



March 1, 2023

Will Rosquist
Administrator, Regulatory Division
Montana Public Service Commission
1701 Prospect Avenue
PO Box 202601
Helena, MT 59620-2601

RE: 2022 Annual Electric Reliability Report – Docket No. 2023.01.002

Dear Mr. Rosquist:

With this letter, NorthWestern Energy submits the 2022 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 note that the 2020 indices in this report differ from what was reported in the 2020 Reliability Report. There have been several changes in data collection in the previous two years including the implementation of a new outage management system that resulted in more accurate reporting.

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.
Asset Management Engineer

Enclosure: 2022 Annual Electric Reliability Report

NorthWestern[®] Energy

2022
-Montana-
Electric Distribution
Annual Reliability Report



March 2023

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EXECUTIVE SUMMARY

This report provides information and insights into NorthWestern Energy's (NorthWestern) 2022 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** (System Average Interruption Duration Index – in minutes), **CAIDI** (Customer Average Interruption Duration Index – in minutes), **SAIFI** (System Average Interruption Frequency Index – 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 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 2022, NorthWestern's Montana service territory experienced two MEDs: a thunderstorm in July and a snow storm in October. An MED was declared if there were more than 6.26 SAIDI minutes in a 24-hour period in 2022.

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 2022. 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 43.8 SAIDI minutes in 2022. 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:

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

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

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

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

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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 2020-2022 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 two MEDs in 2022 as well as several large events that didn’t quite reach the threshold for an MED but had a significant impact on reliability.

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

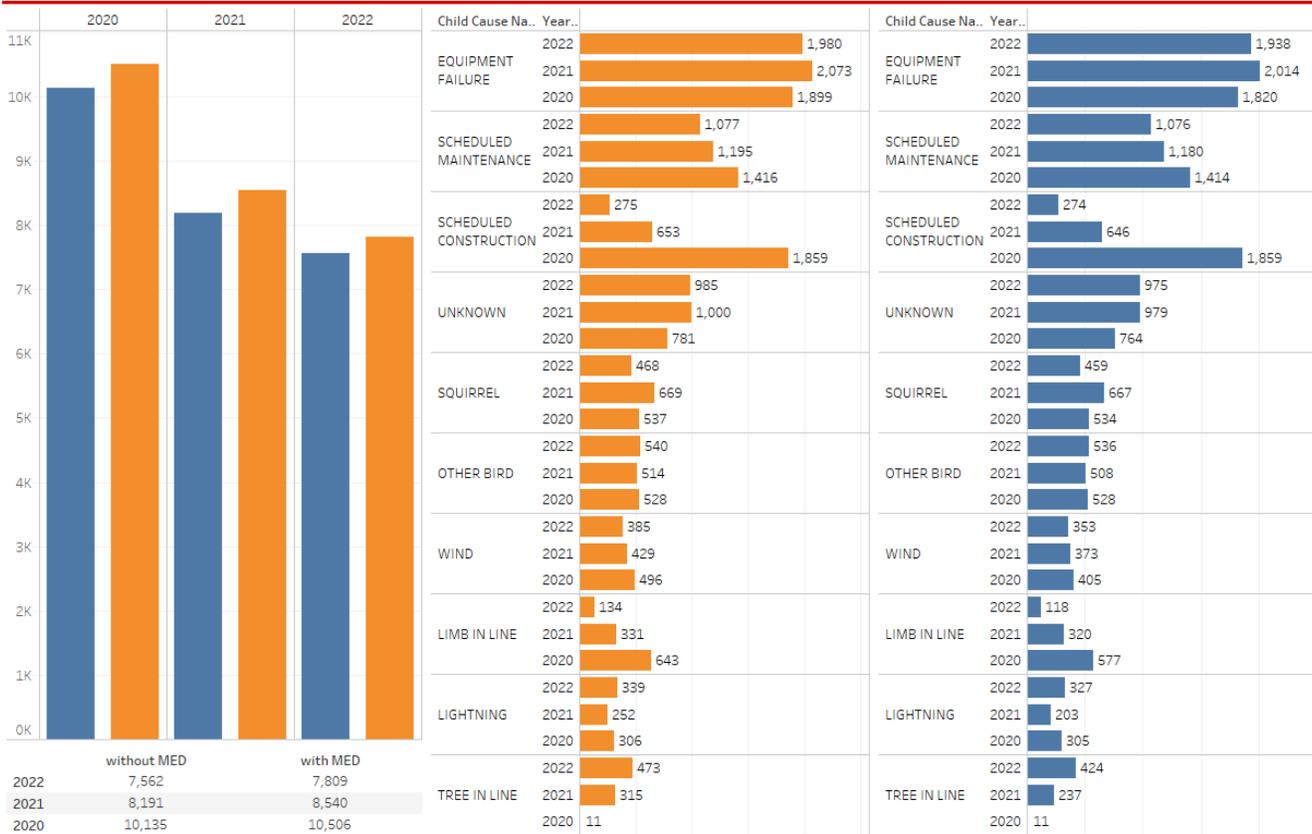


Figure 2.2 Montana system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

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 in 2022 and remain below average in comparison to 5-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 our system. However, scheduled outages are also among the most significant outage causes, accounting for approximately a fifth of the total outages experienced in 2022. 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.). The remaining top 10 outage causes have been fairly steady in number in recent years.

3. BILLINGS SYSTEM RELIABILITY



■ without MED
■ with MED

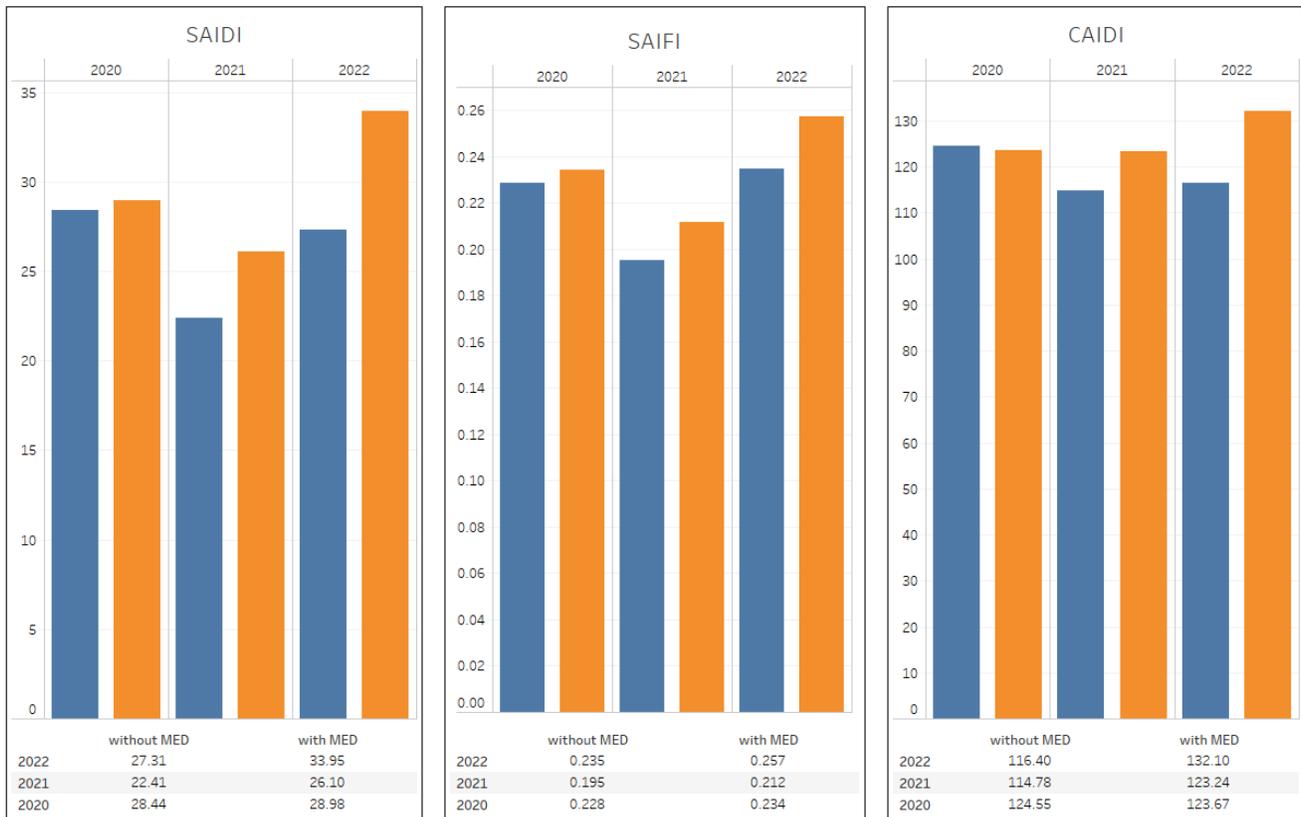


Figure 3.1 Billings system indices with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

SAIDI increased from 2021 to 2022 in the Billings Division. MEDs made a fairly significant impact in this area in 2022 with the July thunderstorm taking the largest toll at nearly 6.4 SAIDI minutes. In June, the major flooding had an impact in the Red Lodge area as well as a wind event that focused in the eastern portion of the state. Other non-MED weather-related outages made up over half of the remaining SAIDI minutes. Both SAIFI and CAIDI numbers are also slightly elevated in comparison to 3-year averages.

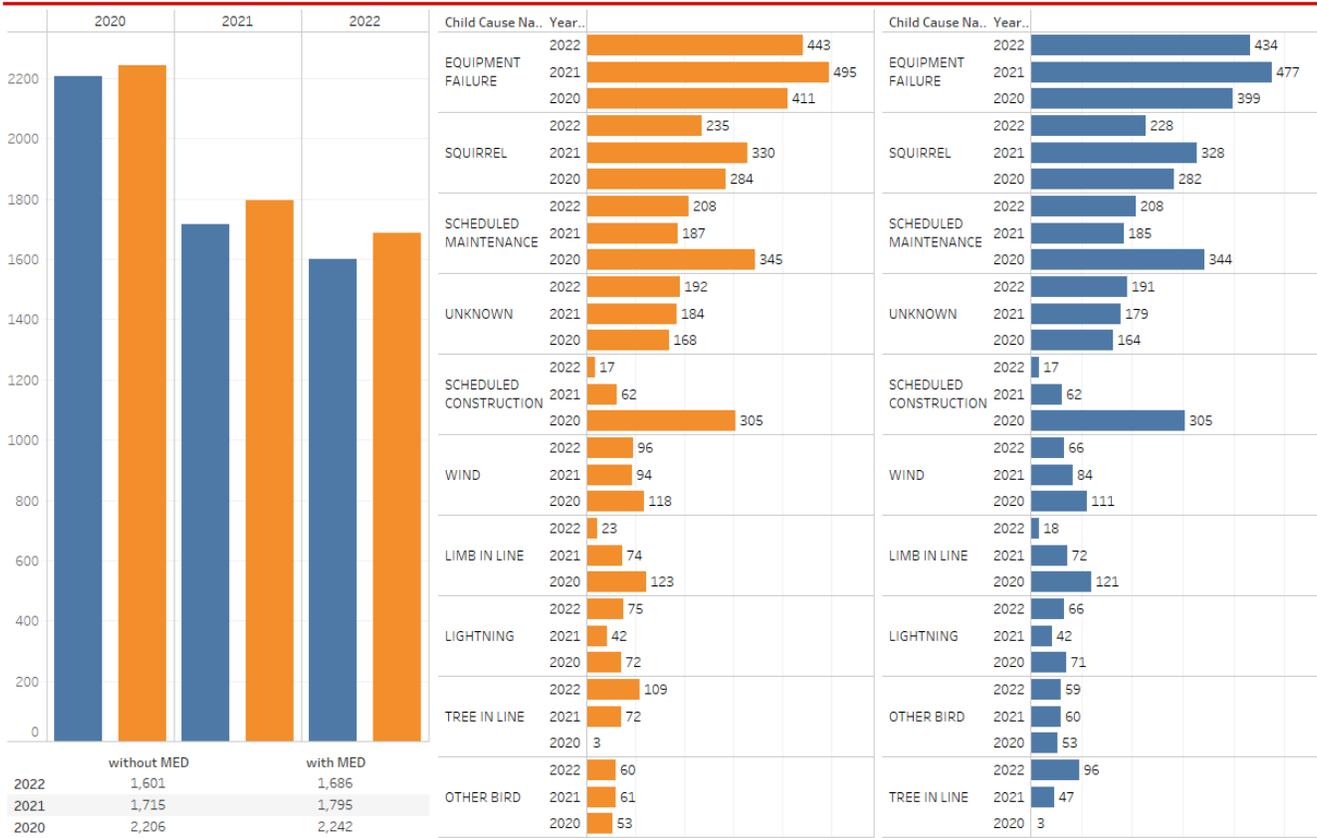


Figure 3.2 Billings system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

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. The number of scheduled outages steadied, indicating that maintenance and construction are being done proactively to mitigate longer, reactive outages. The number of outages where a cause could not be identified (Unknown) has increased again. However, these are often shorter outages with minimal customer impacts. The impact of wind has steadily increased in recent years while lightning, birds, and trees remain in the top outage causes.

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 have continually steadied for the past few years. Nearly a fifth of outages in 2022 can be attributed to the two MEDs and a large transmission-caused outage in this division. Another fifth of outages were found to be on underground sections of line due to the prevalence of this configuration in this area. Adverse weather accounted for a large number of outages in the Bozeman division with wind and snow credited for over 8 SAIDI minutes in addition to outages during the MEDs.

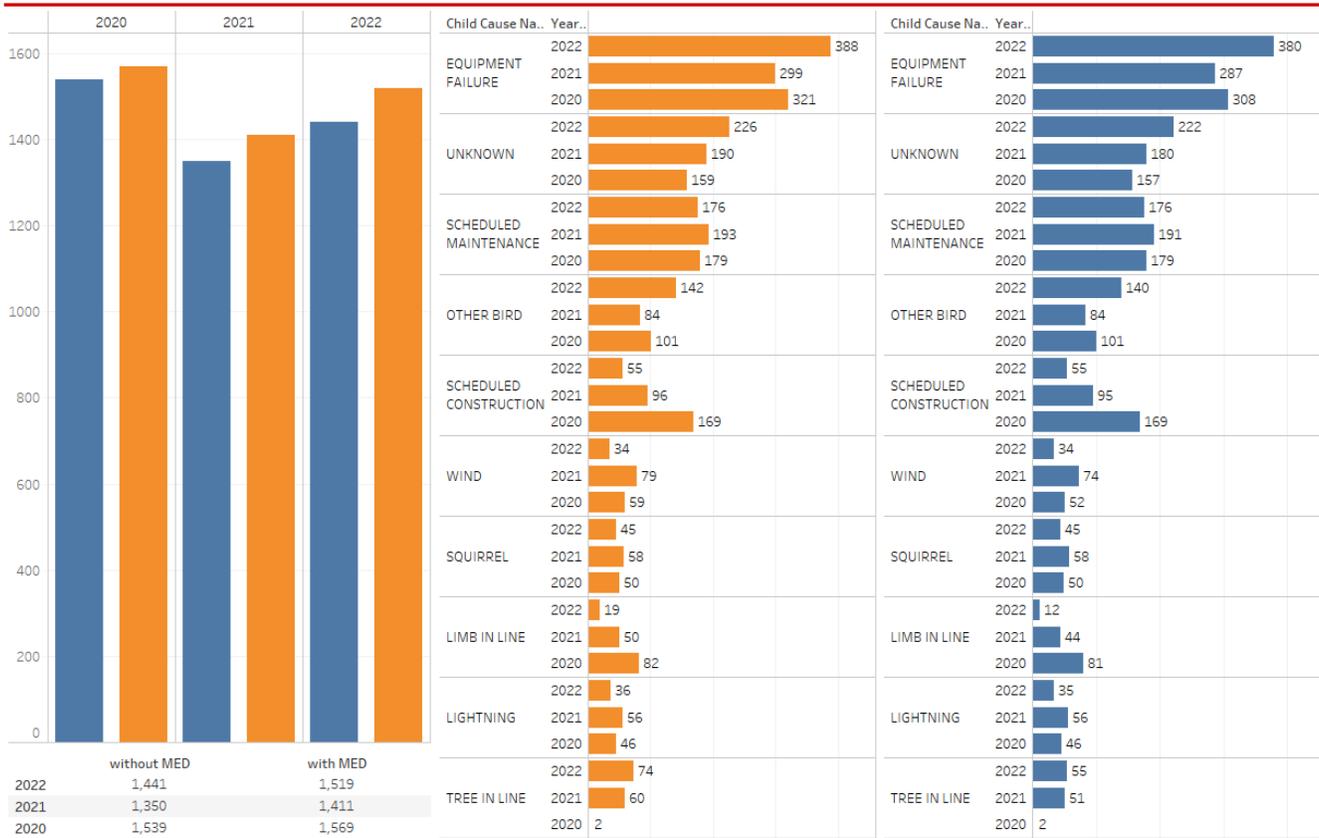


Figure 4.2 Bozeman system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

The number of outages continues to remain fairly steady in Bozeman. Equipment failures, unknown outages, and outages due to birds increased slightly in 2022. Many equipment failures occurred during serious weather events whereas most unknown outages were to single customers. Most of the remaining outage causes including trees, lightning, and animals were fairly steady from year to year.

5. BUTTE SYSTEM RELIABILITY

Outage Metrics

■ without MED
■ with MED

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

SAIDI and CAIDI metrics decreased and SAIFI remained close to previous year values in 2022 and more closely align with 5-year averages. Butte was relatively unaffected by large MEDs as they were centralized over other portions of the state. However, a transmission outage in Dillon from an external entity (non-NorthWestern Energy-owned lines) added 1.6 SAIDI minutes to the region in addition to thunderstorms, wind, and other adverse weather contributing to nearly half of all SAIDI in the division this year.

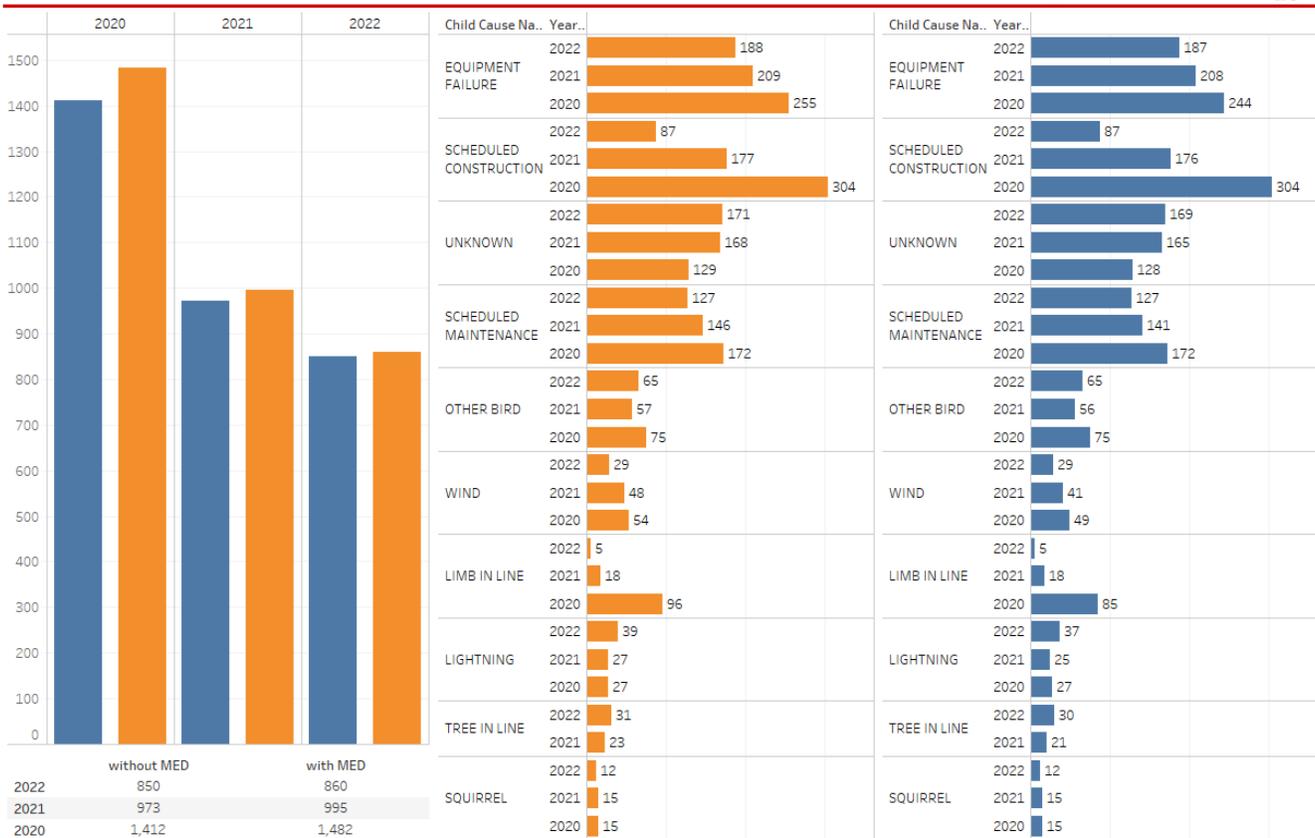


Figure 5.2 Butte system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

Butte has seen a marked decrease in count of outages in the last two years with most of the top outage causes decreasing. Scheduled outages account for a quarter of the outages in this region due to proactive maintenance being completed to prevent reactive failures. Equipment failure was again the largest outage contributor with overhead equipment such as arrestors, insulators, and cutouts being the largest contributors within that category.

6. GREAT FALLS SYSTEM RELIABILITY

Outage Metrics

■ without MED
■ with MED

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

Great Falls Division was impacted just under 2 SAIDI minutes due to the MED in October. Thunderstorms also largely affected the division in the summertime and along with a wind event in mid-November, non-MED weather accounted for an additional 3.5 SAIDI minutes. Overall, however, all indices have continued to improve over previous years.

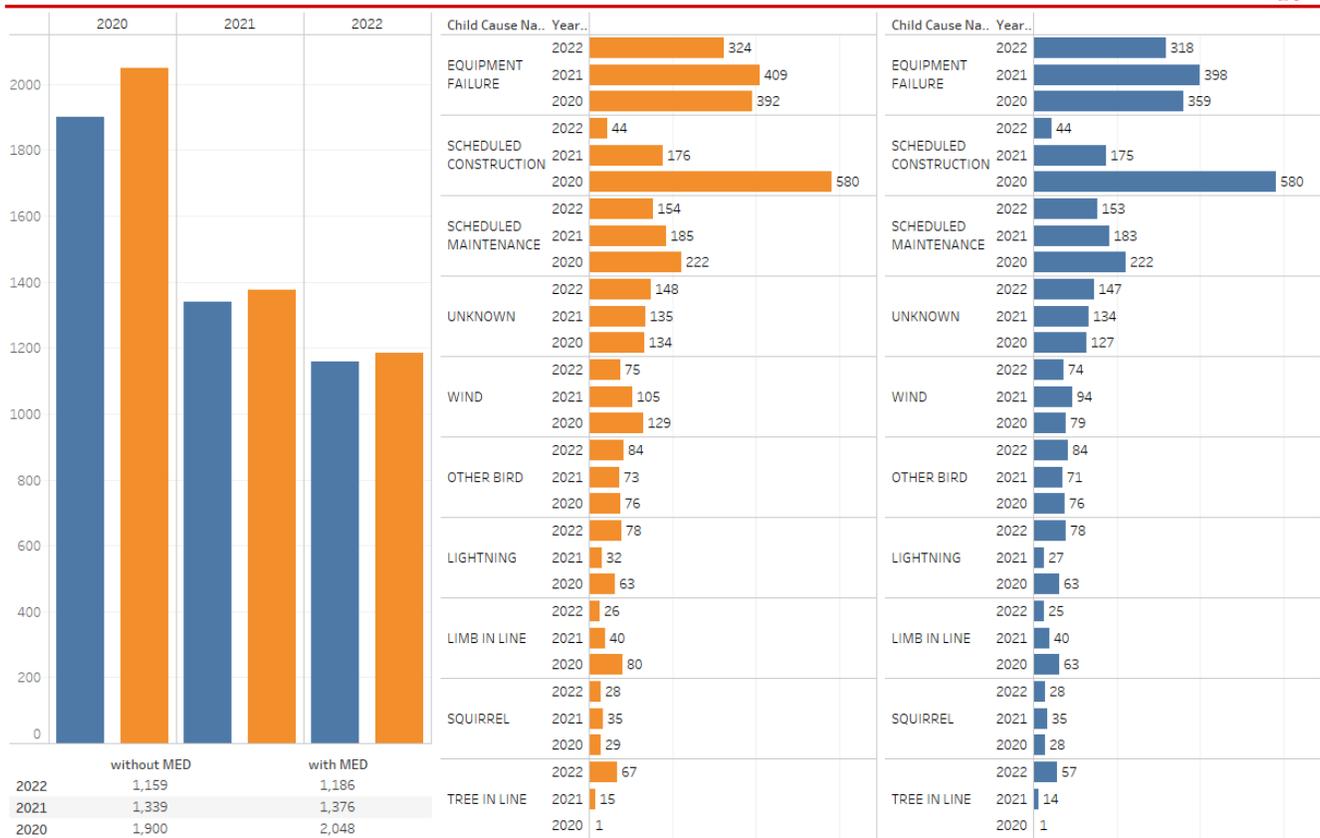


Figure 6.2 Great Falls system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

Outages decreased again in 2022, aligning more closely with 5-year averages. The 2020 capital work plan included many short planned outages in an effort to reduce longer reactive outages. This stabilized in 2021 and 2022, though scheduled interruptions still remain the cause for a significant number of outages. Outages caused by nature – lightning, birds, and trees – increased slightly this year as is seen in the weather contributing to SAIDI numbers as well. Unknown outages also are steadily increasing similar to in other areas of the system.

7. HAVRE SYSTEM RELIABILITY

Outage Metrics

■ without MED
■ with MED

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

SAIDI and SAIFI indices remain steady or even declining in recent years in the Havre division. The October MED and two additional days of transmission-related wind outages caused 4.8 SAIDI minutes – over half of all SAIDI this year. These numbers remain similar to previous year incidents.

Outage Counts

without MED
with MED

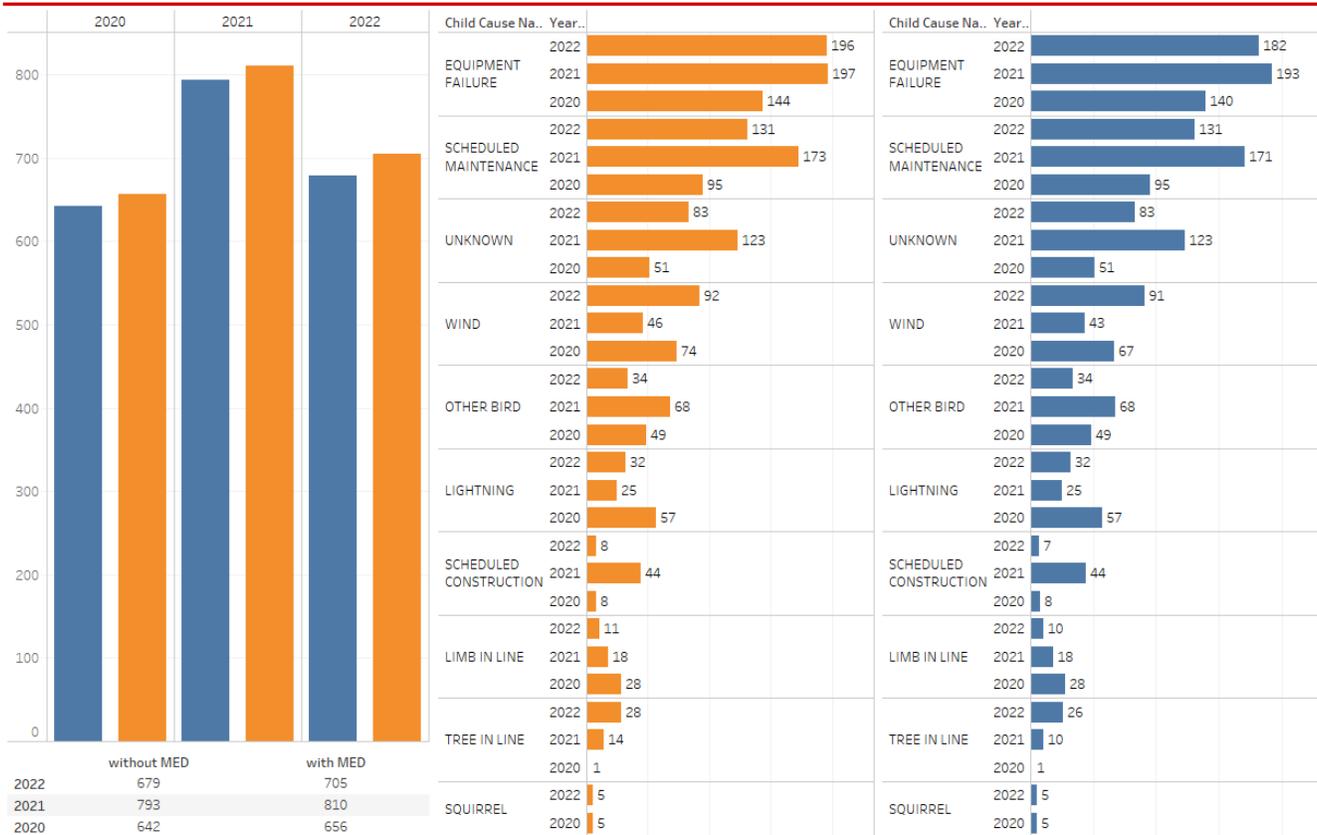


Figure 7.2 Have system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

Over a quarter of the outages in 2022 were caused by equipment failure, with the largest number of these outages attributed to insulators, arrestors, and conductor. Scheduled outages make up nearly another quarter of all outages, and the remaining outages are caused by mostly natural sources including wind and birds.

8. HELENA SYSTEM RELIABILITY

Outage Metrics

■ without MED
■ with MED

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

After a year of increasing indices in 2021, both SAIDI and SAIFI stabilized to more historically average levels in 2022. CAIDI is inversely related, however, so it did increase this past year. Helena was largely unaffected by MEDs, though summer storms, fall wind, and winter extreme cold did add up to over a third of all SAIDI minutes for the year. In addition, a fire on an external transmission line caused a significant outage in September of around 1.7 SAIDI minutes.

Outage Counts

without MED
with MED

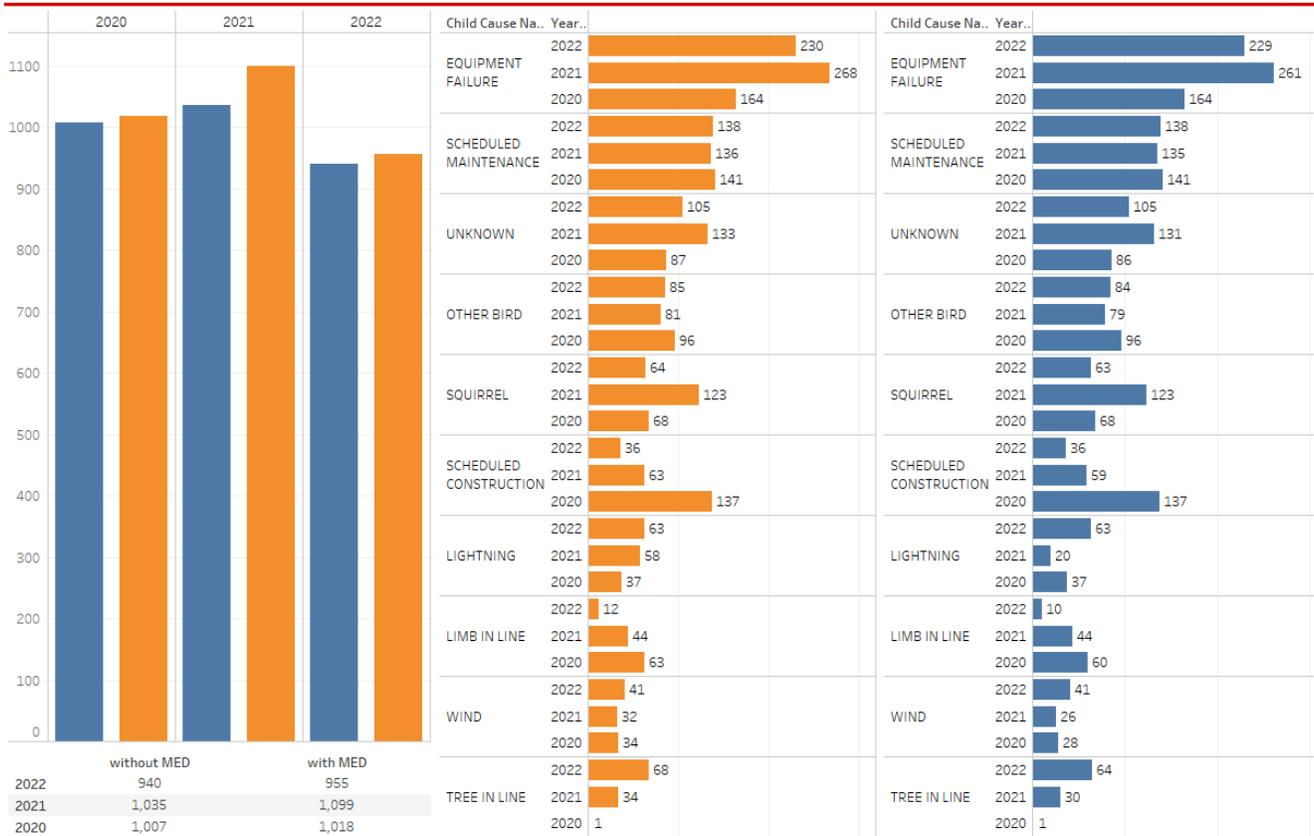


Figure 8.2 Helena system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

There were fewer outages in Helena in 2022, continuing a several-year trend. Birds, squirrels, and lightning steadily continue to cause outages in Helena though scheduled outages continue to be taken in order to proactively reduce outage lengths and reactive situations. The number of unknown and equipment failure outages, though still high on the list of causes, actually decreased this past year unlike in many other areas of the state.

9. MISSOULA SYSTEM RELIABILITY

Outage Metrics

■ without MED
■ with MED

NorthWestern
Energy



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

SAIDI, SAIFI, and CAIDI indices all improved in 2022 in Missoula. MEDs were fairly localized this year, and this region was one of the least affected. However, non-MED weather outages did prove to be a challenge between a January snow storm, June thunderstorm, and wind events in both September and November. Nearly a third of all outages for the year can be attributed to these four events.

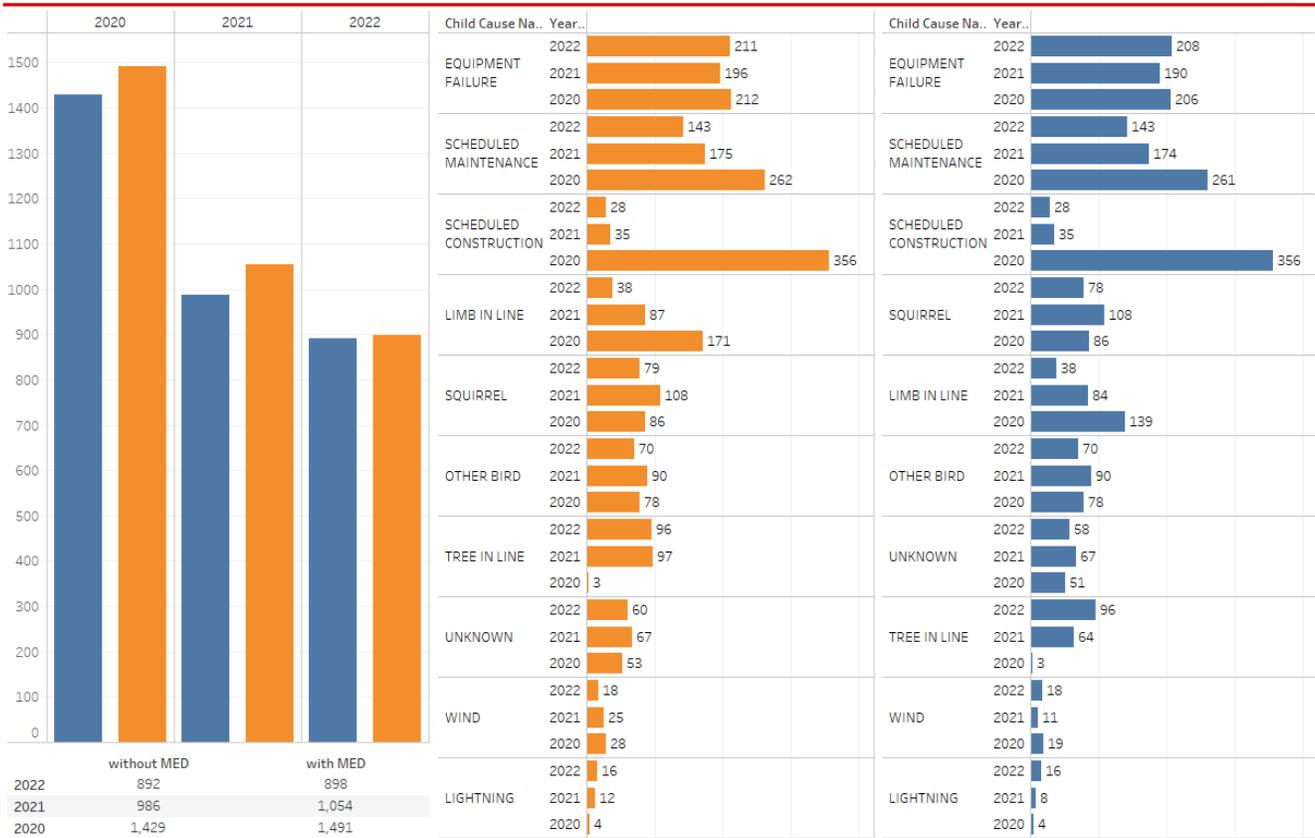


Figure 9.2 Missoula system outages by top ten causes with and without major event days (MEDs) as defined in IEEE Standard 1366-2022.

Outages decreased in Missoula again in 2022 to the lowest number seen in recent years. Of the top outage causes, only lightning, trees, and equipment failure increased and only slightly. The remaining outage causes continue to decrease, and scheduled outages remain at around a fifth of all outages in the region.

10. CONCLUSION

The final 2022 NorthWestern electric reliability numbers are lower than the previous three-year average of 148.9 SAIDI minutes when including Major Event Days. The final 132.1 SAIDI minutes recorded reflect two major storms as well as a year full of smaller storm and wind events. The 118.5 SAIDI minutes recorded without MEDs is trending down from the three-year average of 122.9 SAIDI minutes. More accurate and timely outage reporting and recording has been stabilizing and with it, so have outage metrics.

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 outages will be further analyzed for future improvements in recordkeeping and reporting. 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 2022 Electric Reliability Report in Docket No. 2023.01.002 has been e-filed with the Montana Public Service Commission and emailed to the email list below.

Date: March 1, 2023

/s/ Connie Moran
Connie Moran
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