February 28, 2025

Will Rosquist
Chief Regulator
Montana Public Service Commission
1701 Prospect Avenue
PO Box 202601
Helena, MT 59620-2601

RE: 2024 Annual Electric Reliability Report – Docket No. 2025.01.002

Dear Mr. Rosquist:

With this letter, NorthWestern Corporation d/b/a NorthWestern Energy submits the 2024 Reliability Report in compliance with Mont. Admin. R. 38.5.8619 Annual Electric Reliability Report, effective on July 29, 2005. The data provided in this report includes the information requested in ARM 38.5.8619 and utilizes the *IEEE Guide for Electric Power Distribution Reliability Indices (IEEE Std. 1366-2022)* for definition of major events and the appropriate reliability indices.

Please contact me to answer any questions concerning this report. My contact information is as follows:

Aimee Schober
System Integrity Engineer – Asset Management
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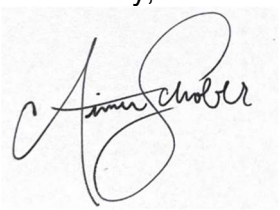
Sincerely,



Aimee Schober, M.S.

Enclosure: 2024 Annual Electric Reliability Report

NorthWestern® Energy

2024

-Montana-
Electric Distribution
Annual Reliability Report

March 2025

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Executive Summary

This report provides information and insights into NorthWestern Corporation d/b/a NorthWestern Energy's (NorthWestern) 2024 Electric Distribution System reliability indices for the Montana region, in accordance with the guidelines outlined by the Administrative Rules of Montana (Rule 38.5.8619). The indices included are **SAIDI** (**S**ystem **A**verage **I**nterruption **D**uration **I**ndex – in minutes), **CAIDI** (**C**ustomer **A**verage **I**nterruption **D**uration **I**ndex – in minutes), **SAIFI** (**S**ystem **A**verage **I**nterruption **F**requency **I**ndex – in frequency) and **Outage Counts**. By the Institute of Electrical and Electronics Engineers (IEEE) standard definitions, these indices are for "sustained interruptions" meaning they lasted longer than five minutes.

IEEE Standard 1366-2022 provides the foundation for this report. IEEE 1366-2022 provides guidelines and strategies for quantifying system impacts outside of normal operating conditions, such as a **Major Event Day** (**MED**). MEDs are classified based upon standard definitions obtained through statistical processes, commonly referred to as the 2.5 Beta Method. The IEEE 1366-2022 **Catastrophic (CAT) Event** designation calculates a threshold which is exceptionally rare to exceed. Given the statistical rarity and geographic isolation of CAT Events, indices are reported and analyzed separately as to not conflate data gathered from normal operating conditions or the occasional adverse weather conditions.

CAT Events at NorthWestern are calculated based upon a modified MED threshold. The MED threshold for 2024 was set at 6.960 SAIDI and the CAT threshold was set at 48.750 SAIDI. Events of this magnitude require additional crews and often lead to much longer restoration times compared to typical outages. These categorizations allow metrics to be analyzed separately from annual reporting, as to more accurately reflect the typical operating conditions of the system. This report includes metrics with and without MEDs for the 2024 reporting period. NorthWestern will continue to utilize IEEE 1366-2022 standards and guidelines as it has in previous annual reports.

This report provides system indices for NorthWestern's Montana service territory. Indices are further analyzed by the seven operating divisions within the state: Billings, Bozeman, Butte, Great Falls, Havre, Helena, and Missoula. SAIDI triggered by an MED or CAT Event in one division will also include the SAIDI seen in other divisions during the same rolling 24-hour period. In 2024, the NorthWestern Montana service territory saw 7 rolling MEDs, and 1 CAT Event which lasted 4 days. The CAT Event, referred to as the Missoula Storm, was a historic straight-line windstorm event that occurred on July 24th and resulted in nearly 200 minutes of regional SAIDI. NorthWestern received an Edison Electric Institute (EEI) storm response award for the swift action to restore gas and electrical services.

1. General

1.1 Reliability Indices Calculation

The calculations of SAIDI and CAIDI (minutes) and SAIFI (outages per customer) are based on the following IEEE formulas:

$$SAIDI = \frac{sum\ of\ all\ customer\ outage\ durations(minutes)}{total\ number\ of\ customers\ served}$$

$$SAIFI = \frac{total\ number\ of\ customers\ experiencing\ outages}{total\ number\ of\ customers\ served}$$

$$CAIDI = \frac{sum\ of\ all\ customer\ outage\ duration(minutes)}{total\ number\ of\ customers\ experiencing\ outages} = \frac{SAIDI}{SAIFI}$$

SAIDI represents the average outage in minutes for each customer served. SAIFI is the average number of interruptions that a customer would typically experience in a year. CAIDI is the average outage duration any given customer would experience and can represent average restoration time.

1.2 2.5 Beta Method

The following calculation represents the method for obtaining the MED threshold (T_{MED}) for the given reporting period. IEEE suggests utilizing 5 years of previous data, omitting days without interruptions and including SAIDI incurred from MEDs.

$$T_{MED} = e^{(\alpha + 2.5\beta)}$$

Where α is the average of the natural log of outages for the given calculation period and β is the log-standard deviation.

T_{MED} serves as a foundation for identifying CAT Events. NorthWestern has set the CAT threshold to be 7 times T_{MED}. This modification is consistent with IEEE recommendations. MEDs occur on a 24-hour rolling period as opposed to a standard midnight-to-midnight 24-hour day. This allows for more accurate reporting of storm events and is common practice for many utilities who participate in IEEE benchmarking. NorthWestern implemented this guideline in 2015. Sequential MEDs are considered discrete events. Sequential CAT days (rolling 24-hour period) are considered part of the same event. For a CAT Event to span multiple days, a continuation threshold of 0.2 times T_{MED} for the reporting period must be met.

2. Montana System Reliability

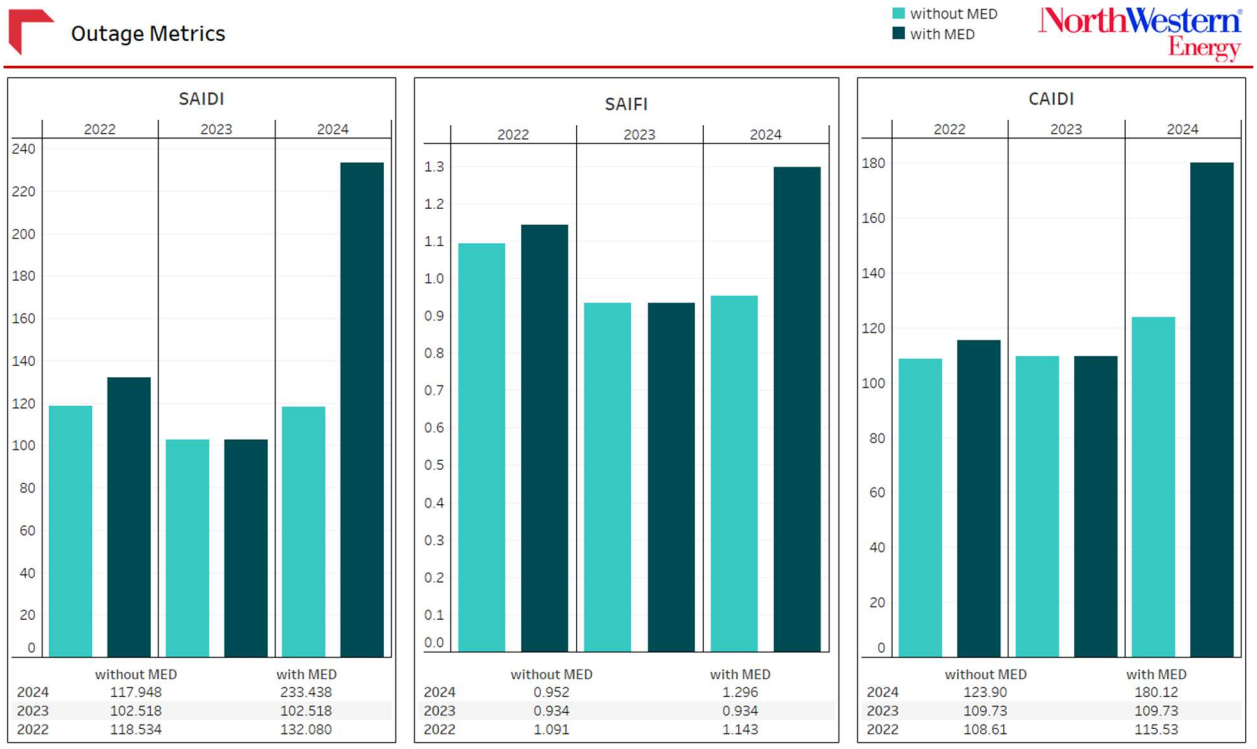

Figure 2.1 Montana system indices with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

The figure above displays NorthWestern's Montana region indices for the years 2022-2024 from year-end audited data. Please note that SAIDI and CAIDI are given in minutes and SAIFI is given in frequency of occurrence. There were no MEDs in 2023 and reliability for that year was significantly better than normal. In 2024, there were 7 MEDs and 1 CAT Event with a four-day duration. Contributing factors to system reliability and outages will be discussed within each division subsection and the report's conclusion. The data presented includes figures with and without MEDs to demonstrate the effect of MEDs on system reliability within the past three years. CAT Events are not represented by either metric, as is consistent with IEEE 1366-2022.

Overall, 2024 service territory reliability was comparable to the previous reporting periods, when excluding MEDs. 117.64 regional SAIDI minutes were measured in the 2024 reporting period. This is below the five-year average of 119.46 SAIDI minutes. The slight increase in SAIFI and CAIDI is largely due to the seasonal weather events in May, July, August, and October. These events produced slightly more equipment and unknown outages than seen in 2023. A marginal increase of 0.018 SAIFI minutes was observed in 2024 – still well below the five-year average of 1.046 minutes. CAIDI in 2024 was reported to be 123.90 minutes, which is above the five-year average of 114.37 minutes. Inclement weather conditions which produced large-scale outages were responsible for longer outages compared to the previous reporting period.

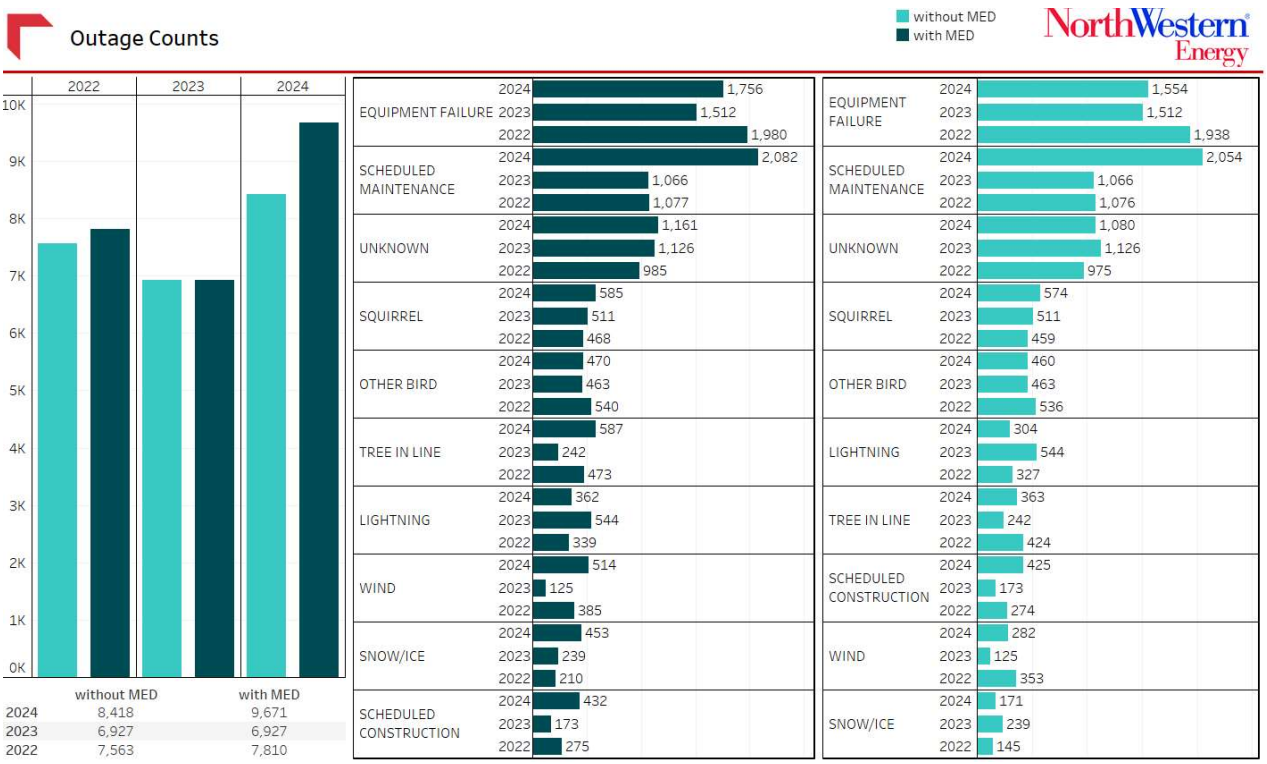

Figure 2.2 Montana system outages by top ten causes with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

The outage causes represented in this table are the top ten major contributors for customer outages on the NorthWestern Energy Electric Distribution System. Overall outages reported increased from the previous reporting years yet remained below the five-year maximum that was reported in 2021. Outage counts including MEDs exceeded the five-year high, largely due to extreme weather events.

Equipment failure continues to be the most common cause of unscheduled outages. This broad category encompasses a variety of failure types. Scheduled maintenance is also among the most significant outage causes as maintenance is performed and improvements are made to the system. Unknown outages rank high on the list, though most often these outages only affect a single customer or occur during a weather event. Animal contacts have remained consistent in their position on the list, while lightning strikes have been steadily increasing. Tree in line outages are much higher on the list compared to previous years, due to the extreme weather observed in 2024.

3. Billings System Reliability

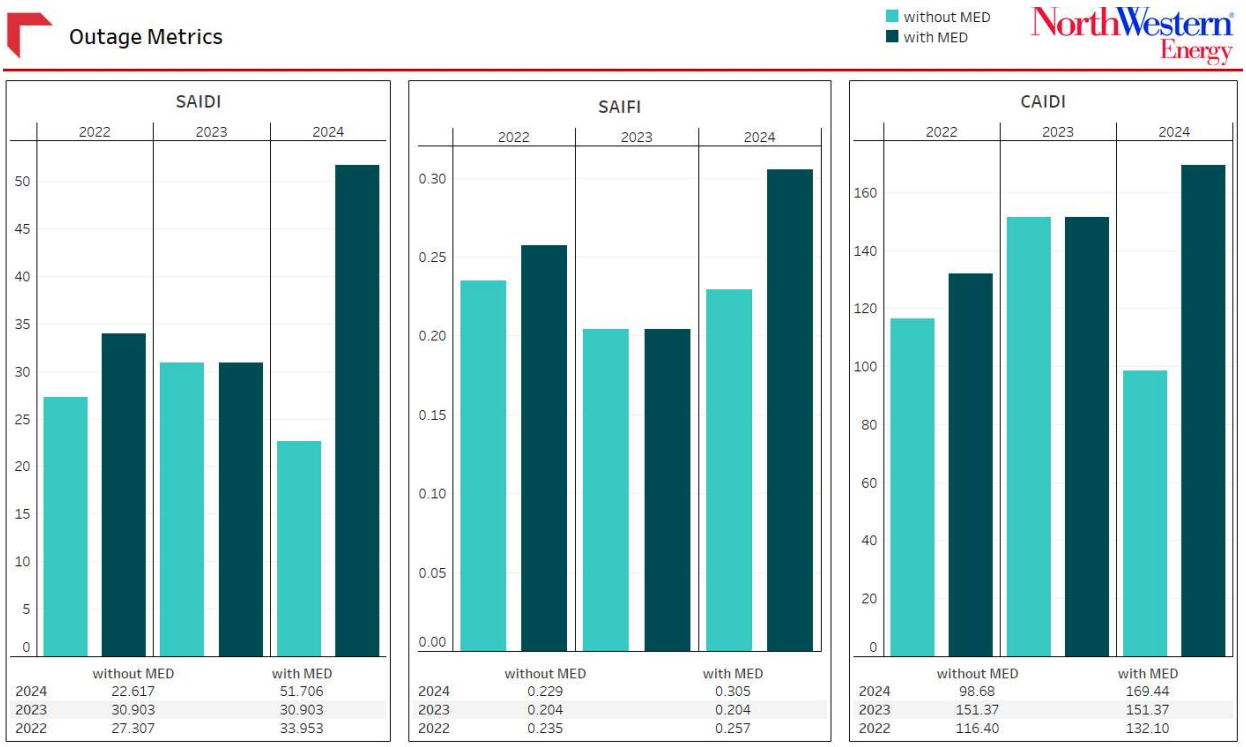

Figure 3.1 Billings system indices with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

Excluding MEDs, Billings customers experienced shorter outages with a slightly increased frequency. Extreme weather events throughout the year, including summer thunderstorms and winter weather, contributed to increased metrics throughout all 3 indices. Winter storm conditions in May and February were responsible for equipment failure and snow/ice outages. A large windstorm on August 5th produced more than 18 SAIDI minutes, concentrated mostly in the Billings division. Under normal operating conditions, reliability indices are within the range of previous years.

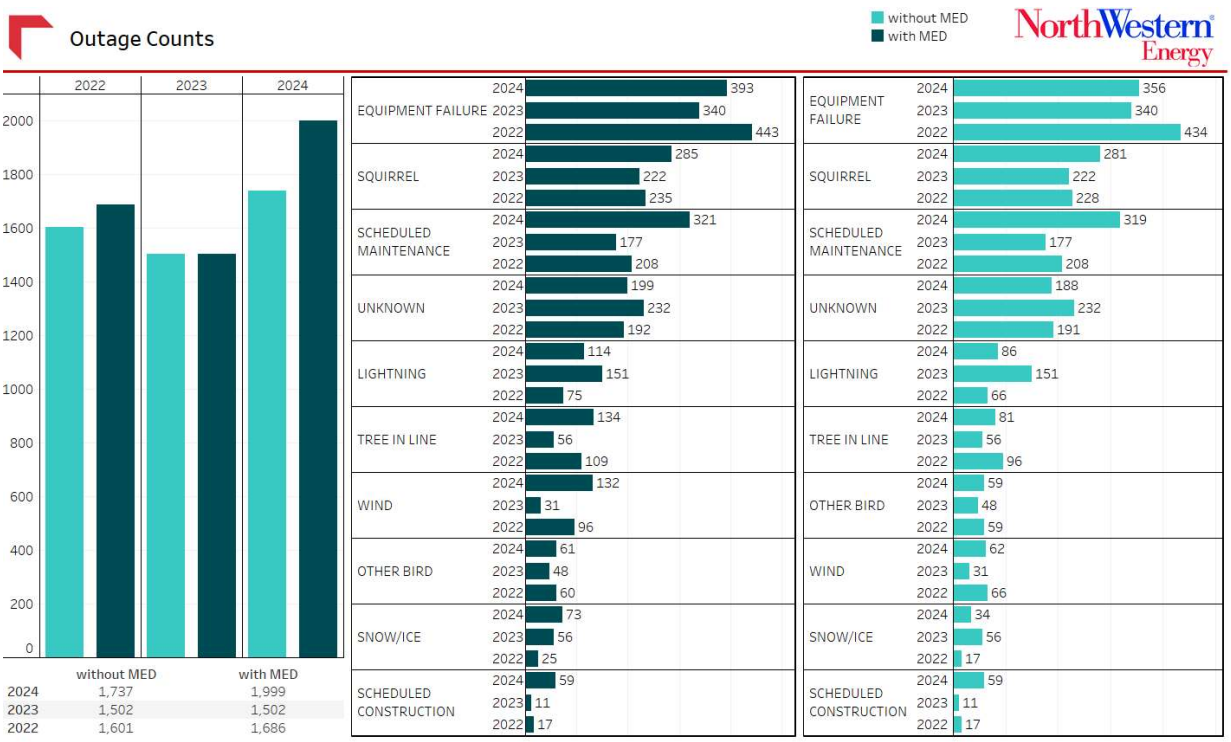

Figure 3.2 Billings system outages by top ten causes with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

Equipment failure remains the cause of the largest number of outages in the Billings division. These outages range from underground faults to overhead cutout failures. Following the trend of previous years, squirrel activity remains high on the list of outage causes. Scheduled maintenance was slightly higher on the list due to the elevated frequency of proactive maintenance and improvements to the system. Unknown outages still represent a large category. These outages can occur from a transmission problem, large scale weather event, or very small outage impacting only one customer.

4. Bozeman System Reliability

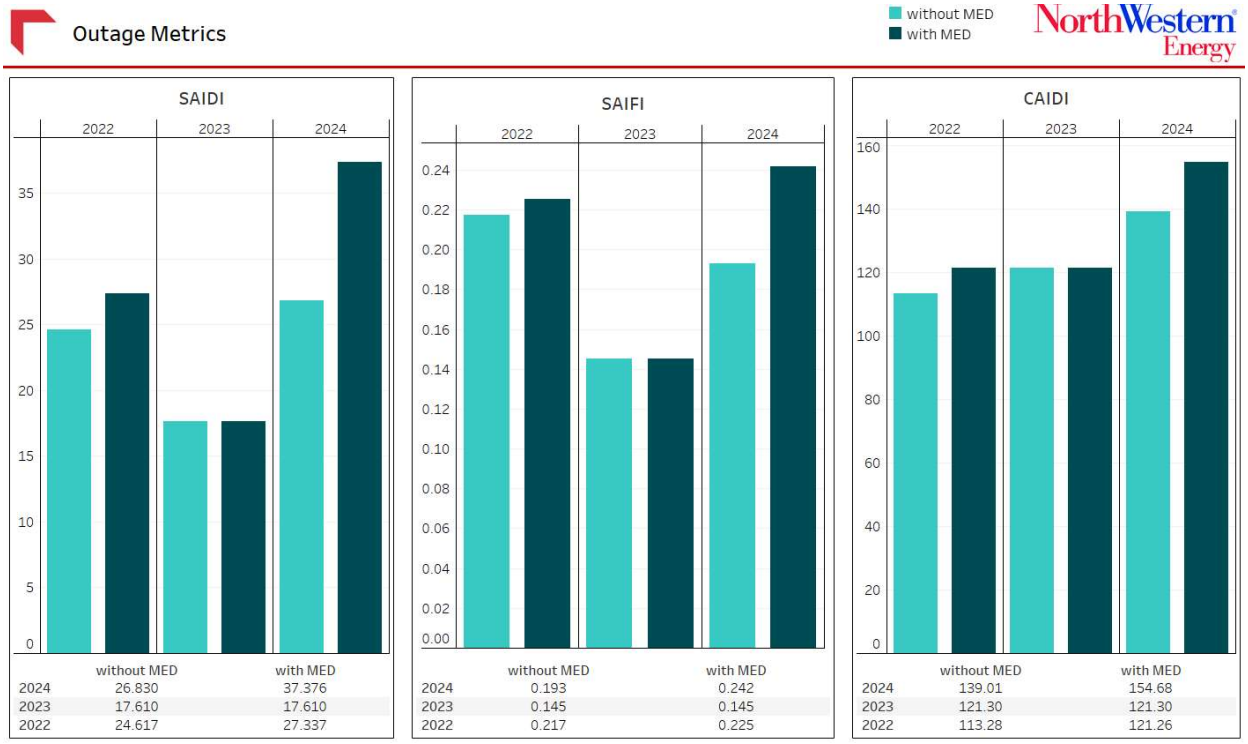

Figure 4.1 Bozeman system indices with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

Bozeman indices increased significantly from the previous year but are still within the range of the previous five years. Significant storms and upgrades to the system contributed to a large number of outages both including and excluding MEDs. Roughly a third of SAIDI minutes, excluding MEDs, within the Bozeman division can be attributed to a weather cause. In addition, a large-scale outage within the Bozeman division occurred in August amidst substation upgrades, which led to longer customer restoration times. Weather events throughout the year like late-season wet snow and summer windstorms contributed to vegetation and equipment failure outages. Scheduled outages still account for the largest category of outage causes.

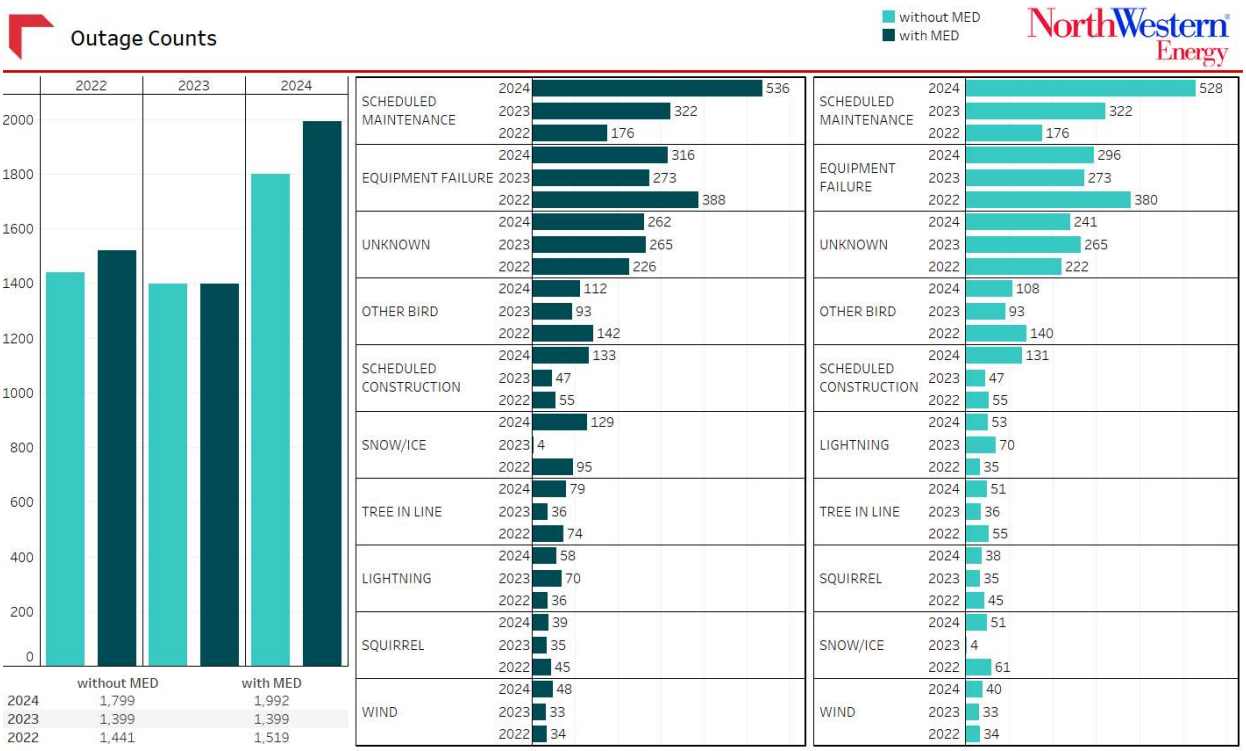

Figure 4.2 Bozeman system outages by top ten causes with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

Scheduled maintenance outages nearly doubled in count from 322 in 2023 to 536 in 2024. While these outages still impact customers, they are generally planned well in advance and prevent large-scale outages from occurring later. Customers are notified prior to planned outages and receive an additional notice once power is restored. Weather-related events caused a spike in snow/ice and equipment failure outages when compared to the 2023 reporting period. The count of unknown outages remains similar to previous years.

5. Butte System Reliability

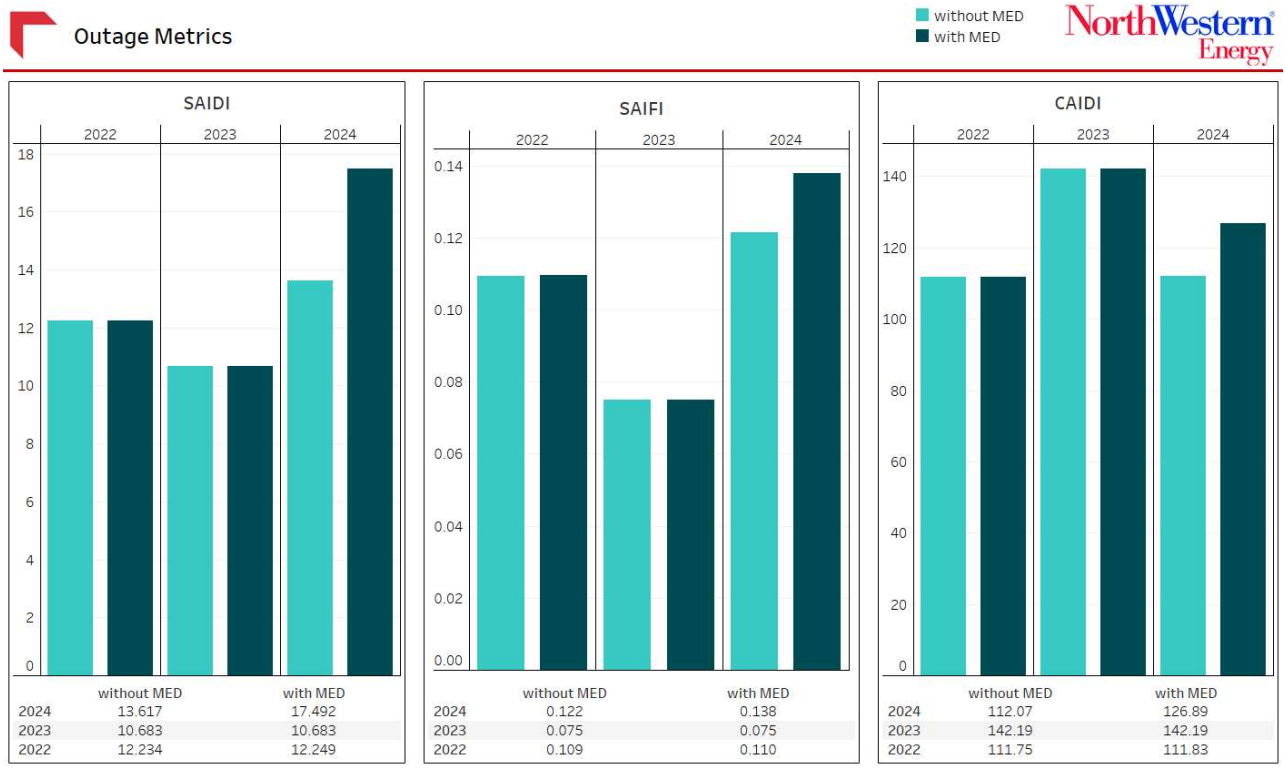

Figure 5.1 Butte system indices with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

Both SAIDI and SAIFI increased from the previous year due to the larger quantity of outages. CAIDI decreased slightly, as customers experienced more frequent, shorter duration outages. As with other areas of Montana in 2024, Butte experienced late spring snowstorms and windstorms in the summer which impacted reliability. A snowstorm on May 22nd contributed to 2.60 of the 17.49 SAIDI minutes, including MEDs, observed by the division.

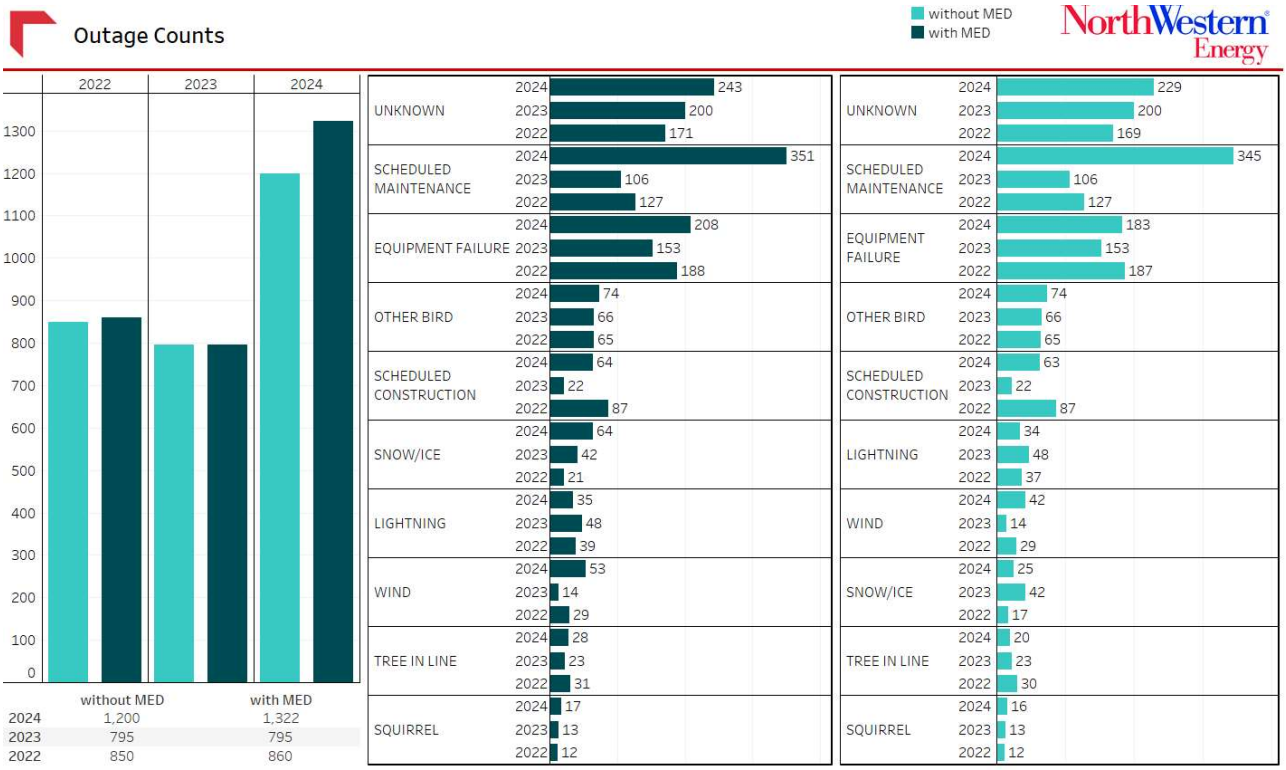

Figure 5.2 Butte system outages by top ten causes with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

The 2024 reporting period disrupted the downward trend in outages for the Butte division. Unknown outages ranked particularly high this year compared to the previous year due to adverse weather conditions. Snowstorms and windstorms also contributed to an increase in equipment failures. Scheduled maintenance remains the largest cause of outages.

6. Great Falls System Reliability

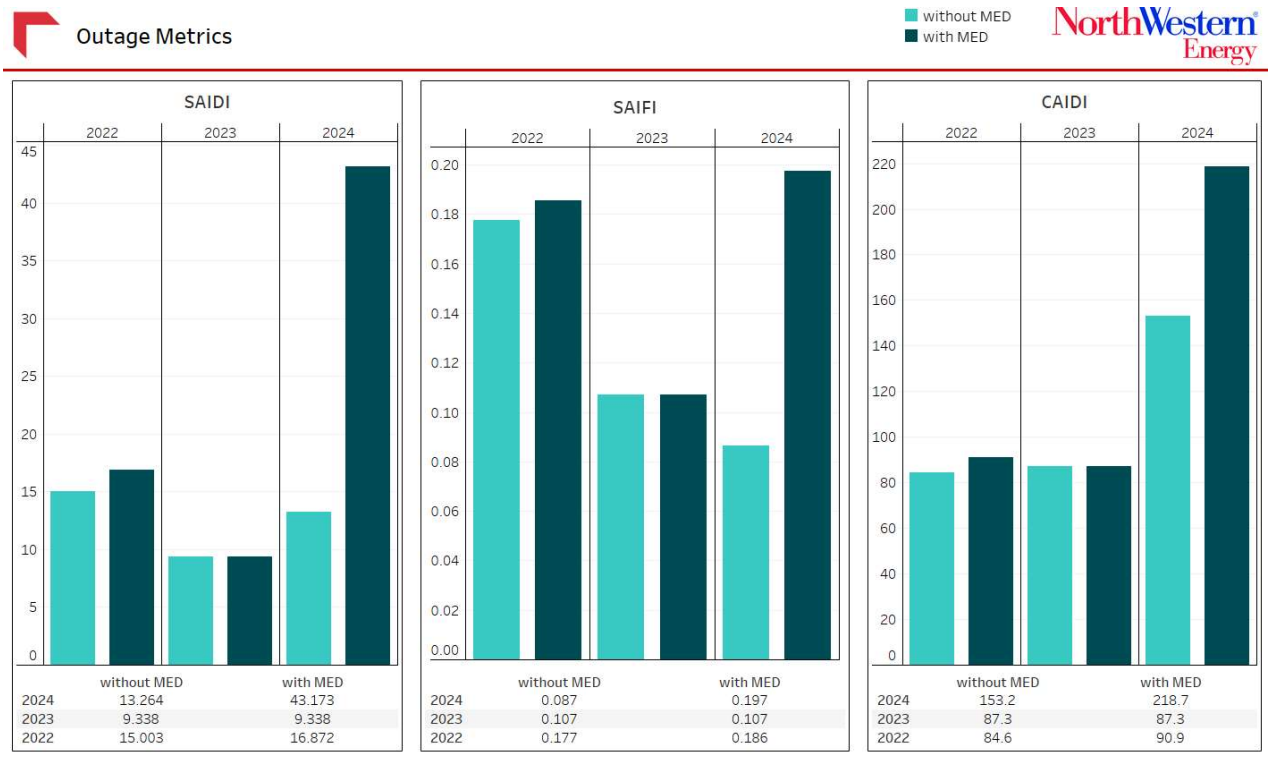

Figure 6.1 Great Falls system indices with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

Great Falls was heavily impacted by two of the MEDs that occurred in 2024. The May 7th and 8th MEDs produced 32.82 SAIDI minutes throughout the Montana region. The Great Falls division incurred roughly 18 SAIDI minutes as a result of this storm. October 5th MED accounted for an additional 8.8 SAIDI minutes. SAIFI decreased in this division as fewer customers experienced outages compared to previous years. Both SAIDI and CAIDI increased from the previous year due to adverse weather conditions that contributed to longer lasting outages. Certain customers in remote areas experienced longer duration outages than typically seen due to the wide-spread impact of weather events.

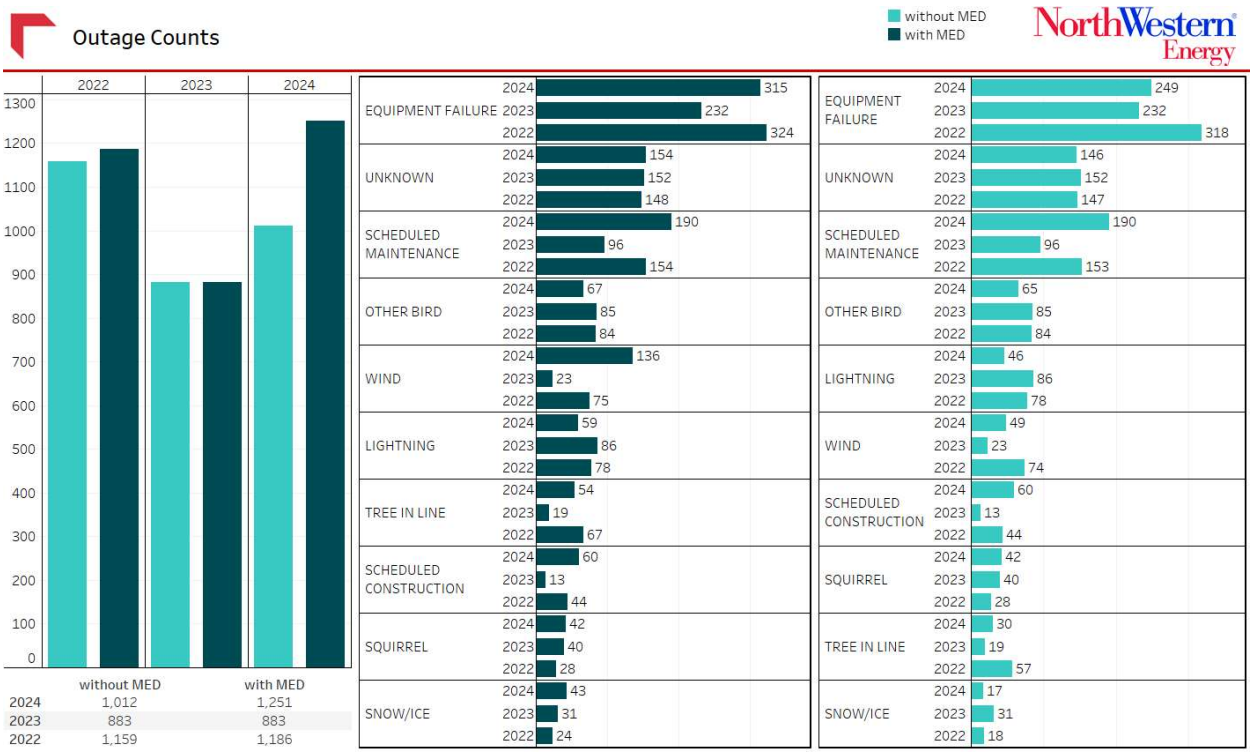

Figure 6.2 Great Falls system outages by top ten causes with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

Outages in 2024 increased from the previous reporting year but remain below the five-year average. Equipment failure continues to rank as the leading outage cause. This outage cause type encompasses a variety of failure modes and commonly occurs during widespread weather events as equipment is subject to conditions beyond which they were designed to withstand. Unknown outages rank steadily compared to previous years. Wind contributed to more outages than previous years and had a large impact on indices including MEDs.

7. Havre System Reliability

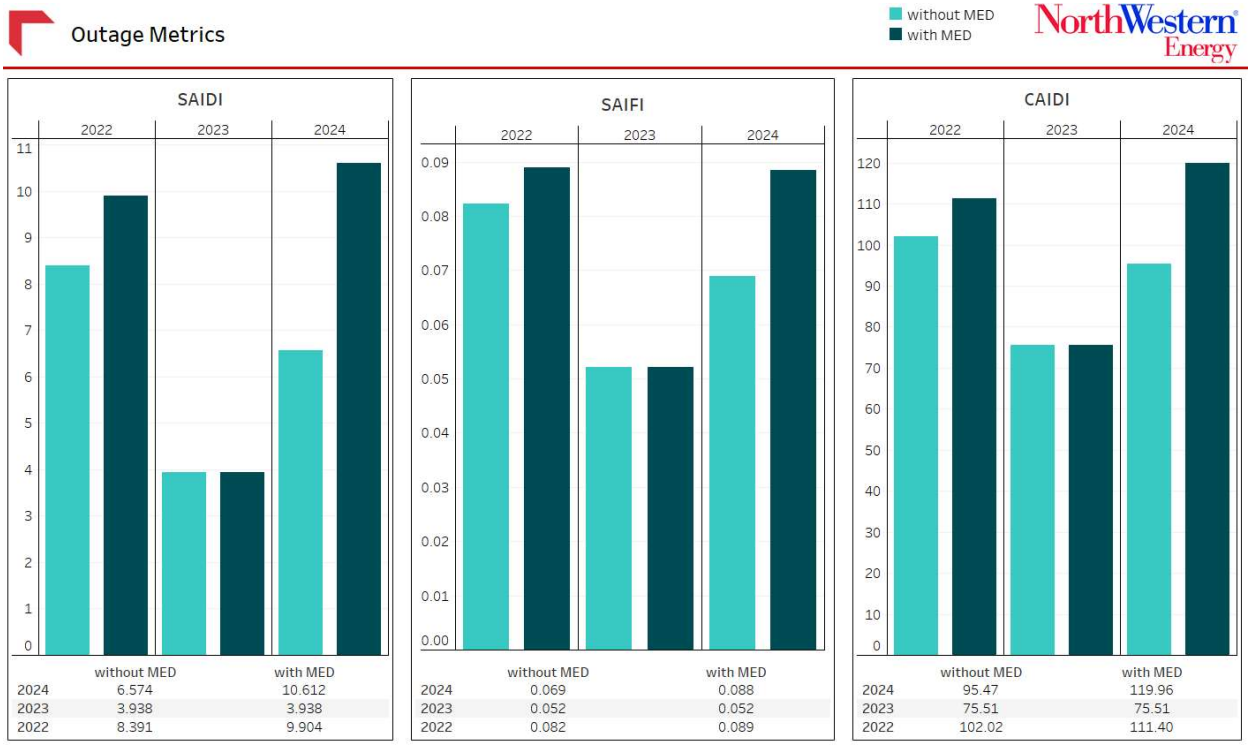

Figure 7.1 Havre system indices with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

SAIDI, SAIFI, and CAIDI increased from the previous year but remained lower than the three-year high in 2022. Havre was also impacted by the May 7th and May 8th MEDs that affected Great Falls, accounting for nearly 10 SAIDI minutes. A subsequent windstorm on October 5th resulted in an additional MED which also impacted the Havre division. This division typically experiences more transmission outages compared to other divisions due to the location of generation sources. Transmission outages reached a five-year low in 2023, accounting for only 2.3 SAIDI minutes. This index further decreased to 2.0 SAIDI minutes in 2024.

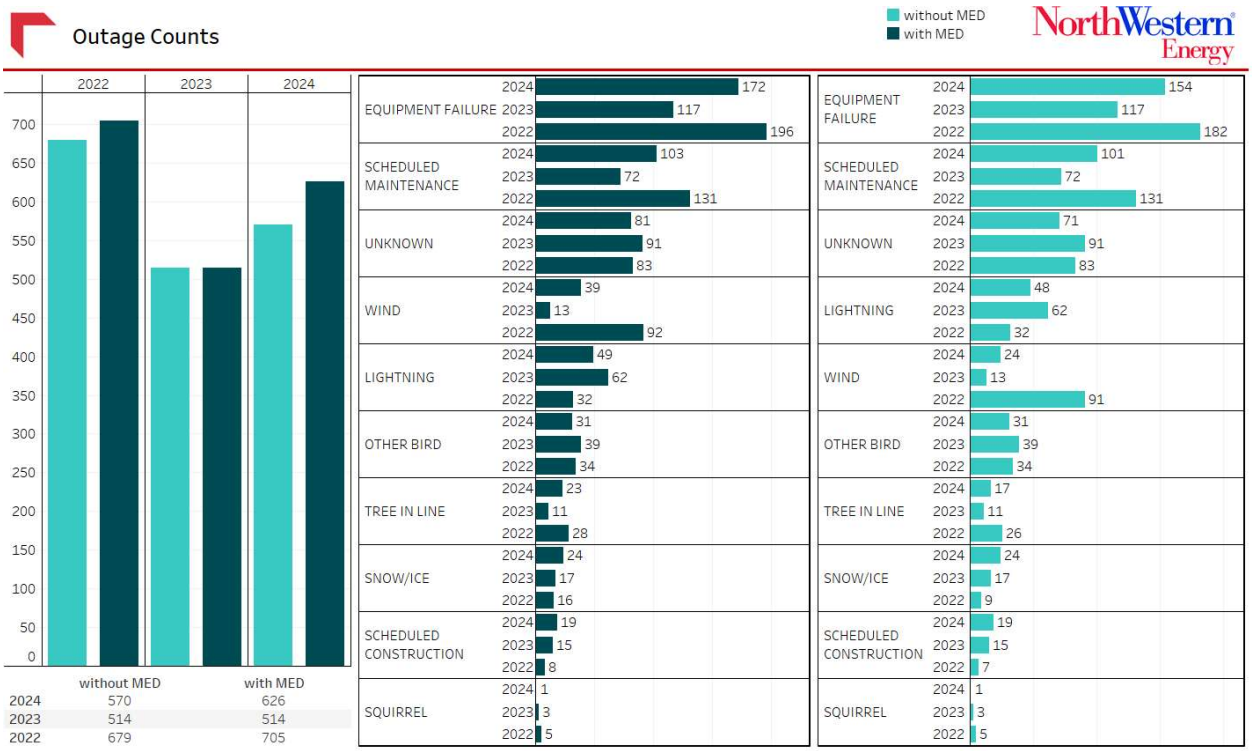

Figure 7.2 Havre system outages by top ten causes with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

Outage counts in 2024 were still below the five-year average but did increase slightly from 2023. The 2023 reporting period saw milder than typical weather conditions, which contributed to favorable reliability indices, whereas the 2024 reporting period experienced more typical weather conditions. Equipment failure, both including and excluding MEDs, continues to rank as a top outage cause. This is consistent with previous reporting years.

8. Helena System Reliability

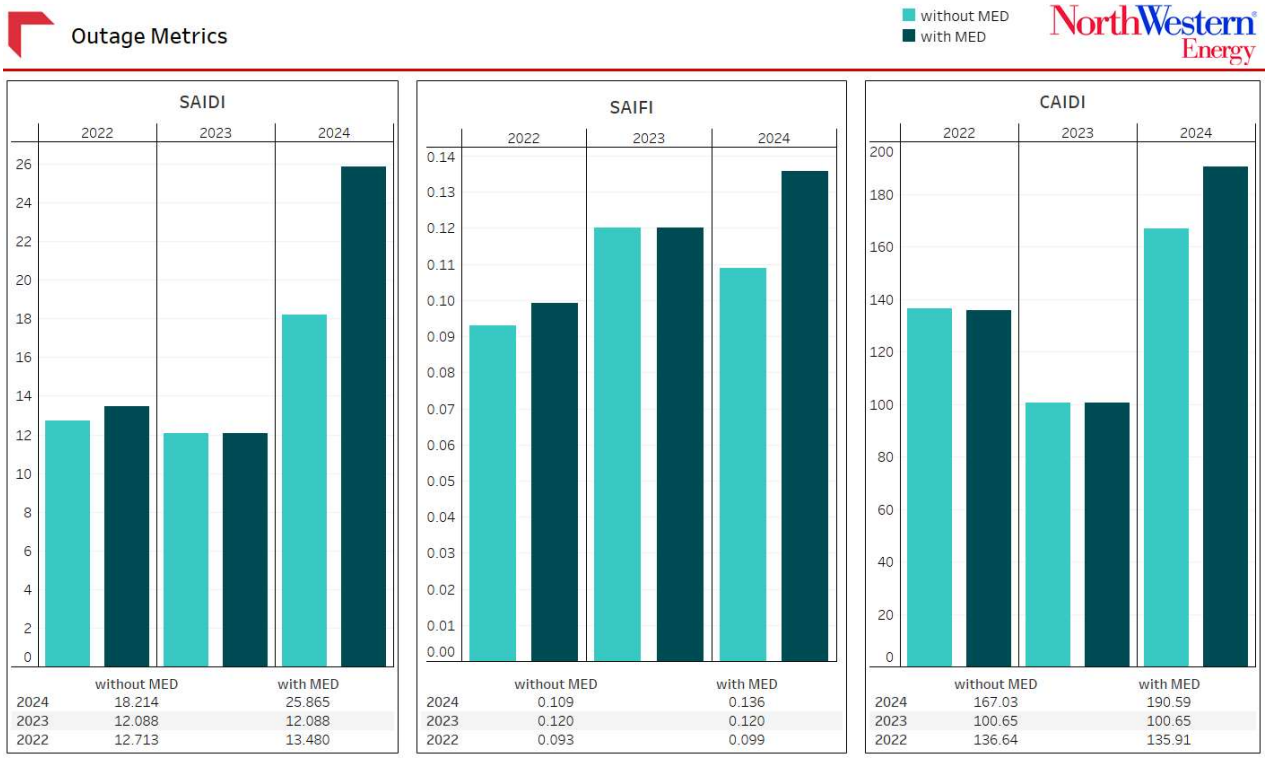

Figure 8.1 Helena system indices with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

SAIFI decreased in 2024 due to the reduced frequency of customers experiencing outages. Both SAIDI and CAIDI increased from the previous reporting year. Much like the other Montana divisions, Helena was impacted by several weather events which were categorized as MEDs. The same storm in early May that devastated the Great Falls division also produced 4.56 SAIDI minutes in the Helena division. Outage restoration efforts occurred over a two-day period which contributed to the reporting of 2 distinct MEDs. The Helena division was also affected by 2 MEDs in August and 1 MED in early October although the reliability impact of these events was less notable compared to the May MED.

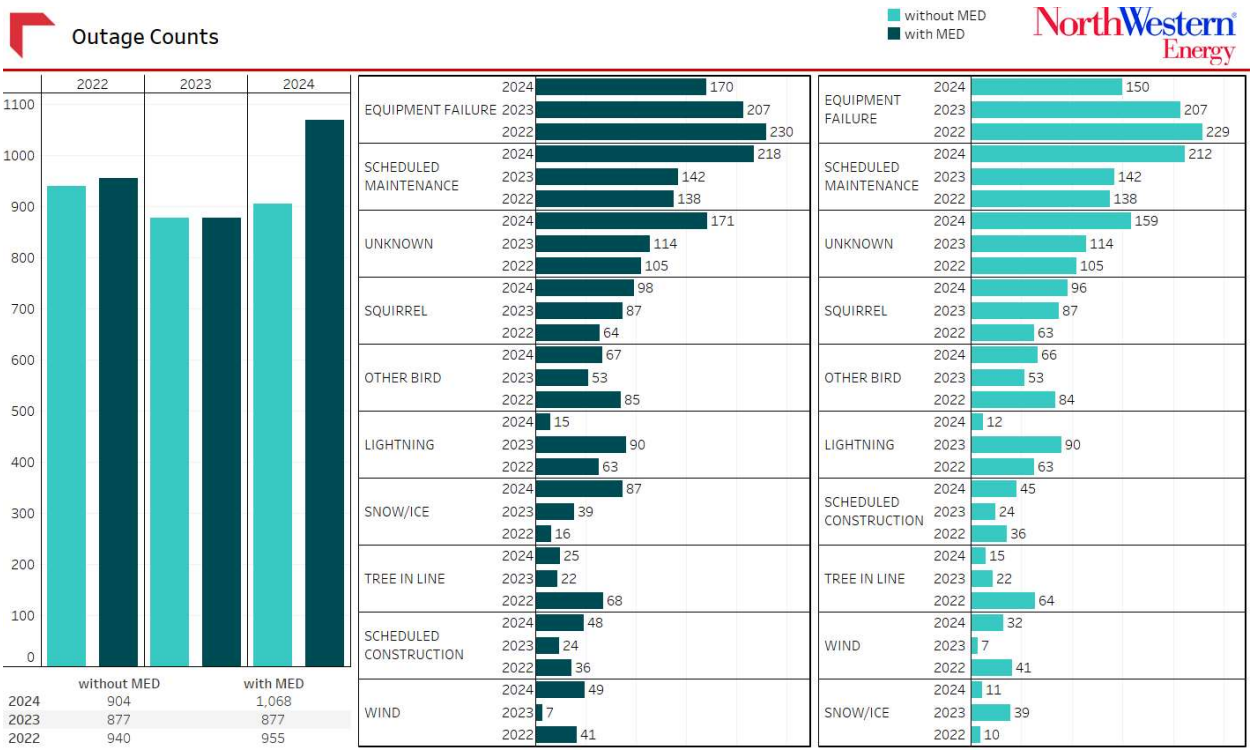

Figure 8.2 Helena system outages by top ten causes with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

The count of outages is within range of previous years and below the five-year average. Much like other divisions, equipment failure continues to rank high on the outage cause list. The outages that did occur were longer in duration, both including and excluding MEDs, which contributed to the increase in SAIDI and CAIDI. Tree in line and other vegetation outages are within range of the previous reporting years. Wind-caused outages increased significantly from 2023.

9. Missoula System Reliability

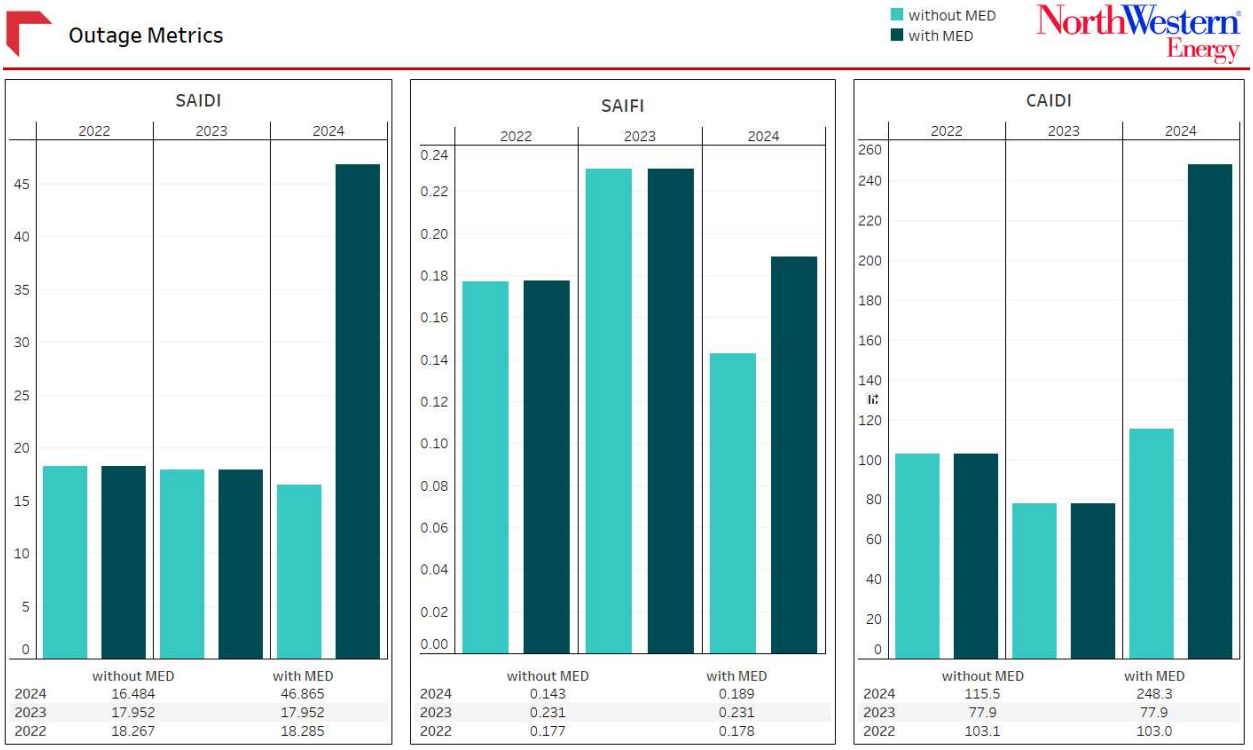

Figure 9.1 Missoula system indices with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

System indices including MEDs rose to a five-year record high in 2024. 46.87 SAIDI minutes were observed in the Missoula division. Excluding MEDs, 16.48 SAIDI minutes were observed in 2024. Removing MEDs from these metrics reveals that SAIDI and CAIDI were comparable to previous years. SAIFI, excluding MEDs, decreased significantly with fewer customers experiencing repeat outages. Missoula was also impacted by the MED in late August. This MED produced 25.1 SAIDI minutes, 22.1 of which were isolated to the Missoula division. The July CAT Event had a large impact in Missoula. However, as previously stated, indices incurred from CAT Events are not included in either metric.

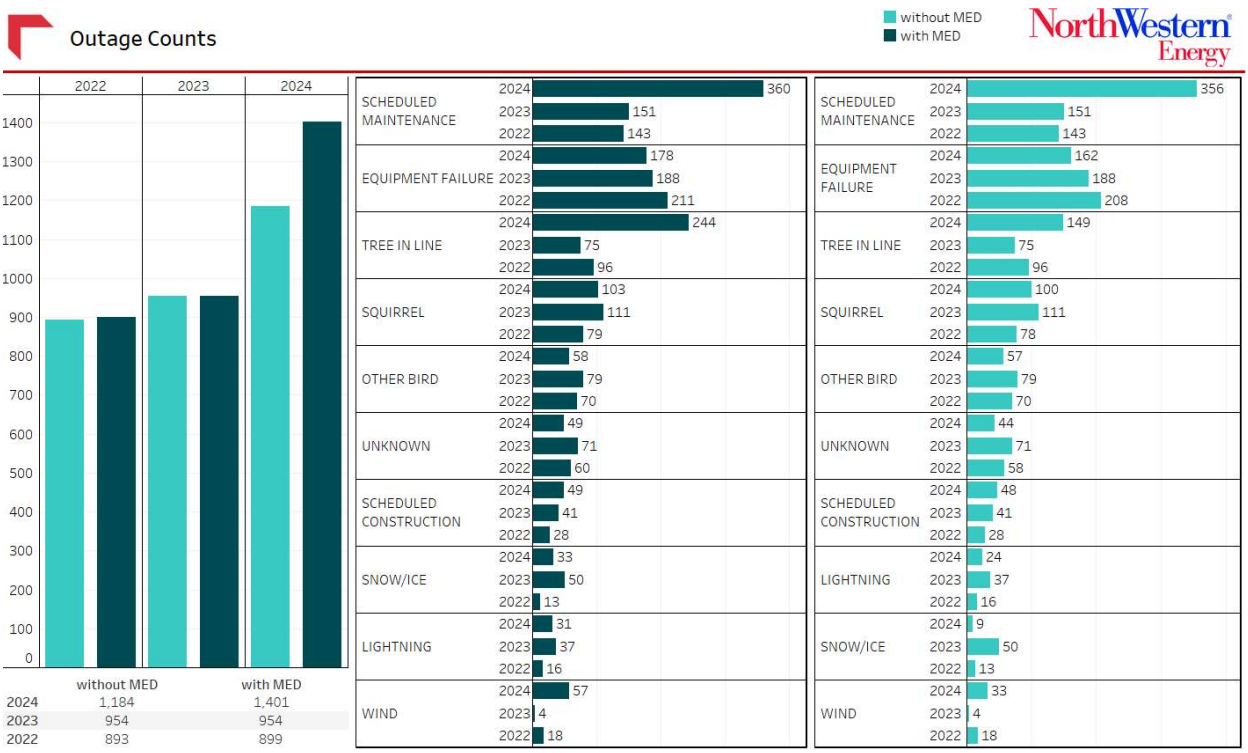

Figure 9.2 Missoula system outages by top ten causes with and without Major Event Days (MEDs) as defined in IEEE Standard 1366-2022.

A total of 1,406 outages occurred in 2024, which is just shy of the five-year record high of 1,490 outages in 2020. Significant system improvements continue to be made in the Missoula division. As a result, the leading outage cause in 2024 was Scheduled Maintenance. Equipment failure, both including and excluding MEDs, decreased from the previous reporting years. Vegetation outages including Tree in line increased significantly in 2024. The extreme windstorms during the summer damaged Missoula's urban canopy and contributed to a significant increase in fall-in outages. Following the major windstorms, NorthWestern's Vegetation Management team worked diligently with landowners and the city to help clear vegetation damaged by the windstorms.

10. Conclusion

The 2024 reporting period produced significantly more weather-related events compared to the previous 3 years. The most notable of these events include the May winter storm in Great Falls and July windstorm in Missoula. In total, there were 7 Major Event Days (MEDs) and 1 4-day Catastrophic (CAT) Event. The CAT Event in Missoula produced the largest SAIDI impact in NorthWestern history and is the first CAT Event since 2021.

System indices continue to perform within range of the previous years when adjusting for the MEDs and CAT Events. Advanced Metering Infrastructure (AMI) and deployment of InService outage reporting has enabled more accurate tracking of reliability metrics. Planned outages including Scheduled Maintenance and Construction rank within the top 10 outage causes for all divisions. Equipment failure and unknown outages continue to rank high on the outage cause lists and encompass a variety of failure modes. Ongoing efforts are dedicated to analyzing these outage causes and continuously improving the system. Transmission and loss of power supply issues persist, which impacts the distribution system. Established preventative maintenance programs and new innovations will further enhance reliability and reporting initiatives. NorthWestern Energy strives to provide safe, reliable electric service to our customers and a safe working environment for our employees, now and into the future.

CERTIFICATE OF SERVICE

I hereby certify that the 2024 Electric Reliability Report in Docket No. 2025.01.002 has been e-filed with the Montana Public Service Commission and emailed to the email list below.

Date: February 28, 2025

/s/ Tracy Lowney Killoy
Tracy Lowney Killoy
Administrative Assistant

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