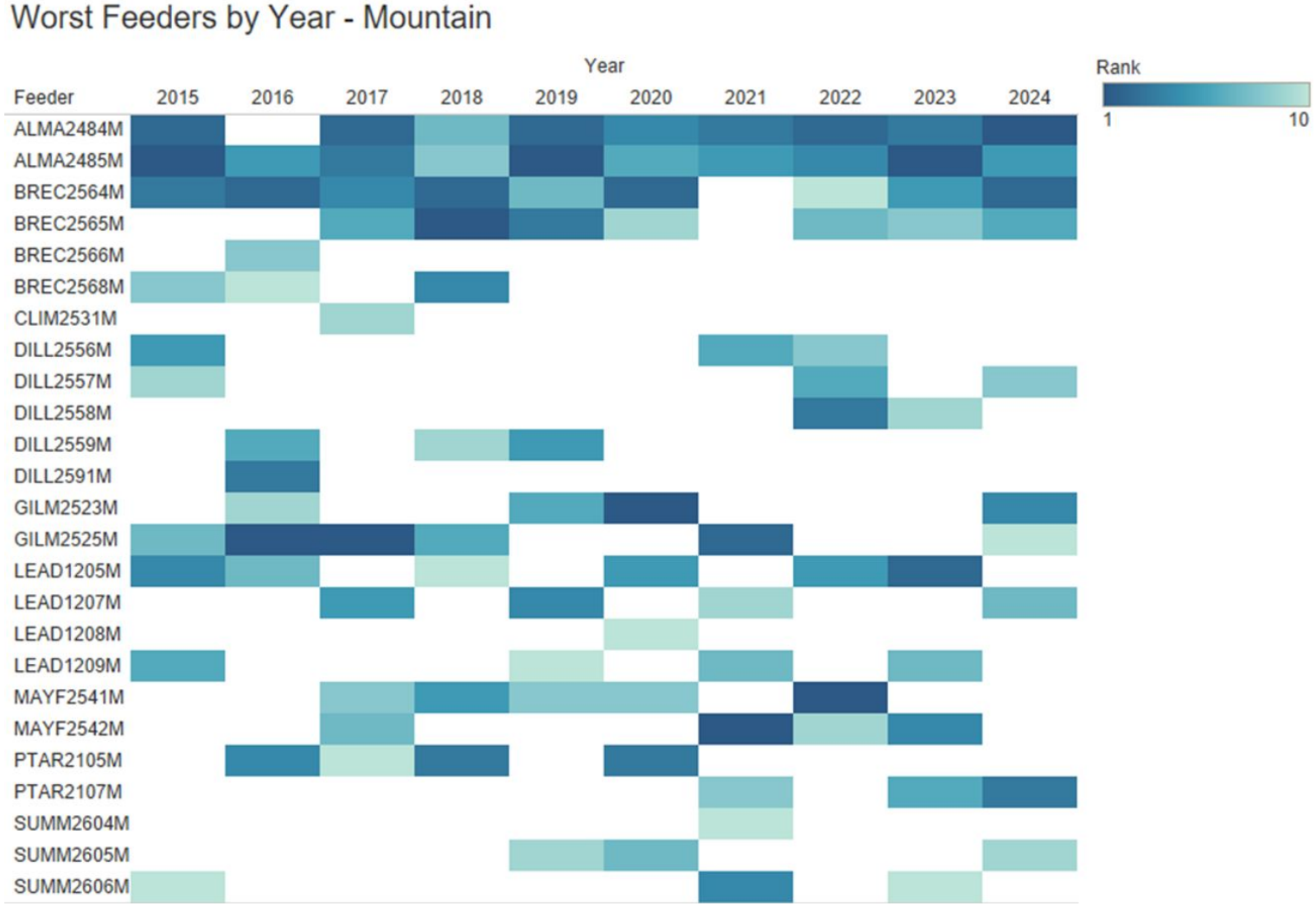
Worst Ranked Feeders - Front Range



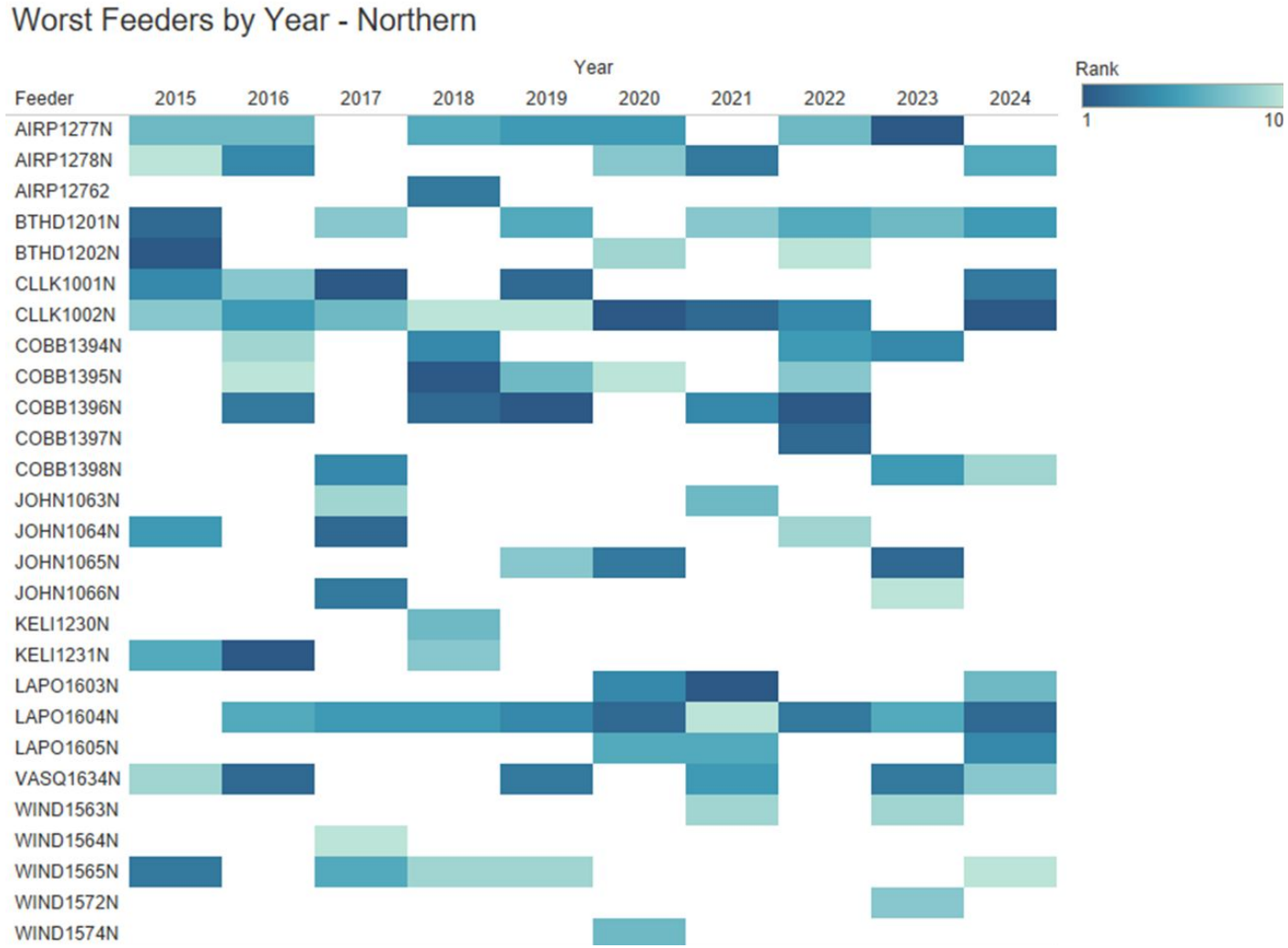
Worst Ranked Feeders - High Plains



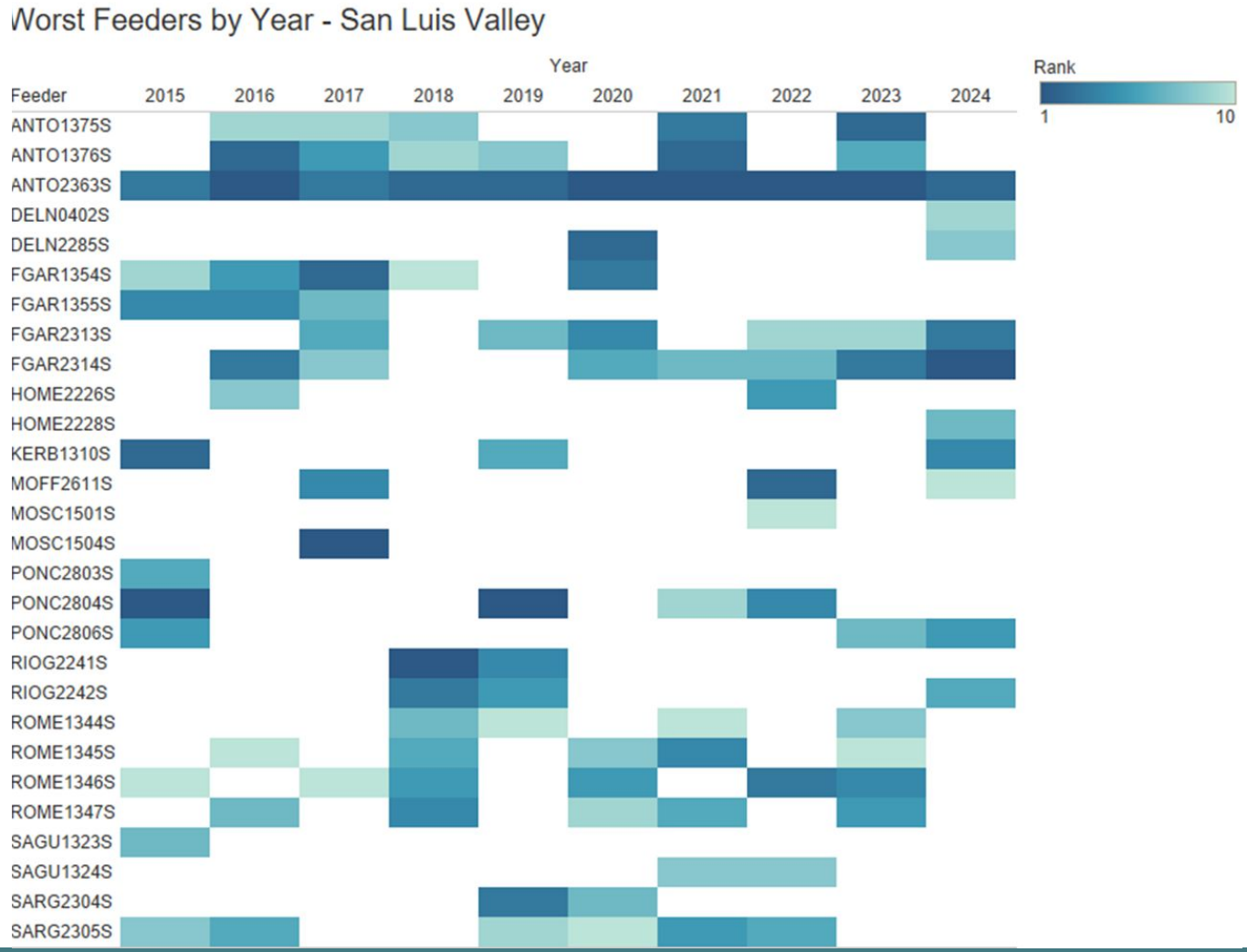
Worst Ranked Feeders - Mountains



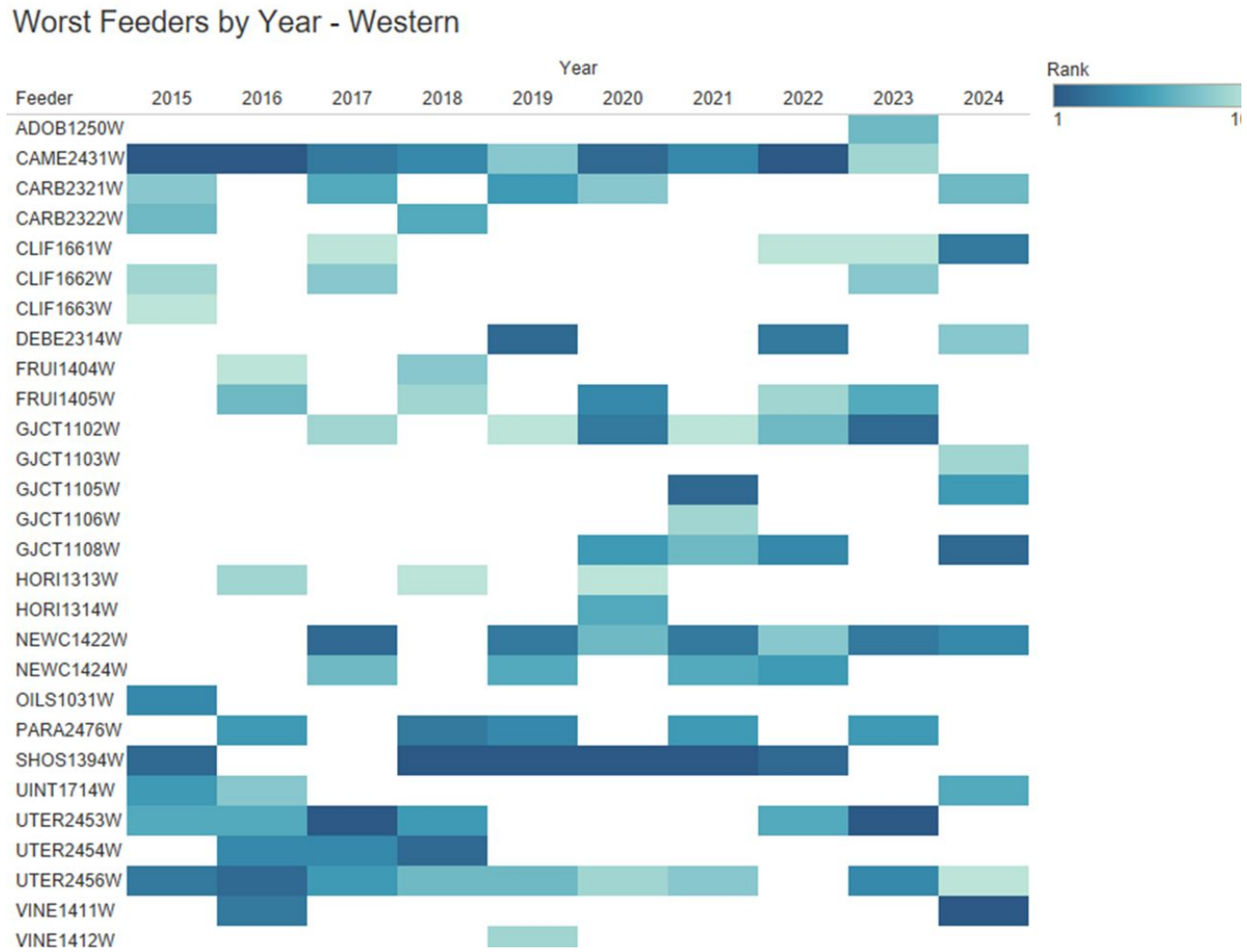
Worst Ranked Feeders - Northern



Worst Ranked Feeders - San Luis Valley

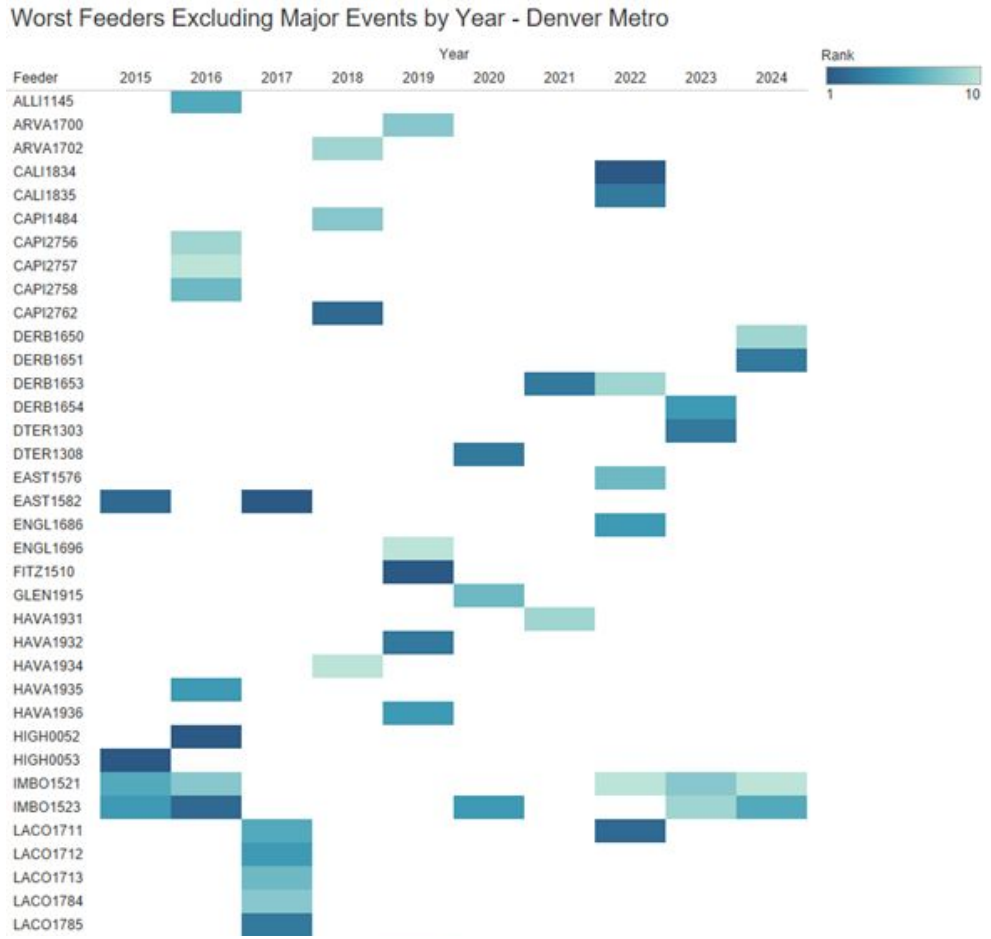


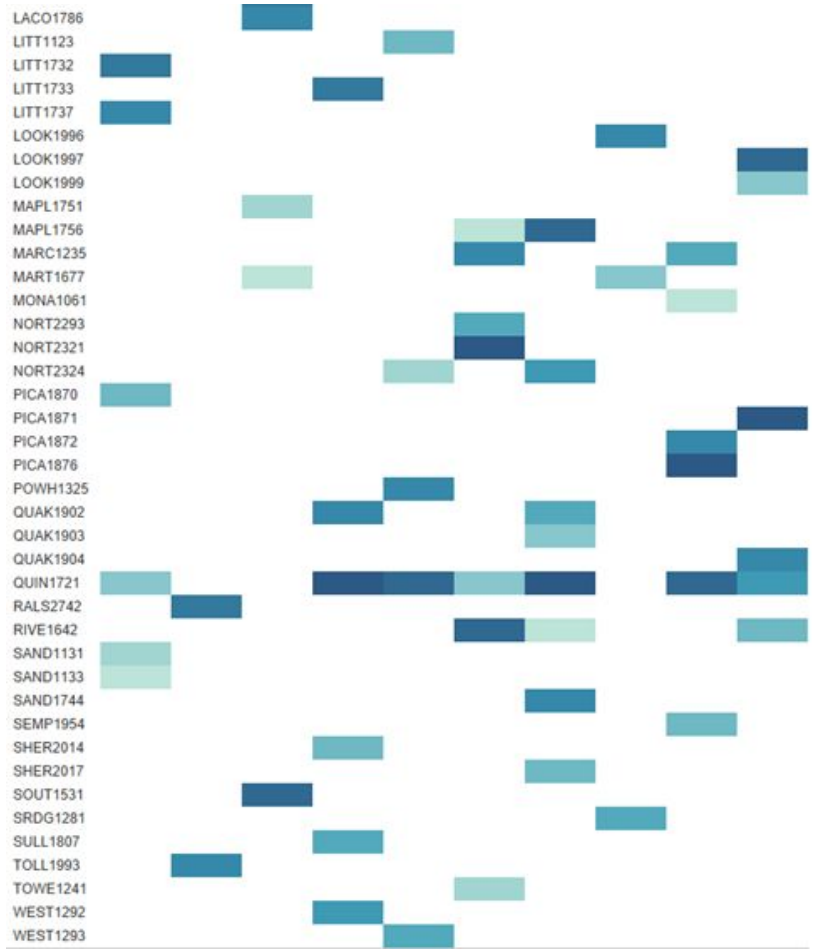
Worst Ranked Feeders - Western



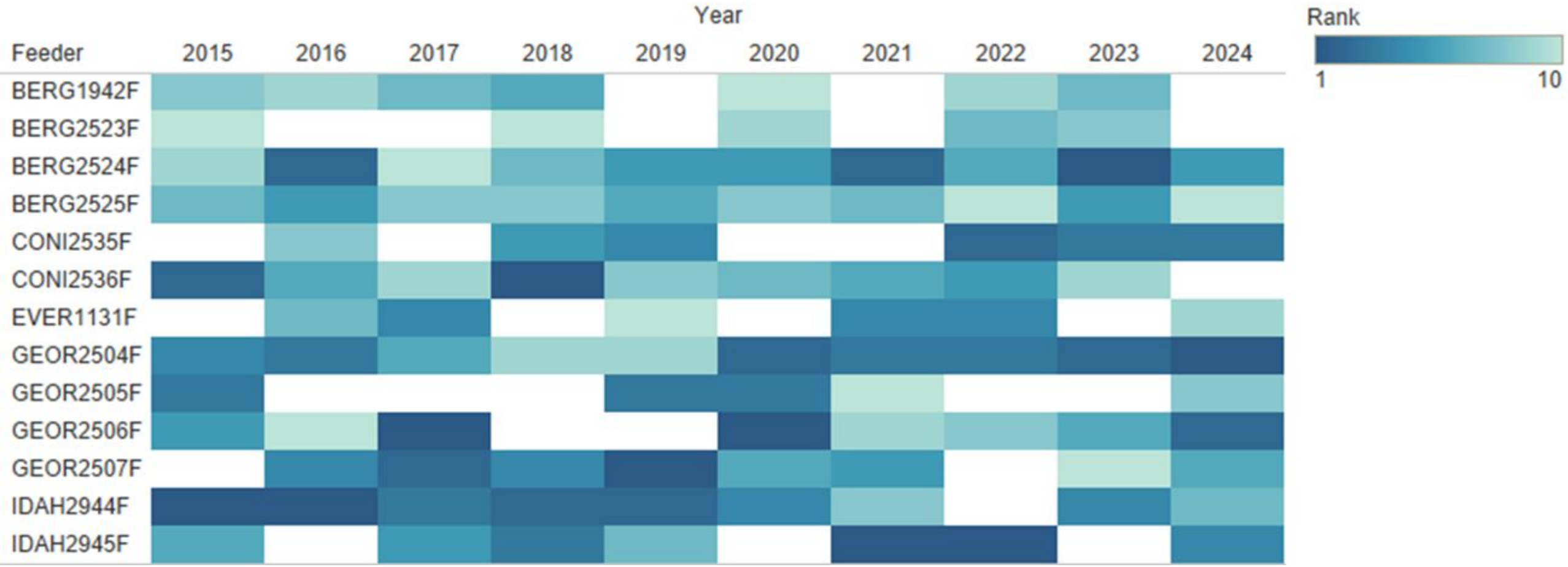
Appendix M: 10 Worst Feeders by Region by Year - Excluding Major Events

Worst Feeders Excluding Major Events by Year - Boulder

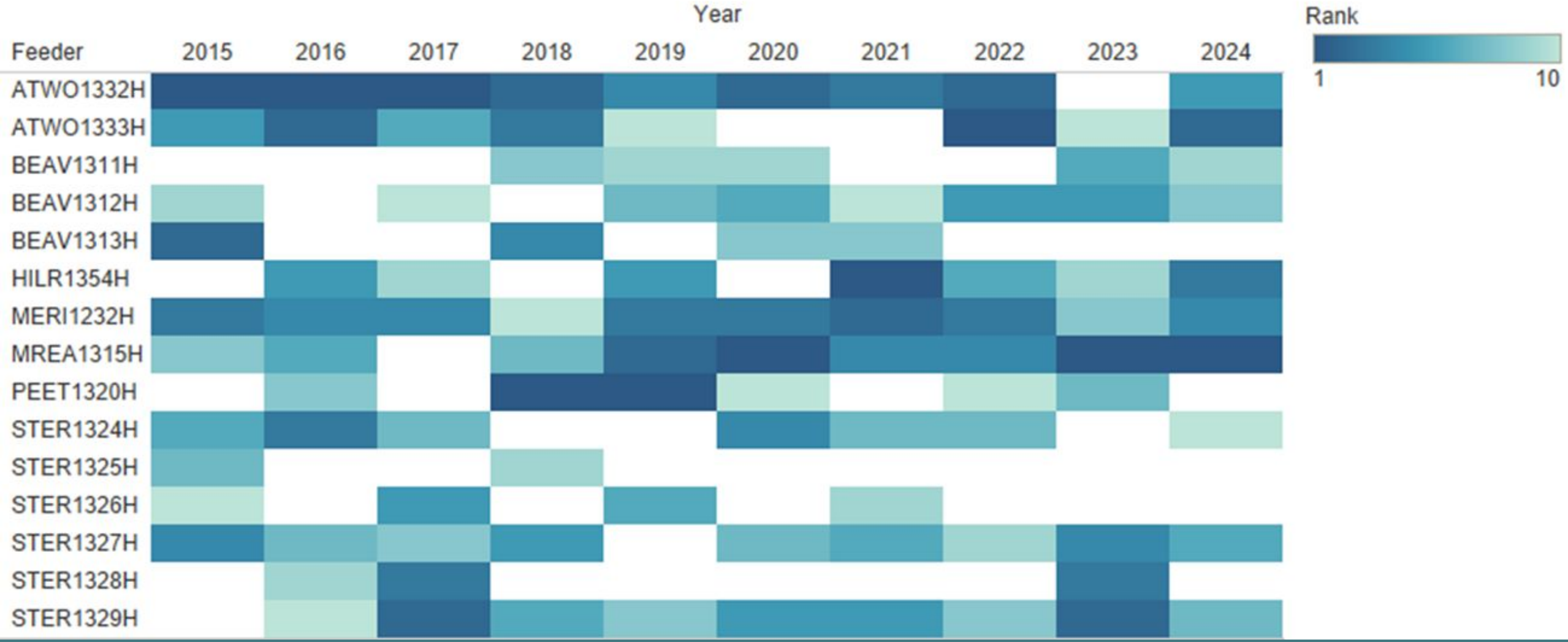

Worst Feeders Excluding Major Events by Year - Denver Metro
Year
Rank
1
10
Feeder
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
ALLI1145
ARVA1700
ARVA1702
CALI1834
CALI1835
CAPI1484
CAPI2756
CAPI2757
CAPI2758
CAPI2762
DERB1650
DERB1651
DERB1653
DERB1654
DTER1303
DTER1308
EAST1576
EAST1582
ENGL1686
ENGL1696
FITZ1510
GLEN1915
HAVA1931
HAVA1932
HAVA1934
HAVA1935
HAVA1936
HIGH0052
HIGH0053
IMBO1521
IMBO1523
LACO1711
LACO1712
LACO1713
LACO1784
LACO1785


LACO1786
LITT1123
LITT1732
LITT1733
LITT1737
LOOK1996
LOOK1997
LOOK1999
MAPL1751
MAPL1756
MARC1235
MART1677
MONA1061
NORT2293
NORT2321
NORT2324
PICA1870
PICA1871
PICA1872
PICA1876
POWH1325
QUAK1902
QUAK1903
QUAK1904
QUIN1721
RALS2742
RIVE1642
SAND1131
SAND1133
SAND1744
SEMP1954
SHER2014
SHER2017
SOUT1531
SRDG1281
SULL1807
TOLL1993
TOWE1241
WEST1292
WEST1293

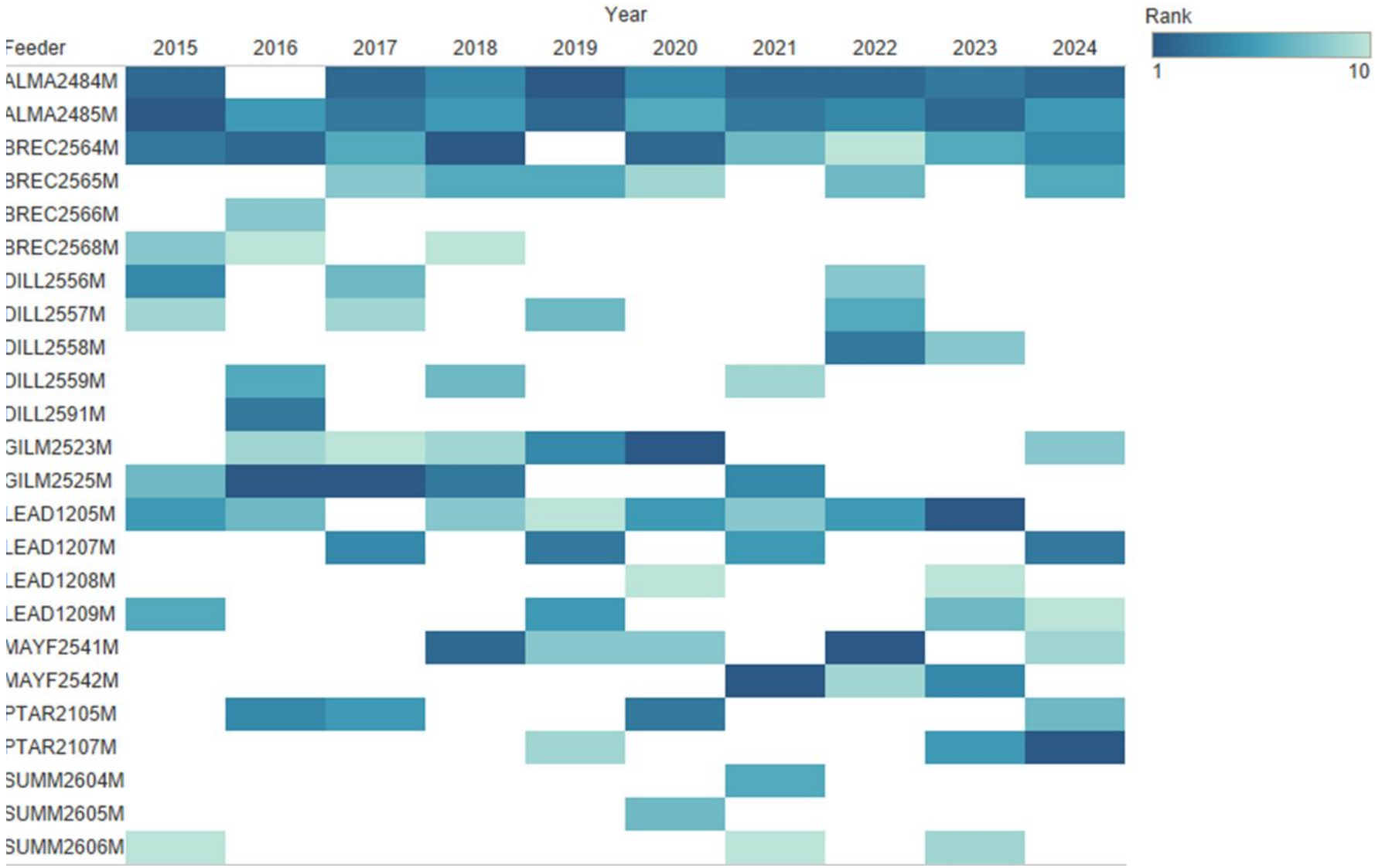
Worst Feeders Excluding Major Events by Year - Front Range



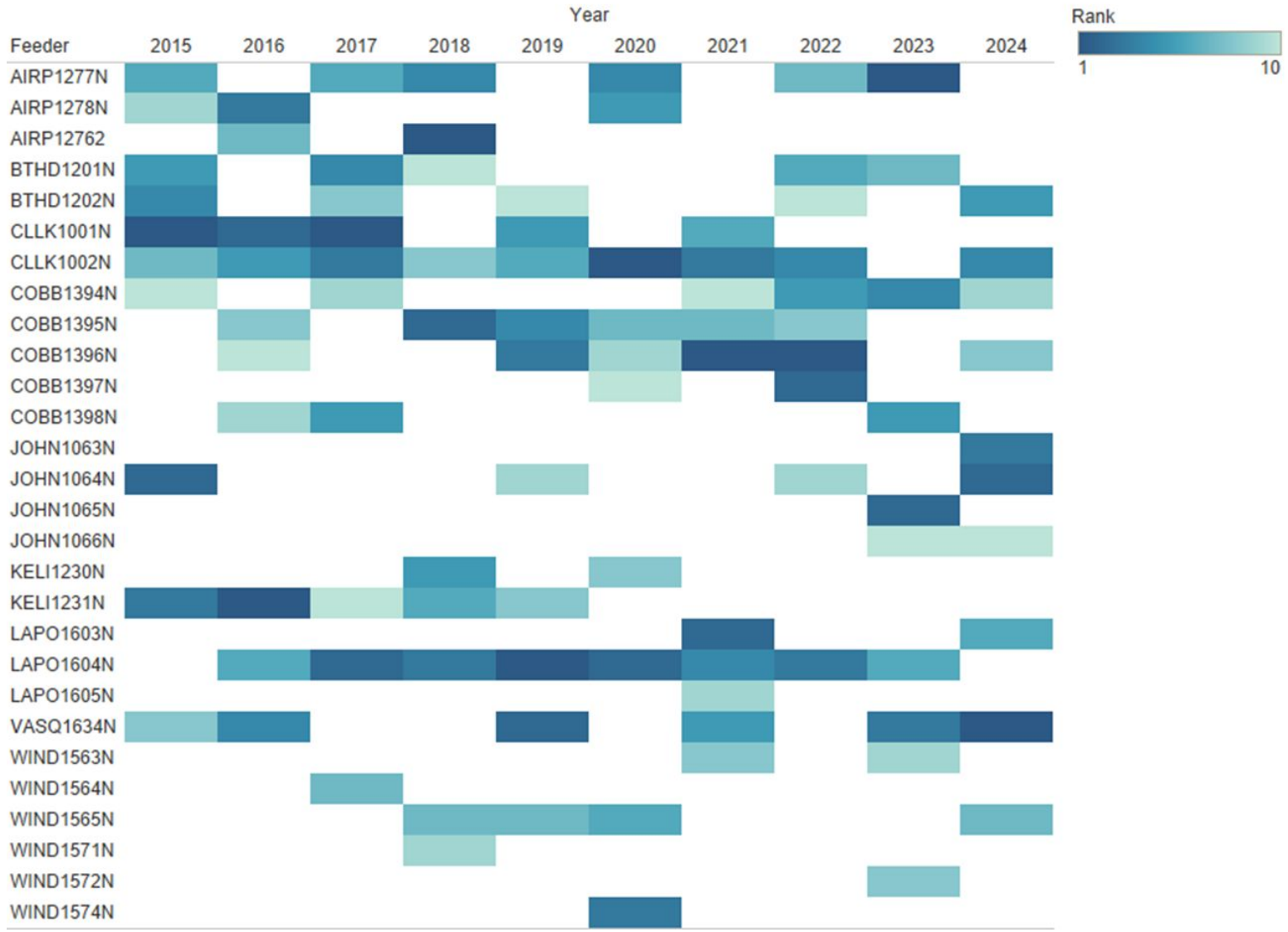
Worst Feeders Excluding Major Events by Year - High Plains



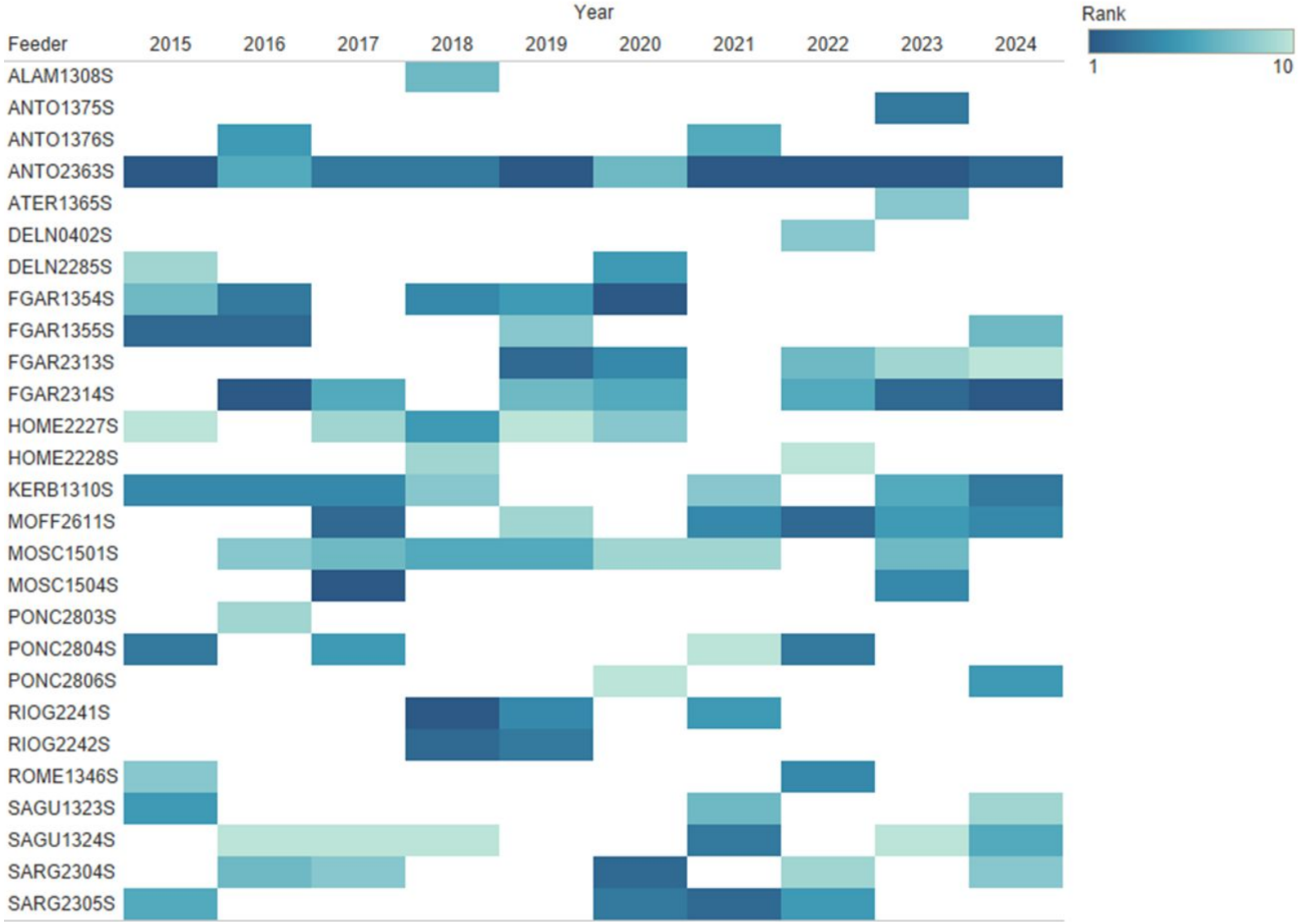
Worst Feeders Excluding Major Events by Year - Mountain



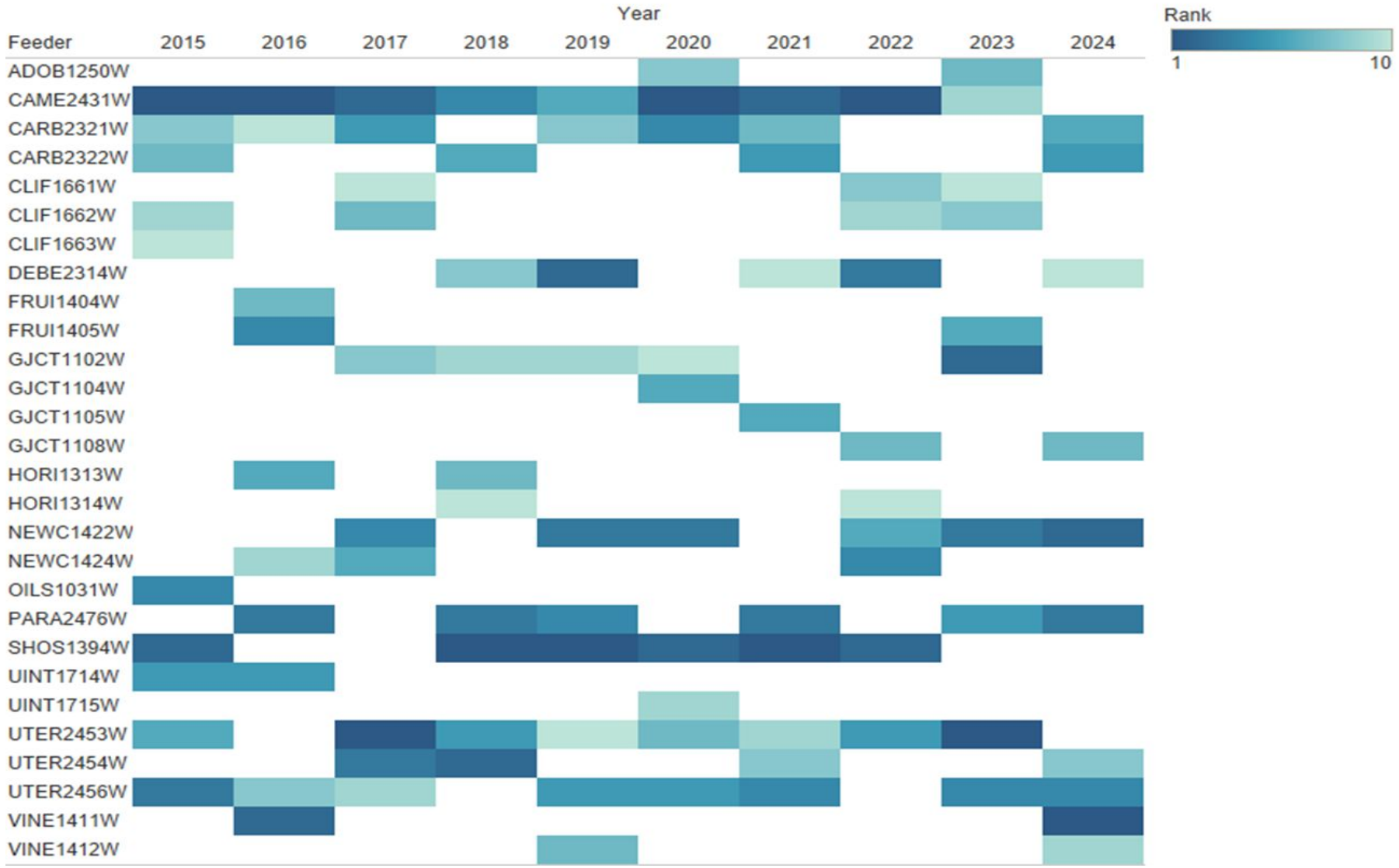
Worst Feeders Excluding Major Events by Year - Northern



Worst Feeders Excluding Major Events by Year - San Luis Valley



Worst Feeders Excluding Major Events by Year - Western

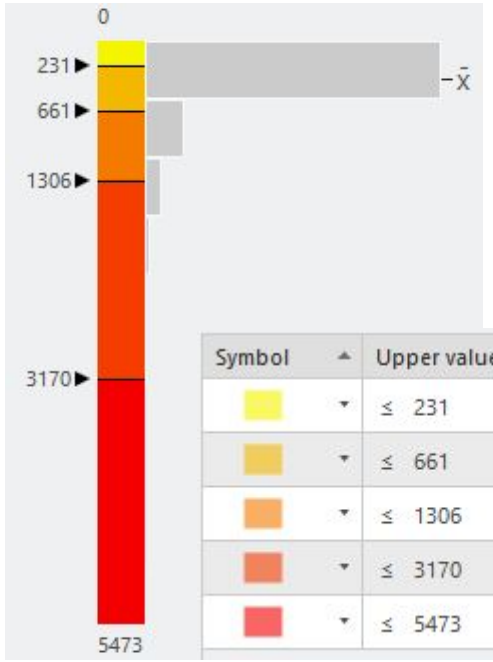


Appendix N: Disproportionately Impacted Communities (DIC) Definition

- The Disproportionately Impacted Community definition provided below is sourced from https://cdphe.colorado.gov/ej/learn
- Disproportionately impacted communities include:
  - **Low-income communities**: Census block groups in which more than 40% of households are at or below 200% of the federal poverty line.
  - **Communities of color**: Census block groups in which more than 40% of the population identify as anything other than non-Hispanic white.
  - **Housing cost-burdened communities**: Census block groups in which more than 50% of households spend more than 30% of their income on housing costs like rent or mortgage payments.
  - **Linguistically isolated communities**: Census block groups in which more than 20% of the population lives in households where all adults speak a language other than English or do not speak English well.
  - **Communities with environmental and socioeconomic impacts**: Communities in which multiple factors, including socioeconomic stressors, vulnerable populations, disproportionate environmental burdens, vulnerability to environmental degradation or climate change, and lack of public participation, may cumulatively affect public health and the environment and may contribute to persistent environmental health disparities. Cumulatively impacted communities can be presumptively identified in one of two ways:
    - They are in a census block group with a Colorado EnviroScreen score above the 80th percentile.
    - They are in a census tract that the federal Council on Environmental Quality's Climate and Economic Justice Screening Tool identifies as disadvantaged.
  - **Tribal lands:** The Southern Ute and Ute Mountain Ute reservations.
  - **Mobile home communities:** Areas that meet the Department of Local Affairs' definition of a mobile home park. (These are shown as points, and are not represented in the 6 DIC classifications shown on our map)
  - **Historically marginalized communities**: Communities with a history of environmental racism created through redlining or anti-Black, anti-Hispanic, anti-immigrant, or anti-Indigenous laws, policies, or practices that continue to experience present-day environmental health disparities.

Appendix O: Disproportionately Impacted Communities: Average Outage Minutes per Customer Map Symbology

- Colored symbols were assigned using Jenks Natural Breaks Classification, which clusters data into groups by minimizing the variation within each group
- The table below shows the average outage minutes per customer range for each color, as well as the count of feeders that fall within each range
- The histogram to the left shows the distribution of feeders that fall within each symbol category
- Of note is that very few feeders fall within the highest two categories



Symbol	Upper value	Label	Count
	≤ 231	0 - 231	479
	≤ 661	232 - 661	146
	≤ 1306	662 - 1306	73
	≤ 3170	1307 - 3170	38
	≤ 5473	3171 - 5473	5