



March 1, 2024

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

RE: 2023 Annual Electric Reliability Report – Docket No. 2024.01.002

Dear Mr. Rosquist:

With this letter, NorthWestern Corporation d/b/a NorthWestern Energy submits the 2023 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:

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Sincerely,

Alyssa Bender, P.E.

Enclosure: 2023 Annual Electric Reliability Report

NorthWestern[®] Energy

2023
-Montana-
Electric Distribution
Annual Reliability Report



March 2024

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EXECUTIVE SUMMARY

This report provides information and insights into NorthWestern Corporation d/b/a NorthWestern Energy's (NorthWestern) 2023 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.

System indices are given for the NorthWestern Montana operating region and are also broken down into the seven operating areas of the state: Billings, Bozeman, Butte, Great Falls, Havre, Helena, and Missoula. As with the previous years' annual reports, the IEEE Standard 1366 will again be followed. This standard is directly related to the use of a statistically based definition for classification of Major Event Days (MEDs) – also commonly referred to as the 2.5 Beta Method. MEDs are days in which the regional SAIDI exceeds a statistically derived threshold value and in which the electric system experienced stresses beyond normal operating conditions (such as a severe weather storm) and often requiring additional crews be brought into the area for repairs.

NorthWestern implemented the InService mobile work force and outage management system during the fall of 2014. In 2020, NorthWestern began implementing the Advanced Distribution Management System (ADMS) to replace the InService mobile work force. In 2021, improvements were made to ADMS for more timely and accurate outage reporting and this was again followed in 2022 and 2023 reporting. Outage customer counts and times are derived from the Geographic Information System, call logging, and automated systems, though new equipment is being installed that allows for NorthWestern controllers to determine when devices are out of power without the need for customers to call in. Both IEEE and the Department of Energy reports indicate that SAIDI numbers normally increase with this improved accuracy, but with the unpredictability of nature, this may be difficult to determine for some time.

MEDs are identified through a daily process for each region and can be included or excluded per the data requested. This report will provide all information, including and excluding MEDs, for all three indices to better demonstrate and allow for analysis of normal versus emergency conditions. In 2023, NorthWestern's Montana service territory experienced no MEDs. An MED would have been declared if there were more than 5.78 SAIDI minutes in a 24-hour period in 2023.

The IEEE reliability standard does not define the 24-hour day, and many of the utilities involved in the IEEE benchmark survey have gone to something other than midnight-to-midnight. Some will “roll” the 24 hours to more accurately capture the full impact of a storm day (and possible MED). NorthWestern implemented this option in 2015.

There were no catastrophic events in 2023. NorthWestern has defined a “Catastrophic Event” as a sequential series of days that begins with an MED and has a combined SAIDI that is seven times the MED threshold, or 40.43 SAIDI minutes in 2023. Catastrophic events are not included in any reliability metric.

1. GENERAL

1.1 Reliability indices calculation

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

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

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

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

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. CAIDI is also typically thought of as the average restoration time.

2. MONTANA SYSTEM RELIABILITY

Outage Metrics

■ without MED
■ with MED

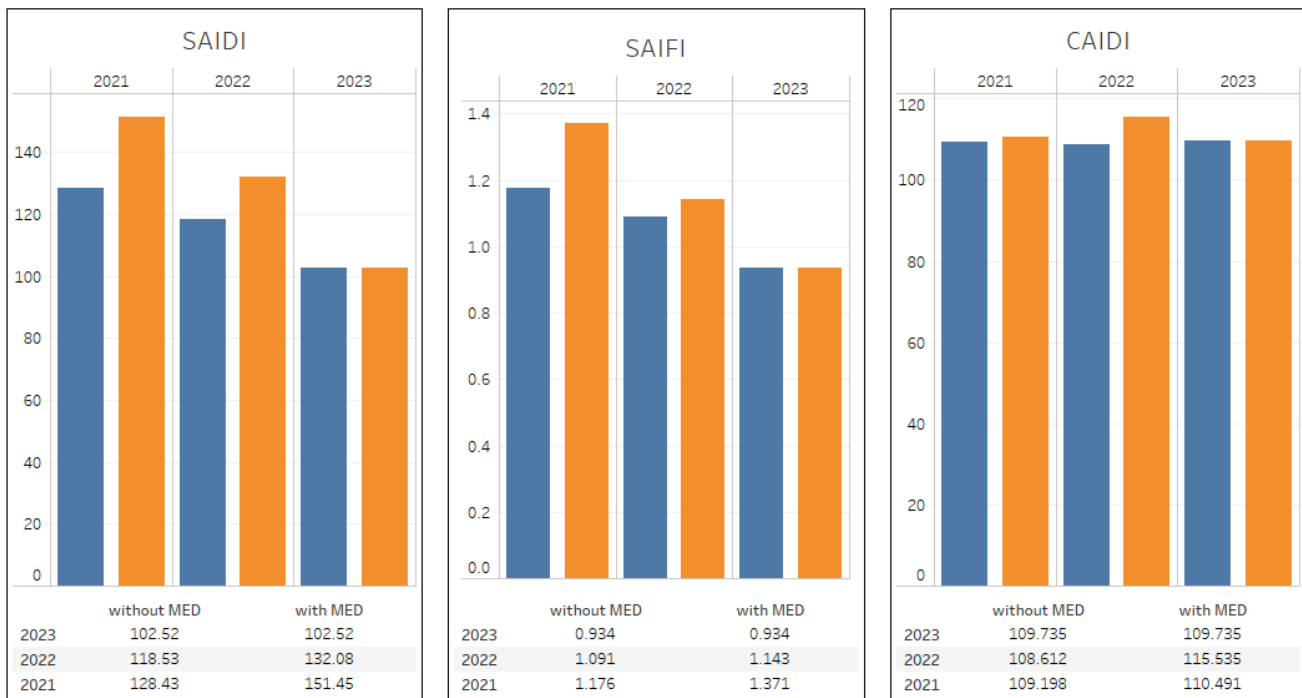


Figure 2.1 Montana system indices with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

The figure above displays NorthWestern’s Montana region indices for the years 2021-2023 from year-end audited data. Please note that SAIDI and CAIDI are given in minutes and SAIFI is given in the frequency of occurrence. There were no MEDs in 2023 and reliability for the service territory was significantly better than normal.

Contributing factors to system reliability will be discussed as each of the operating divisions of the Montana region are examined and in the report conclusion. Data and figures are presented that characterize the system reliability both with and without MEDs to demonstrate the effect MEDs had on the system reliability in previous years.

Outage Counts

without MED
with MED

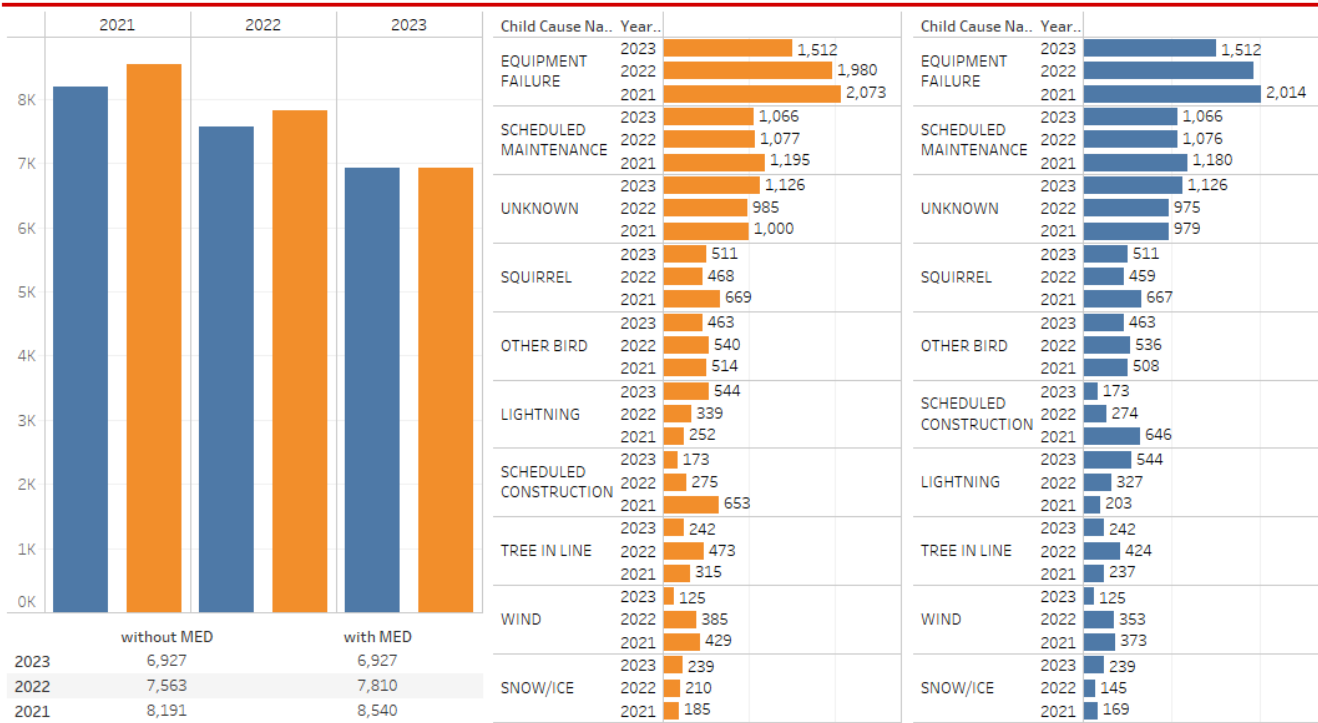


Figure 2.2 Montana system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

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 decreased again in 2023 and remain below average in comparison to five-year data.

Equipment Failure is the most common of unscheduled outage causes due to the broadness of the category. Outages can be related back to Equipment Failure in many different ways, making it customarily the largest outage cause on the system. However, scheduled outages (Maintenance and Construction) are also among the most significant outage causes, accounting for approximately a fifth of the total outages experienced in 2023. Unknown causes of outages continue to remain a top contributor, though most often these outages only affect a single customer or occur during a weather event (rain, thunderstorm, etc.). Animals remain high on the list and outages caused by lightning have been steadily increasing. The remaining top 10 outage causes have been fairly steady in number in recent years.

3. BILLINGS SYSTEM RELIABILITY

Outage Metrics

■ without MED
■ with MED

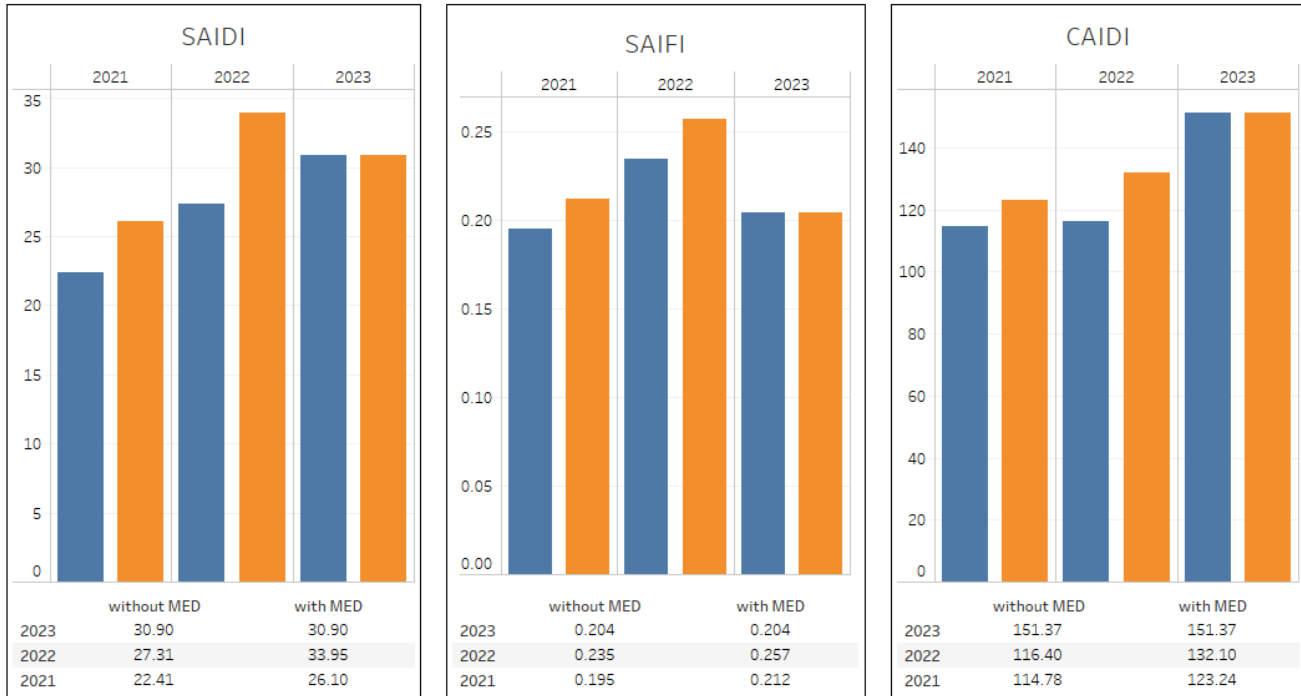


Figure 3.1 Billings system indices with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

SAIDI with MED decreased from the previous year, though overall trends are increasing in the Billings Division. There was a snowstorm in the Rockvale and Fromberg areas at the end of March that caused significant outages and then another storm in April had a large impact in the Roundup area. Three other days of outages in July, August, and September due to animals, wind, and a hit-pole added an additional 4.5 SAIDI minutes. These five events account for a total of nearly half of all the SAIDI in this division for 2023. With the increase in SAIDI there was also an increase in the CAIDI metrics, especially as SAIFI has been steady for the previous several years.

Outage Counts

■ without MED
■ with MED

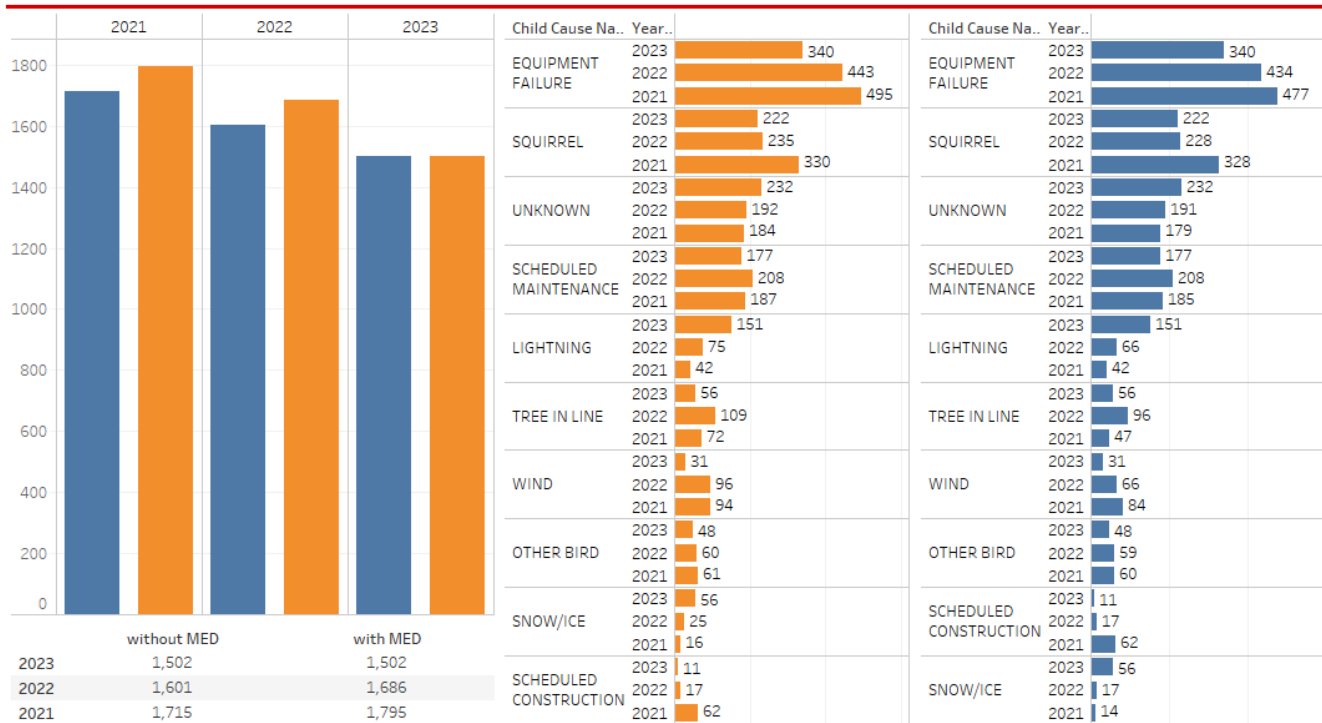


Figure 3.2 Billings system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

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. As with previous years, squirrel activity still remains high on the cause list. Unknown outages have increased in comparison to previous years though some of these seem to be due to transmission problems or contributing weather and the remaining only impact a single customer or two with minimal disruption reported. The number of scheduled outages remains high on the list, indicating that maintenance and construction are being done proactively to mitigate longer, reactive outages.

4. BOZEMAN SYSTEM RELIABILITY

Outage Metrics

■ without MED
■ with MED

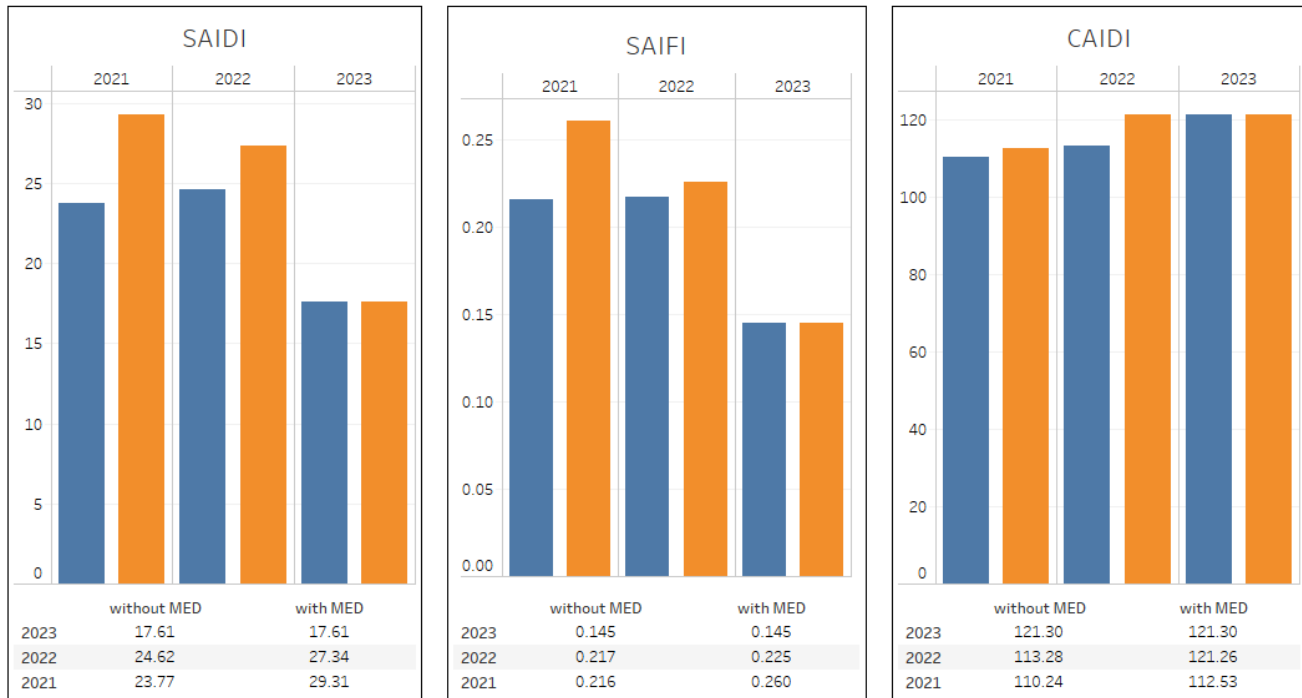


Figure 4.1 Bozeman system indices with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

Bozeman division indices dropped significantly in 2023. There were no major storms, MEDs or large outages during the year. Outages on underground sections in this area continue to be a large contributor due to the prevalence of this configuration in this area. Although there were no major storms, adverse weather still accounted for a large number percentage of outages in the Bozeman division with wind and snow credited for around fifteen percent of SAIDI. These values are significantly reduced in comparison to previous years, however.



Outage Counts

■ without MED
■ with MED

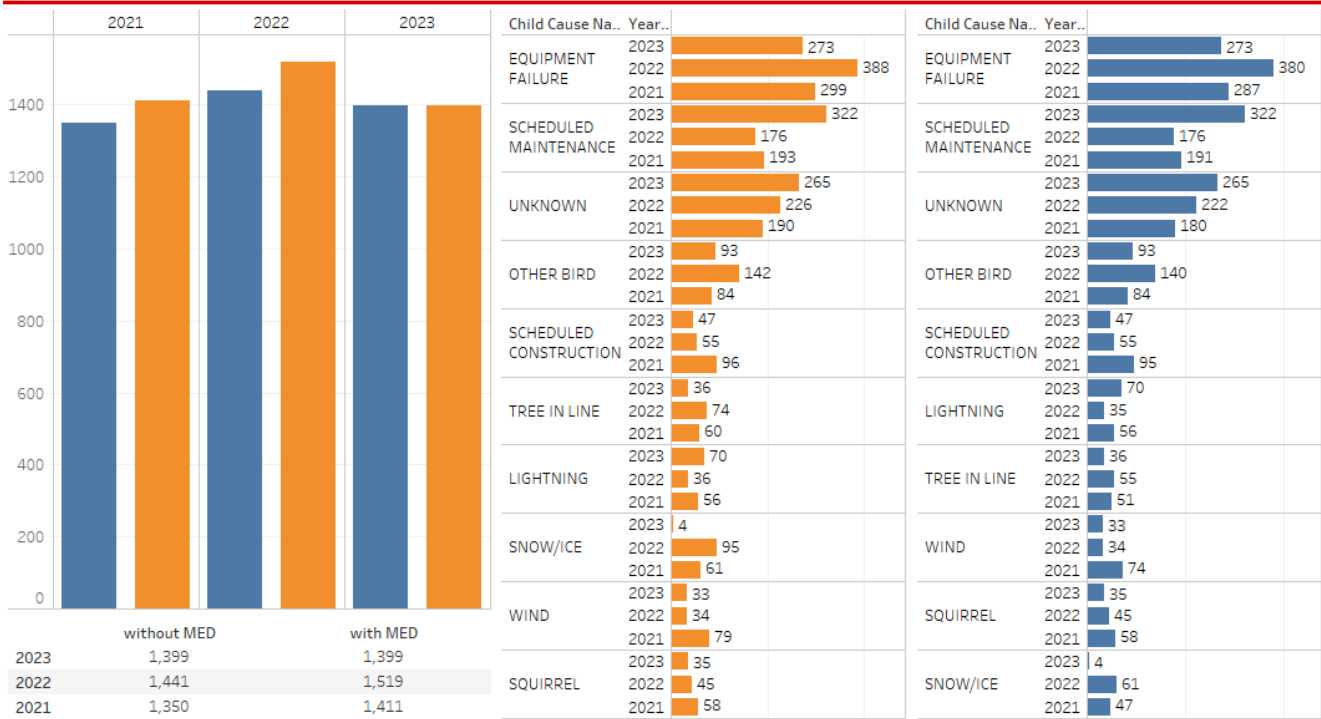


Figure 4.2 Bozeman system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

Equipment failure significantly decreased in 2023, though the three-year average keeps this at the top of the list for outage count. Scheduled maintenance increased nearly two-fold in the same period of time, meaning outages were being taken proactively to prevent the reactive outages that often last longer. Unknown outages are on the rise as well but the remaining categories show a steady trend or decrease.

5. BUTTE SYSTEM RELIABILITY

Outage Metrics

■ without MED
■ with MED

NorthWestern
Energy

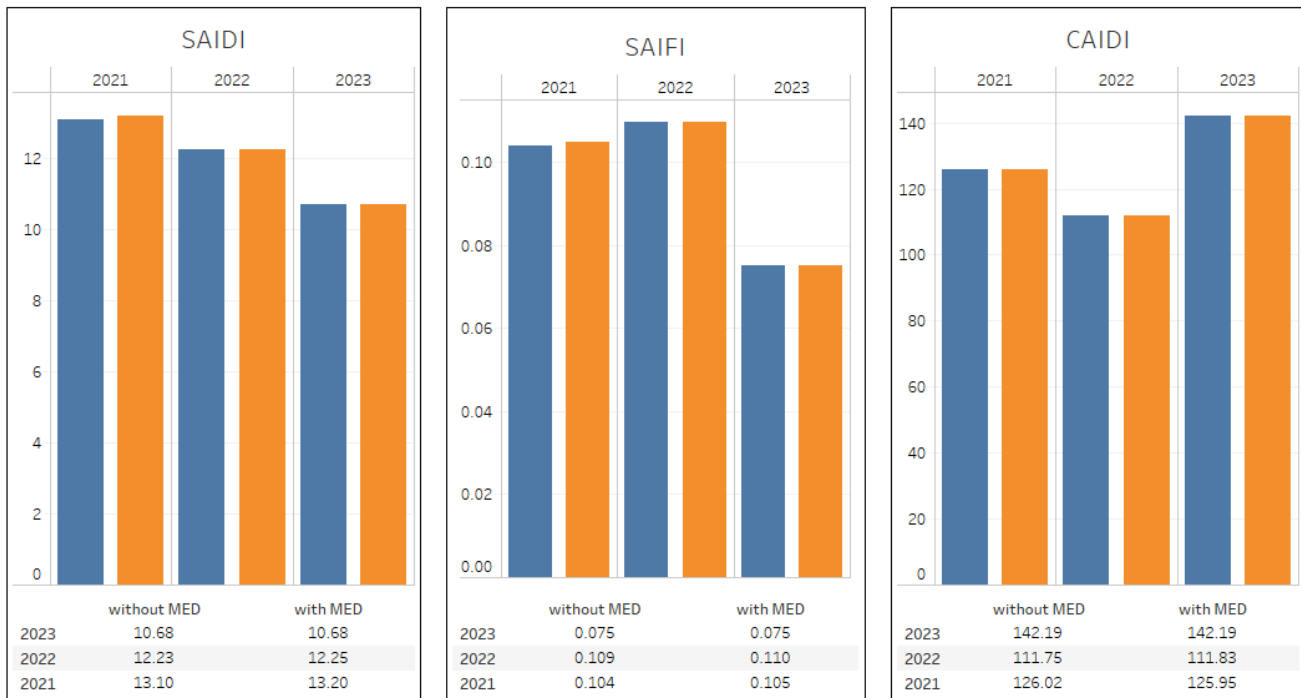


Figure 5.1 Butte system indices with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

SAIDI and SAIFI metrics again decreased in 2023. Because of the large decrease in SAIFI in relation to SAIDI, however, CAIDI metrics are higher than they have been in previous years. Outages due to storms accounted for nearly one third of all SAIDI in this region. Outages due to line equipment, ranging from insulators to transformers and cutouts, also had a significant impact on reliability in the region, accounting for over a quarter of all outages. Vegetation-caused outages decreased significantly in 2023.

Outage Counts

■ without MED
■ with MED

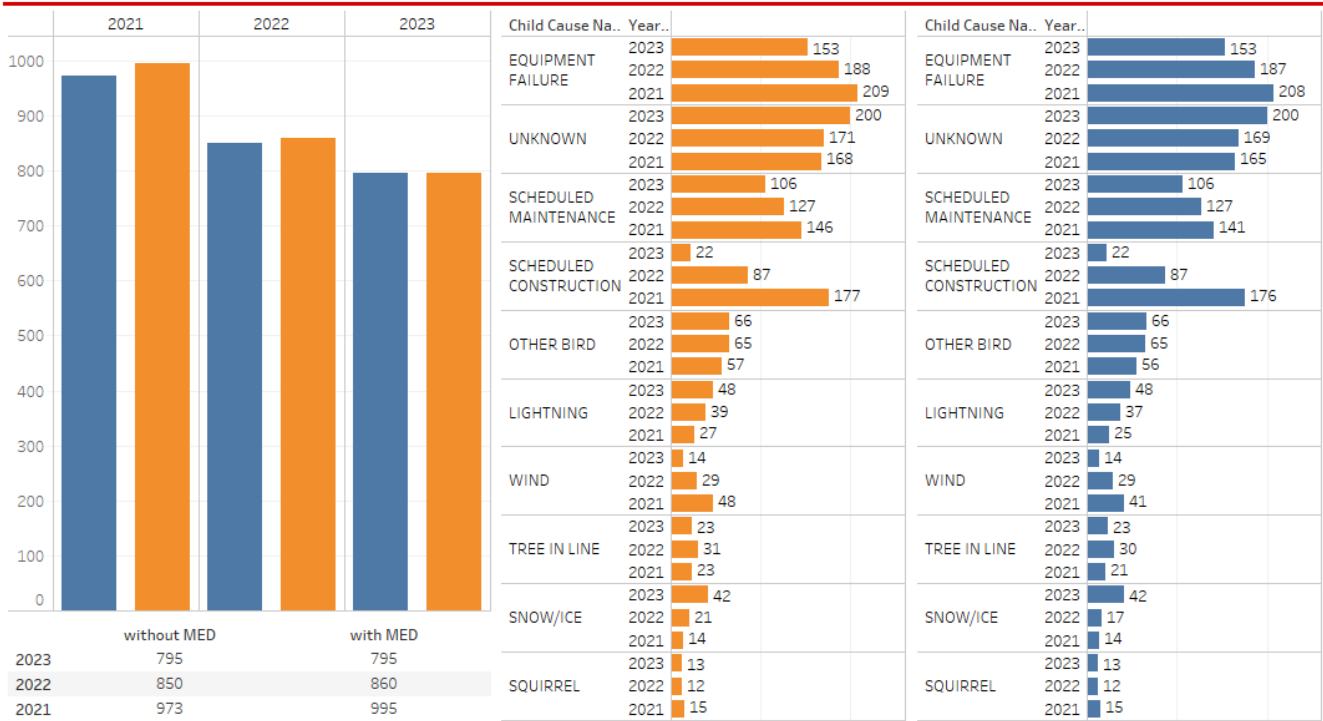


Figure 5.2 Butte system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

Butte continued to see a decrease in outages in 2023. Most of the top ten categories have decreased, though Unknown outage causes did increase slightly. Scheduled outages accounted for almost a fifth of outages in the region whereas animals, weather, lightning and other natural causes accounted for over a quarter of the outages.

6. GREAT FALLS SYSTEM RELIABILITY



Outage Metrics

■ without MED
■ with MED

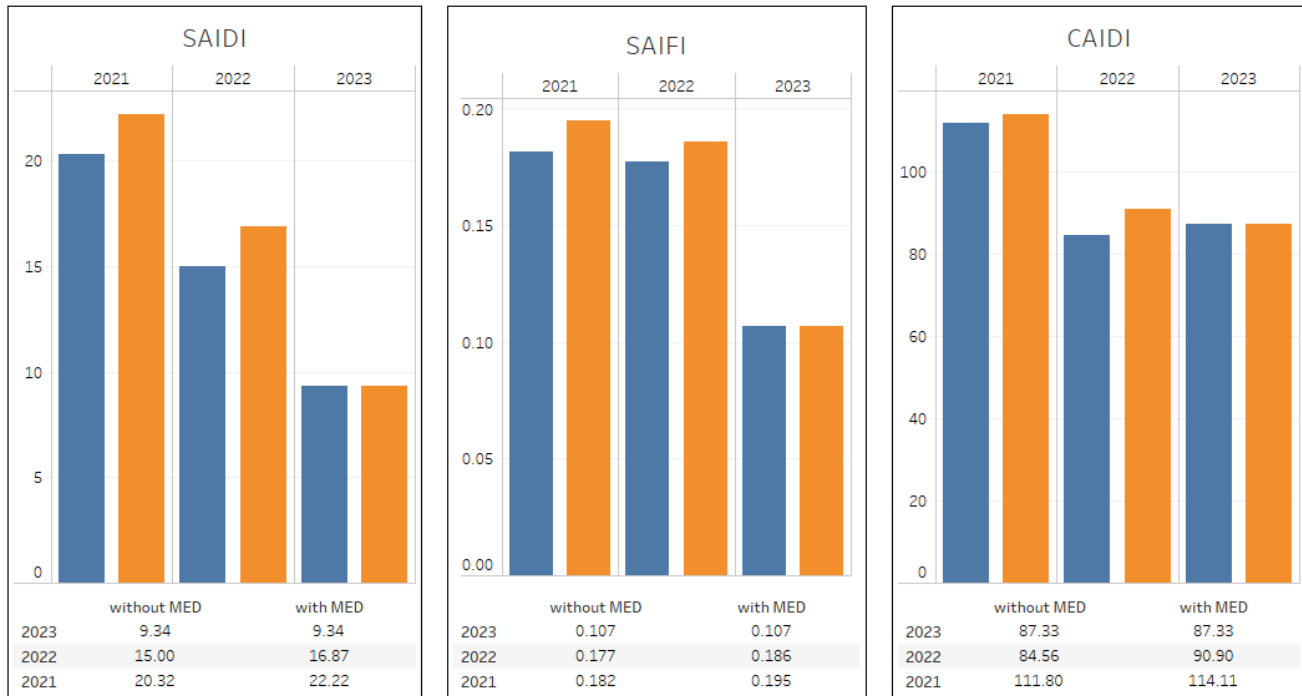


Figure 6.1 Great Falls system indices with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

As with elsewhere in the state, Great Falls experienced no MEDs in 2023. Weather did have an impact in this division, however, accounting for 2.2 SAIDI minutes of outages. Indices overall in this region decreased by almost half for SAIDI and SAIFI and stayed steady for CAIDI metrics.

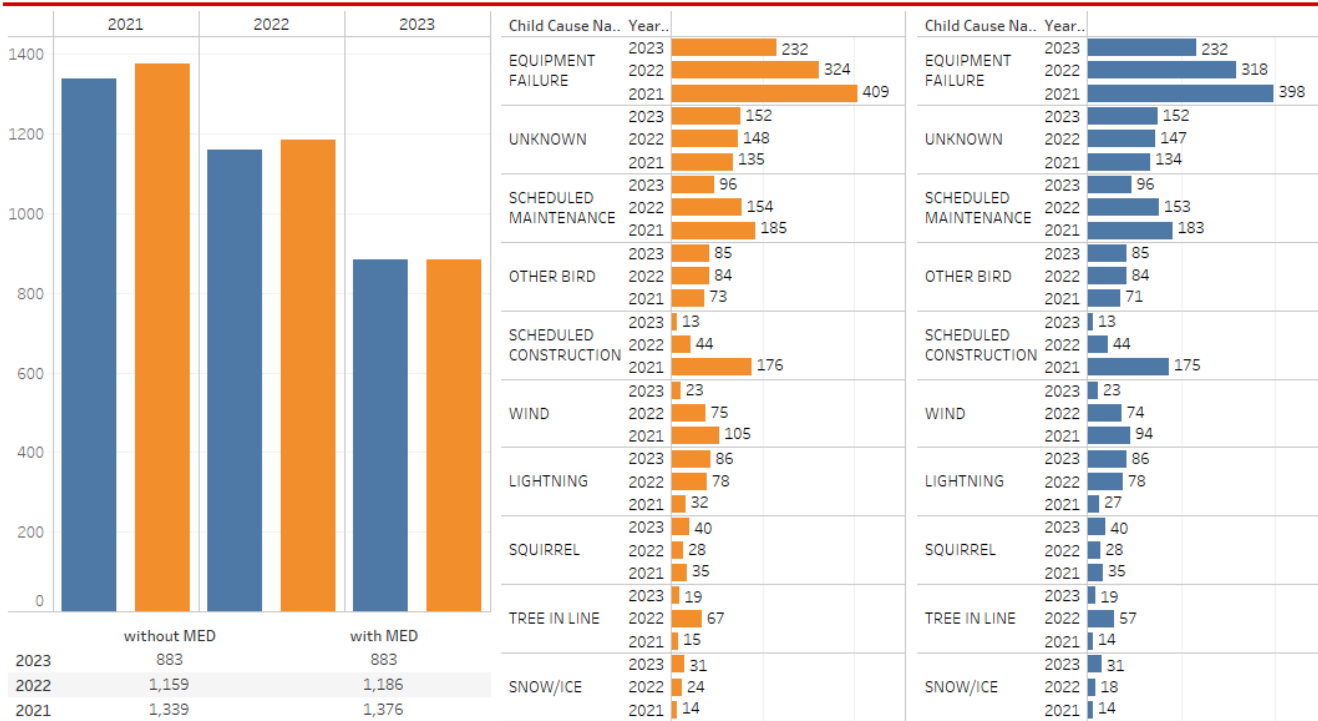


Figure 6.2 Great Falls system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

Outages in 2023 were well below five-year averages. Equipment failure outages decreased by almost half since 2021 and most other categories are seeing a downward trend as well. Unknown, bird, and lightning outages did increase slightly in 2023.

7. HAVRE SYSTEM RELIABILITY



Outage Metrics

■ without MED
■ with MED

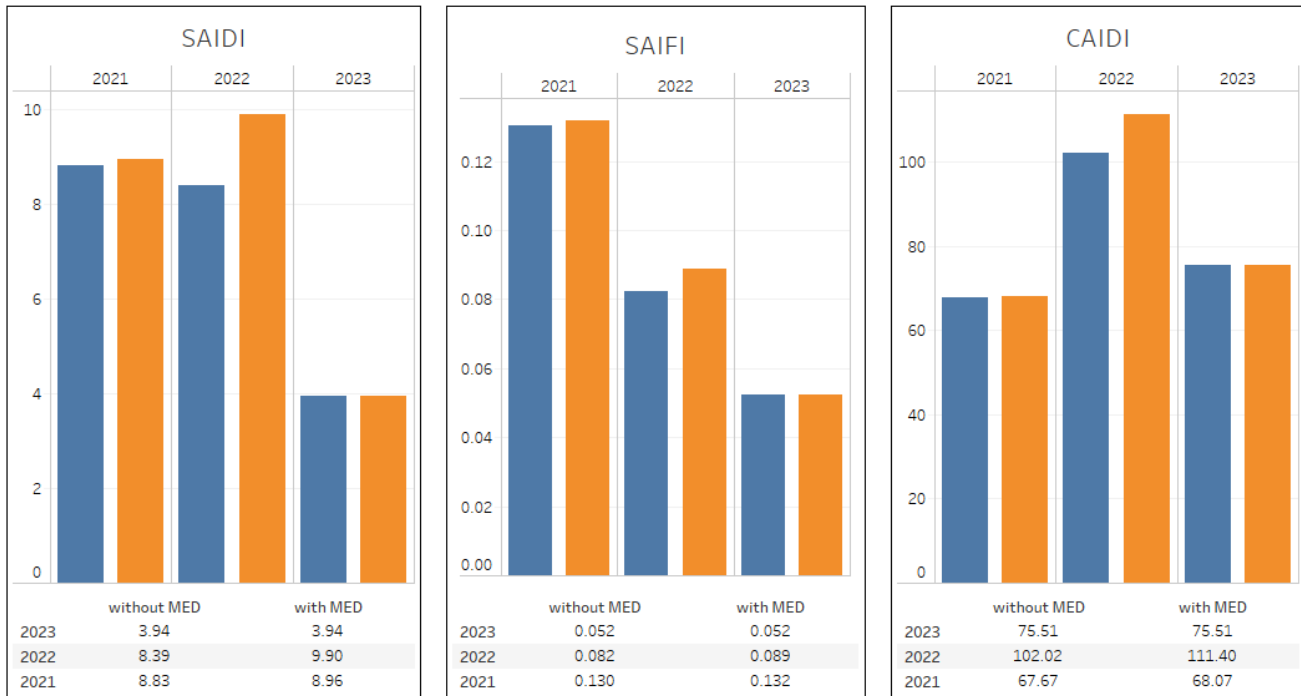


Figure 7.1 Havre system indices with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

Havre had an exceptionally good year for SAIDI and SAIFI, likely due to the lack of storms in the region. Transmission line outages (NorthWestern and non-NorthWestern) usually contribute 4-6 SAIDI minutes to this region, but in 2023 only accounted for 2.3 SAIDI. Weather-caused outages also decreased from around 1 SAIDI minute annually to less than 0.4 SAIDI minutes in 2023.

Outage Counts

■ without MED
■ with MED

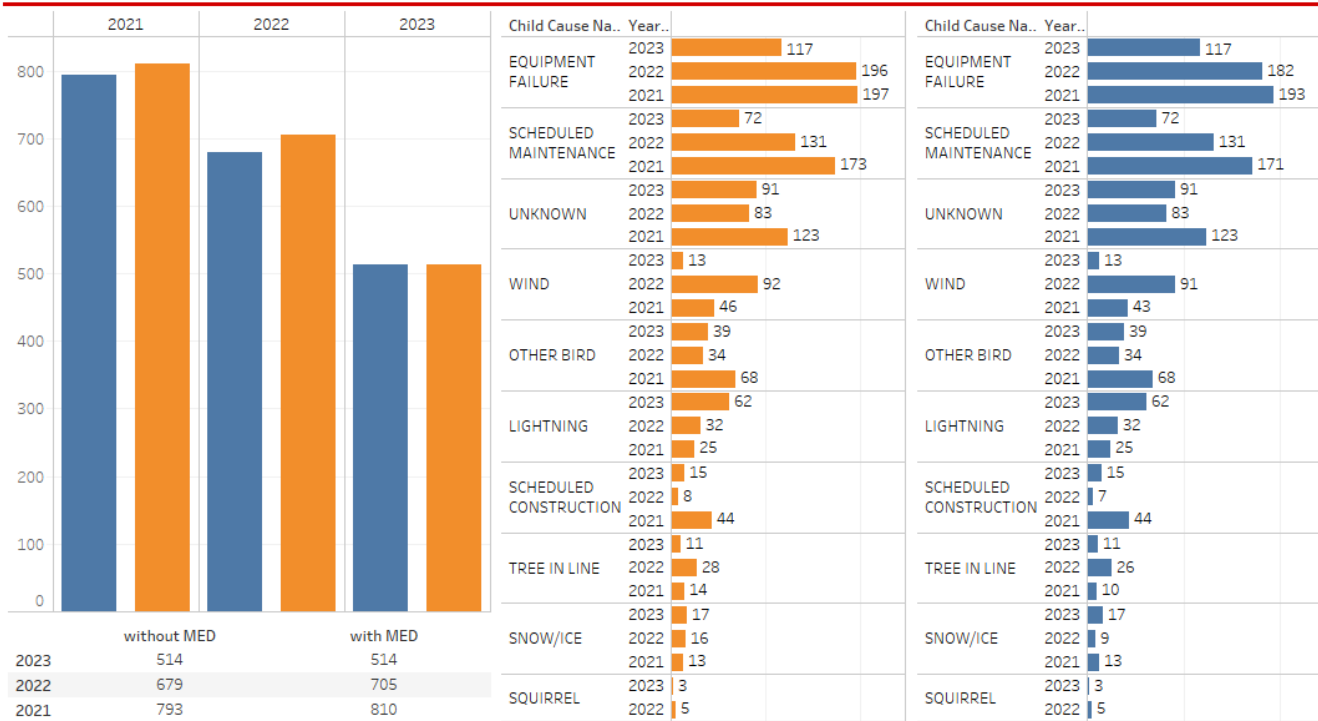


Figure 7.2 Havre system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

Outage counts were also drastically reduced in 2023, with most of the top ten outage causes decreasing since the previous year. Outages due to equipment failure still were the highest contributor of nearly a quarter of all outages, with the largest number of these outages attributed to insulators, arrestors, and conductor.

8. HELENA SYSTEM RELIABILITY



Outage Metrics

■ without MED
■ with MED

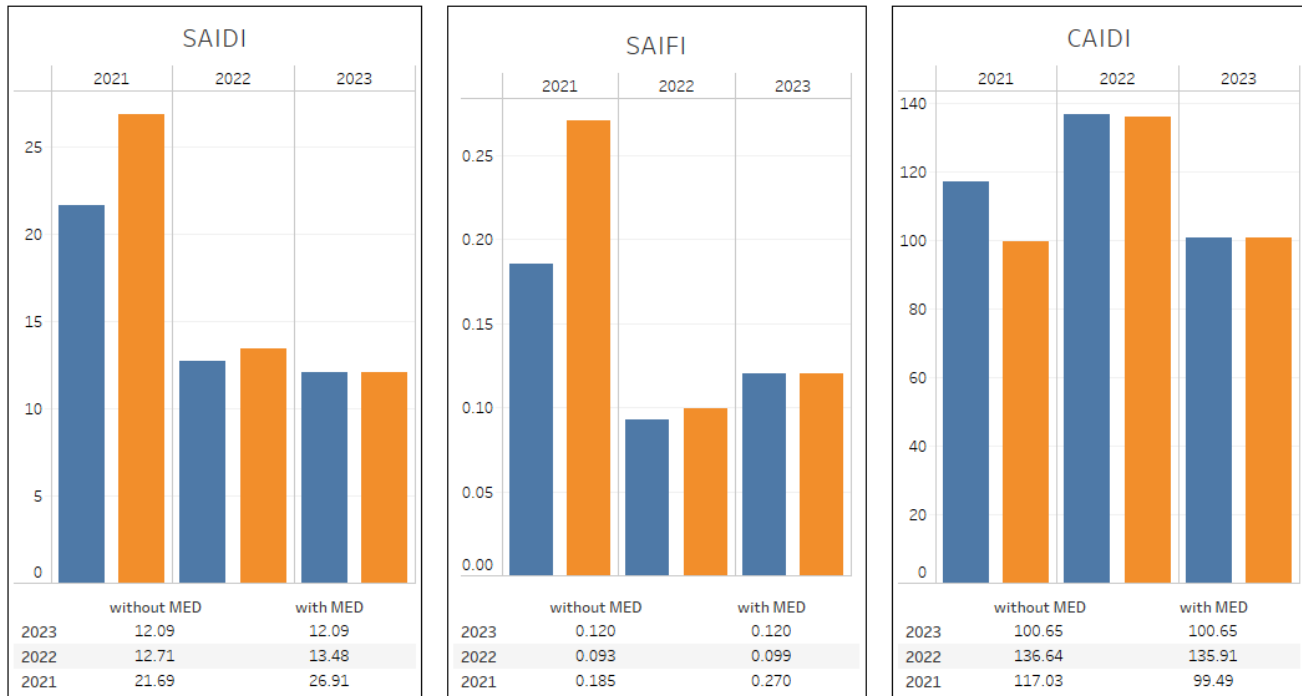


Figure 8.1 Helena system indices with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

Helena has had two years in a row of remarkably good reliability. SAIDI and SAIFI stayed similar to last year's metrics while CAIDI decreased. The annual 12 SAIDI minute metric achieved in both 2022 and 2023 is significantly below the five-year average in the Helena division of 16 SAIDI minutes. Natural causes such as animals, weather, and vegetation added up to over a third of the SAIDI in this region in 2023.



Outage Counts

■ without MED
■ with MED

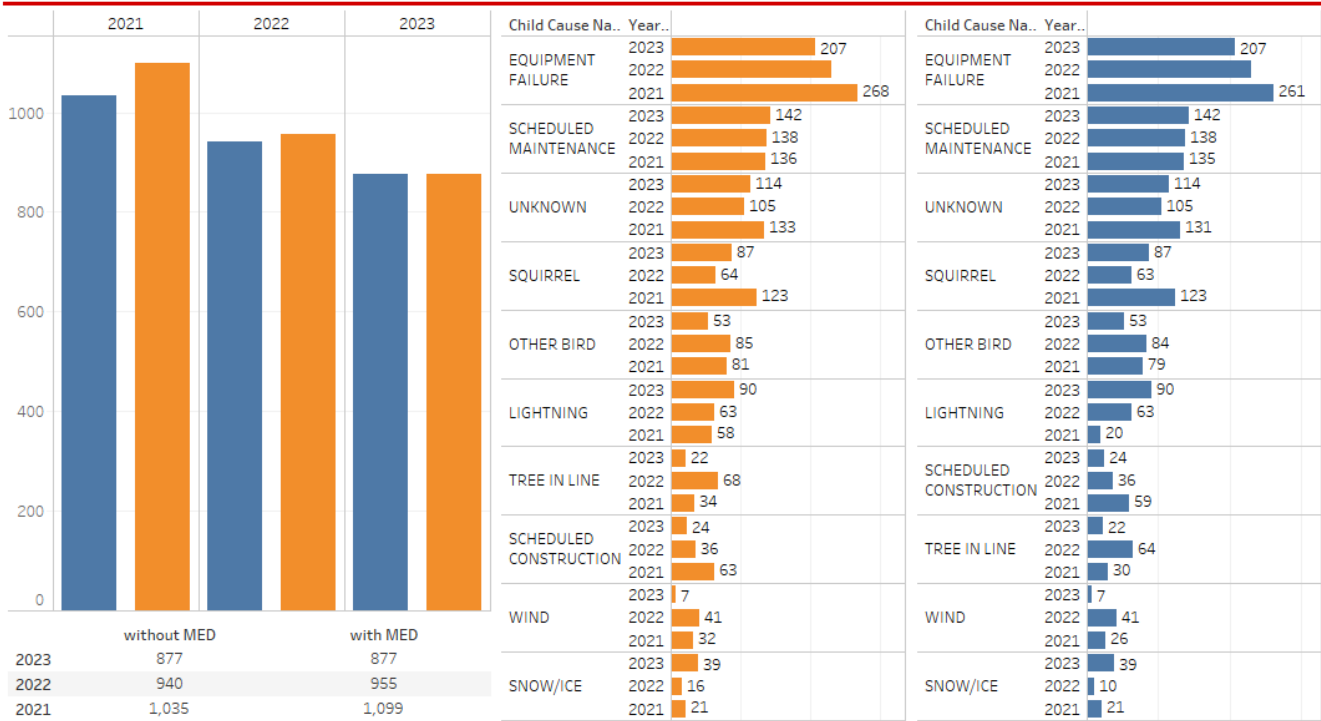


Figure 8.2 Helena system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

There were fewer outages in Helena in 2023, continuing a several-year trend. Equipment failure outages continued to decrease while scheduled outages increased. This data suggests that more frequent but shorter outages are being scheduled and in turn reducing the number of equipment failures that often lead to longer outage times. As with other areas in the state, natural causes such as squirrels and lightning increased in count this year.

9. MISSOULA SYSTEM RELIABILITY



Outage Metrics

■ without MED
■ with MED

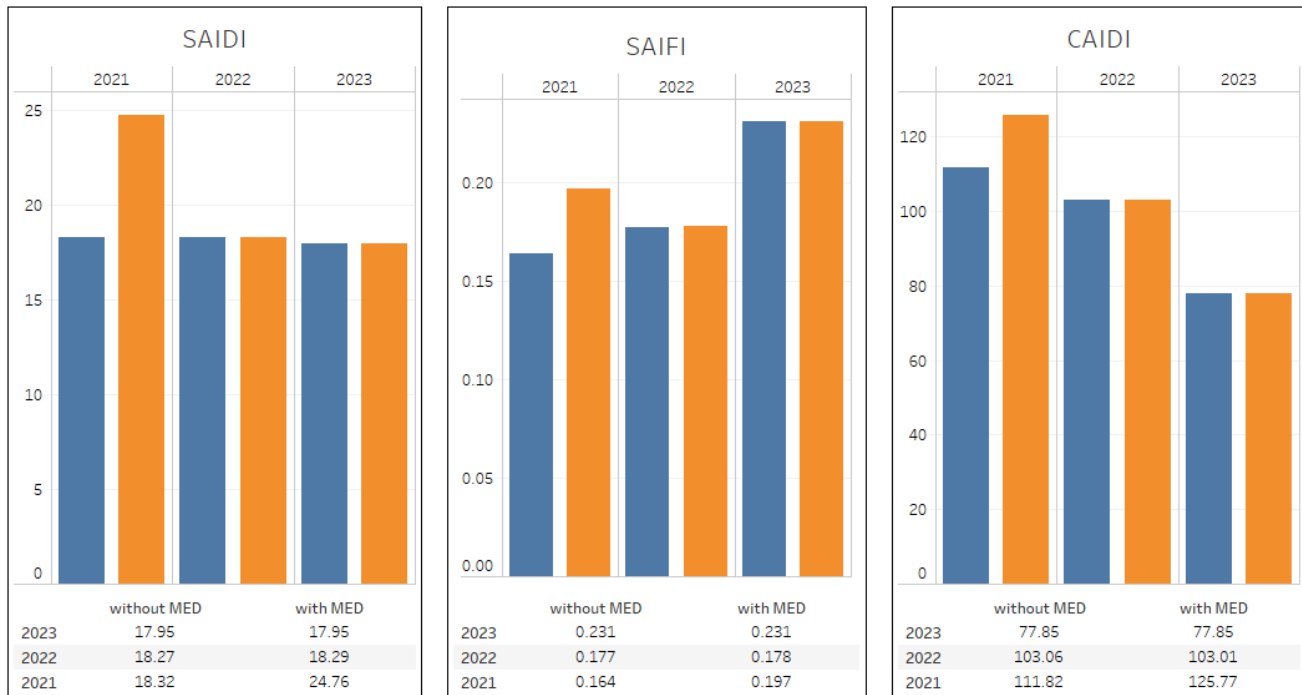


Figure 9.1 Missoula system indices with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

SAIDI and CAIDI indices improved in 2023 in Missoula while SAIFI saw an increase. These changes in the metrics represent a slight increase in the frequency of outages with a slight decrease in duration of outages. Outages due to line equipment accounted for nearly a fifth of the SAIDI in this division whereas planned outages accounted for almost ten percent of SAIDI. There was an outage in a Missoula substation due to a squirrel that caused nearly ten percent of the outages for the year as well.

Outage Counts

■ without MED
■ with MED

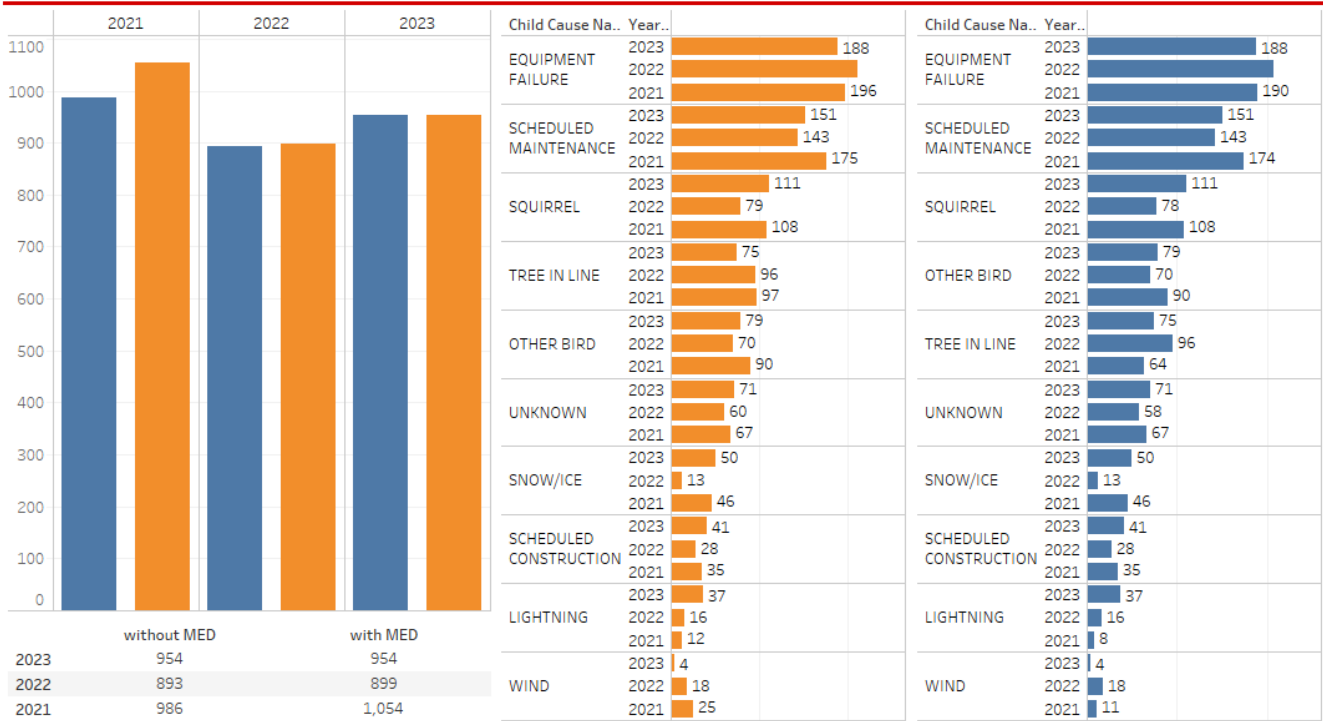


Figure 9.2 Missoula system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

There was a slight increase in the count of outages in 2023 though this is still about ten percent less than the five-year average for the area. Equipment failure remains the top outage cause, though this has been a fairly steady number in recent years. There were more outages caused by animals in 2023, most notably the increase in outages caused by squirrels. Snow/ice, wind, and lightning remain among the top ten causes of outages in this division.

10. CONCLUSION

The final 2023 NorthWestern electric reliability numbers are lower than the previous three-year average of 126 SAIDI minutes when excluding Major Event Days and 156 SAIDI minutes when including Major Event Days. There were no Major Event Days in 2023 and overall weather was very mild, which is reflected in the final recorded number of 102.5 SAIDI minutes. There were several small storms, most notably snowstorms in March and April as well as wind and thunderstorms in June and August. In addition, there have been several technological enhancements put in place in recent years to improve the accuracy and timeliness of recording outages.

Substation, distribution line, and other asset improvements cause a number of scheduled outages. This work helps avoid longer reactive outages caused by equipment failures and provides facilities to serve future loads. Equipment Failure continues to be a broad outage cause that NorthWestern is always working to improve upon and unknown outage causes will be further analyzed for future improvements in recordkeeping and reporting. Transmission and loss of power supply continue to cause a significant portion of outages on the distribution system. Where NorthWestern owns the transmission lines, there are programs in place to mitigate those outages in the future. With continued upgrades and planning, diligent work, and sincere effort, 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 2023 Electric Reliability Report in Docket No. 2024.01.002 has been e-filed with the Montana Public Service Commission and emailed to the email list below.

Date: March 1, 2024

/s/ Tracy Lowney Killoy
Tracy Lowney Killoy
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