MINNESOTA
PUBLIC UTILITIES COMMISSION

Staff Briefing Papers: Volume 1

Meeting Date	December 19, 2019	Agenda Item **7
Company	Xcel Energy, Minnesota Power, Otter Tail Power	
Docket No.	**E002/M-19-261 In the Matter of Xcel Energy's Annual Report on Safety, Reliability, and Service Quality for 2018; and Petition for Approval of Electric Reliability Standards for 2019** **E017/M-19-260 In the Matter of Otter Tail Power Company's 2018 Annual Safety, Reliability and Service Quality Report and Proposed SAIFI, SAIDI, and CAIDI Reliability Standards for 2019** **E015/M-19-254 In the Matter of Minnesota Power's 2019 Safety, Reliability and Service Quality Standards Report**	
Issues	1. Should the Commission accept the utilities' annual Safety, Reliability, and Service Quality reports for 2018? 2. At what level should the Commission set Xcel Energy's, Otter Tail Power's, and Minnesota Power's reliability standards for 2019? 3. Should the Commission take any other action on the Annual Reports or associated matters?	
Staff	Hanna Terwilliger hanna.terwilliger@state.mn.us	651-201-2243

Relevant Documents	**Date**
Xcel Energy (19-261)	
Initial Filing – 2018 Annual Safety, Reliability and Service Quality Report	April 1, 2019
Department of Commerce – Comments	June 7, 2019
Xcel Energy – Reply Comments	June 28, 2019
Department of Commerce – Response to Reply Comments	August 14, 2019
Otter Tail Power (19-260)	
Initial Filing - 2018 Annual Safety, Reliability and Service Quality Report	April 1, 2019
Department of Commerce – Comments	June 7, 2019
Otter Tail Power – Reply Comments	June 28, 2019
Minnesota Power (19-254)	

Initial Filing – Safety, Reliability and Service Quality Standards Report	April 12, 2019
Department of Commerce – Comments	June 7, 2019
Minnesota Power – Reply Comments	July 8, 2019

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The attached materials are work papers of the Commission Staff. They are intended for use by the Public Utilities Commission and are based upon information already in the record unless noted otherwise.

Contents

Introduction

Each year Minnesota's Investor Owned Utilities (IOUs) submit Safety, Reliability, and Service Quality (SQR) Reports. For 2018 and 2019, Commission staff split the reports into two sections. The Service Quality and Reporting portion will be summarized in the separate Volume 2 of the briefing papers, while Volume 1 includes the Safety and Reliability metrics as laid out in Minnesota Rules, Chapter 7826, Electric Utility Standards, with specific attention to the reporting requirements outlined by Minn. Rules 7826.0400 to 7826.0600 and order points from the Commission's March 19, 2019 Order. Below, Staff summarizes the utility reports and Department comments, and makes a series of recommendations for future reports. The briefing papers also include a discussion of two future metrics from Xcel's Performance Metrics Docket (17-401) on Locational Reliability and Equity – Reliability.

As in previous years, the Department has acknowledged utility compliance with the Commission's rules. The Commission included a number of additional reporting requirements in other Orders, which utilities have by and large provided information on. Appendix A includes a compliance matrix with the Commission's rules and order points. Staff notes that while the

Department noted compliance with Minnesota Rules, it only acknowledged compliance with the Commission's Order in the case of Minnesota Power's report. In instances where the Department did not indicate whether it felt the utility had complied with Minn. Rules or the Commission's Order, Staff uses "N/A"

Staff has provided a single set of decision options and recommendations for Volume One and Volume Two of the briefing papers, the decision options are replicated in both documents.

Acronyms

ASAI	Average Service Availability Index
CAIDI	Customer Average Interruption Duration Index
CELI	Customers Experiencing Lengthy Interruptions
CEMI	Customer Experiencing Multiple Interruptions
EEI	Edison Electric Institute
ERT	Estimated Restoration Time
FLISR	Fault Location, Isolation, and Service Restoration
IEEE	Institute of Electrical and Electronics Engineers
IMS	Interruption Monitoring System
MAIFI	Momentary Average Interruption Frequency Index
MED	Major Event Day
OMS	Outage Management System
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCADA	Supervisory Control and Data Acquisition
SQR	Service Quality and Reliability

Reliability

Utilities must report reliability results under Minn. Rules 7826.0500. This includes outage tracking metrics like SAIDI, SAIFI, and CAIDI, along with indices like staffing levels and bulk power supply interruptions. The Commission has also asked for various additional information in various orders.

SAIDI, SAIFI, and CAIDI

Utilities report normalized[1] SAIDI, SAIFI, and CAIDI by work center and for the state. In its March, 2019 Order the Commission required all utilities to use the IEER 1366 standard (also known as the 2.5 Beta method) for normalizing Major Event Days. They also propose numerical, individual reliability standards[2] for each work center. The Commission then sets reliability performance standards annually for the utilities, which "remain in effect until final action is taken on a filing proposing new standards or changes them in another proceeding."[3]

[1] Per Minn. Rules 7826.0200, Subp. 9. "Storm-normalized data" means data that has been adjusted to neutralize the effects of outages due to major storms. Minn. Rules 7826.0500 Subd. D require "an explanation of how the utility normalizes its reliability data to account for major storms."
[2] Minn. Rules 7826.0600, Subp. 1
[3] Minn. Rules 7826.0600, Subp. 2

Historically the Commission has directed utilities to use a rolling five year average of SAIDI, SAIFI, and CAIDI metric for each work center in a utility's service territory. However, the Commission has 'frozen' standards for utilities at prior year's levels if there is not sufficient progress. Otter Tail's standards have been frozen at 2013 levels and Minnesota Power's 2017 and 2018 standards were set at 2016 levels. Xcel had standards for the Southeast work center held at 2017 levels. Utilities are also required to provide "an action plan for remedying any failure to comply with the standard" or "why non-compliance was unavoidable under the circumstances."[4]

The following sections summarize individual utility performance for 2018. Instances where standards were not met are **bold underlined**.

Minnesota Power

Table 1: Minnesota Power 2019 Results and 2019 Proposed Standards

Metric	SAIDI	SAIFI	CAIDI
2018 Standard	98.19	1.02	96.26
2018 Performance Results (Normalized)	**134.00**	**1.39**	**96.50**
2018 Performance Results (Non-Normalized)	158.51	1.49	106.04
2019 Proposed Standards Option A (2016 Standard)	98.19	1.02	96.26
2019 Proposed Standards Option B (5 year average)[5]	110.53	1.17	95.04

The Commission froze MP's reliability standards at 2016 levels after the Company failed to meet its SAIDI and SAIFI targets for 2015 and 2016. Minnesota Power did not meet any of its standards again in 2018. The Company gave weather and equipment failure as the primary reasons for not meeting its reliability goals. MP noted that it has hired additional engineers in 2017 to implement a trouble order tracking and remediation system, which was implemented in Q4 of 2018. The engineers also began to audit MP's system and develop an asset management program, which has now been fully deployed.[6] MP's report indicated weather was responsible for less than 50% of SAIDI and SAIFI outages in 2018, compared to 2017's 55% of SAIFI events and 93% of SAIDI minutes. Equipment failure spiked as an outage cause from 2017, with an increase from 3% to 37% of all causes for SAIDI, and 11% to 34% for SAIFI.[7]

Figure 1 and Figure 2 compare the contributing factors to MP's SAIDI and SAIFI values for 2017 and 2018, created by Commission Staff. Both figures include all outages (non-normalized).

[4] Minn. Rules 7826.0500, Subp. 1E
[5] Omits 2016 data, as it was an abnormally high year
[6] MP, Initial Filing, Docket No. 19-254, Appendix A, p. 9
[7] MP, Initial Filing, Docket No. 19-254, pp. 17-18, MP, Initial Filing, Docket No. 18-250, pp. 18-19

Figure 1: Comparison of SAIDI causes, 2017 to 2018[8]

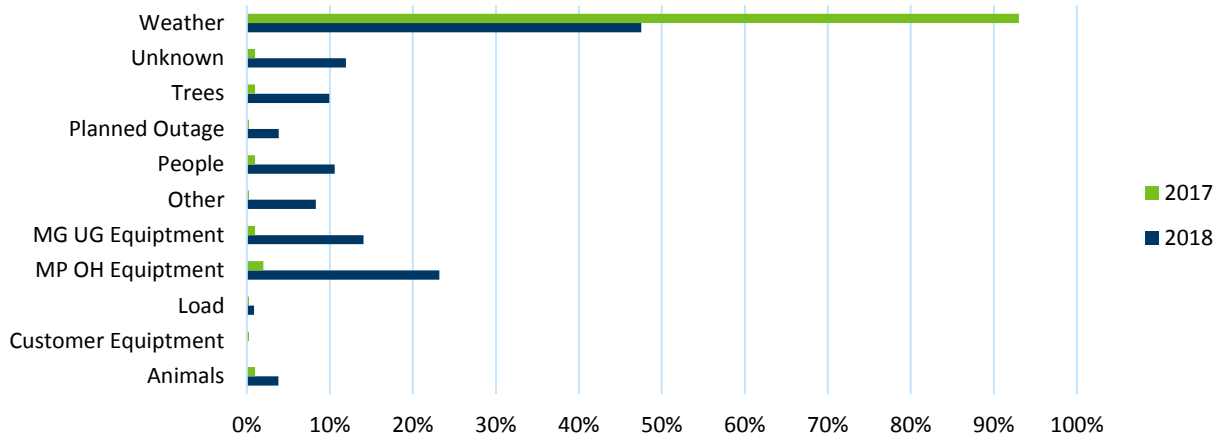
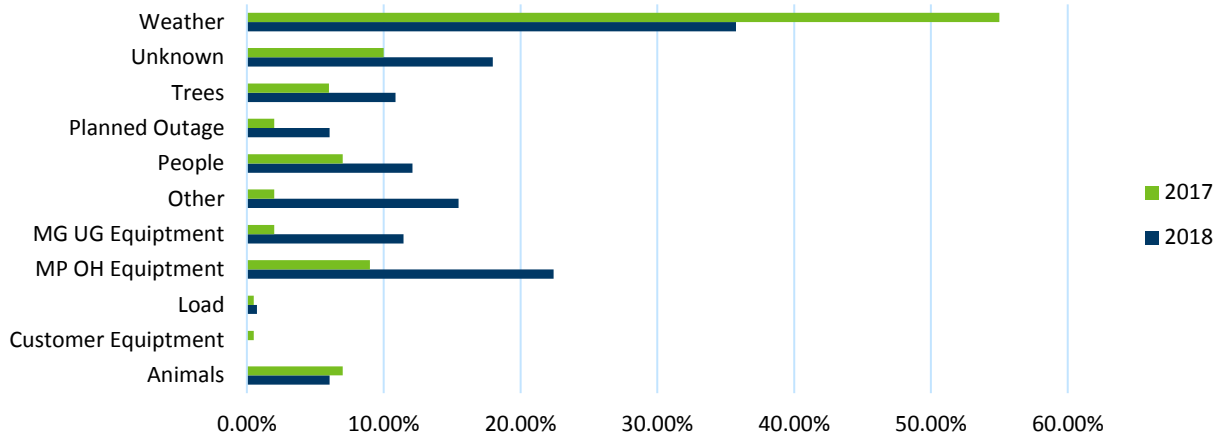


Figure 2: Comparison of SAIFI causes, 2017-2018[9]



The Department acknowledged that MP fulfilled the requirements of Minn. Rules 7826.0500 Subp. 1A-D. However, the Department recommended leaving Minnesota Power's standards at 2016 levels for 2019, as the Company's second option for 2019 standards would be slightly higher (easier to meet) than the existing standards.[10] The Department also provided Figures 3 through 5 showing MP's reliability actuals and goals, along with trend lines, over the past 10 years (recreated by staff below).

[8] *Id.*
[9] *Id.*
[10] Department, Initial, Docket No. 19-254, p. 9

Figure 3: Minnesota Power SAIDI 2009-2019

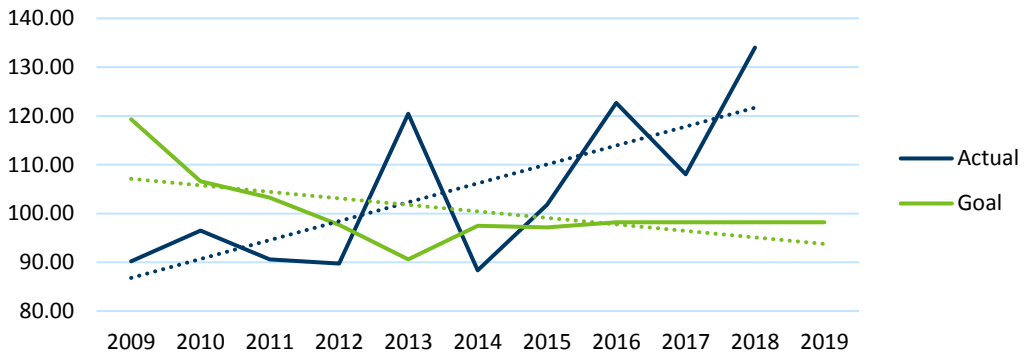


Figure 4: Minnesota Power SAIFI 2009-2019

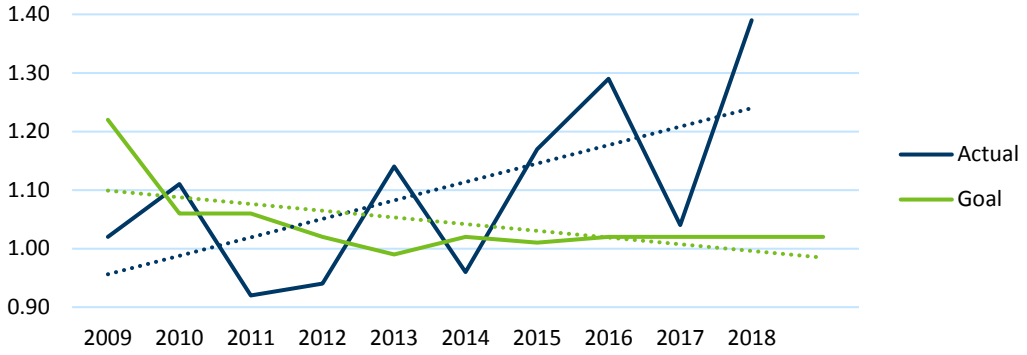
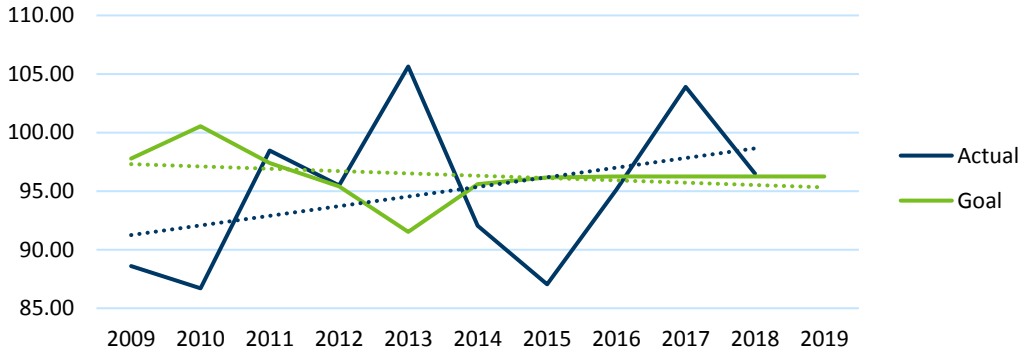


Figure 5: Minnesota Power CAIDI 2009-2019



Staff Analysis

Staff concurs with the Department's recommendation to keep Minnesota Power's standards frozen at 2016 levels. Minnesota Power did not appear to object to these standards, and so Staff only lists the frozen standards as **Decision Option 5** for simplicity.

4Additionally, Staff points out Minnesota Power's decreasing reliability compliance, and increasing reliability numbers. In its December 5 oral decision accepting Minnesota Power's 2019 General Rate Case, the Commission requested parties and the ALJ develop an additional record examining the Company's distribution budget and other areas relating to reliability.

Otter Tail Power

Table 2: Otter Tail Power 2018 Results and 2019 Proposed Standards

Region	Metric	2018 Standard	2018 Performance Results (normalized)	2018 Performance Results (non-normalized)	2019 Proposed Standard
Minnesota	SAIDI	64.95	**75.33**	86.41	64.95
	SAIFI	1.13	**1.23**	1.31	1.13
	CAIDI	57.48	**61.12**	67.7	57.48
Bemidji	SAIDI	70.64	**77.35**	127.27	70.64
	SAIFI	1.26	1.14	1.38	1.26
	CAIDI	56.06	**67.86**	92.44	56.06
Crookston	SAIDI	69.33	**74.75**	83.66	69.33
	SAIFI	1.19	**1.79**	1.95	1.19
	CAIDI	58.26	41.7	42.98	58.26
Fergus Falls	SAIDI	66.97	57.65	57.65	66.97
	SAIFI	1.11	0.81	0.81	1.11
	CAIDI	60.33	**71.35**	94.68	60.33
Milbank	SAIDI	75.49	70.35	70.35	75.49
	SAIFI	1.82	0.74	0.74	1.82
	CAIDI	41.48	**94.68**	94.68	41.48
Morris	SAIDI	55.78	**88.09**	88.09	55.78
	SAIFI	1.01	**1.41**	1.41	1.01
	CAIDI	55.23	**62.29**	62.29	55.23
Wahpeton	SAIDI	57.24	**201.38**	201.38	57.24
	SAIFI	1.13	**3.07**	3.07	1.13
	CAIDI	50.65	**65.67**	65.57	50.65

Otter Tail proposed leaving its 2018 reliability standards at 2013 levels and the Department concurred.[11] Figures 6 through 8 depict OTP's SAIDI, SAIFI, and CAIDI trends over the past decade. As a whole, Otter Tail has seem mainly flat or slightly increasing reliability indices over the past 10 years, aside from the Milbank and Wahpeton work centers, which Staff understands are service centers with very few feeders, leading to much higher fluctuations from year to year.

[11] OTP, Initial Filing, Docket No. 19-260, p.31; Department, Initial, Docket No. 19-260, p. 26

Figure 6: Otter Tail Power SAIDI Trends, 2009-2018

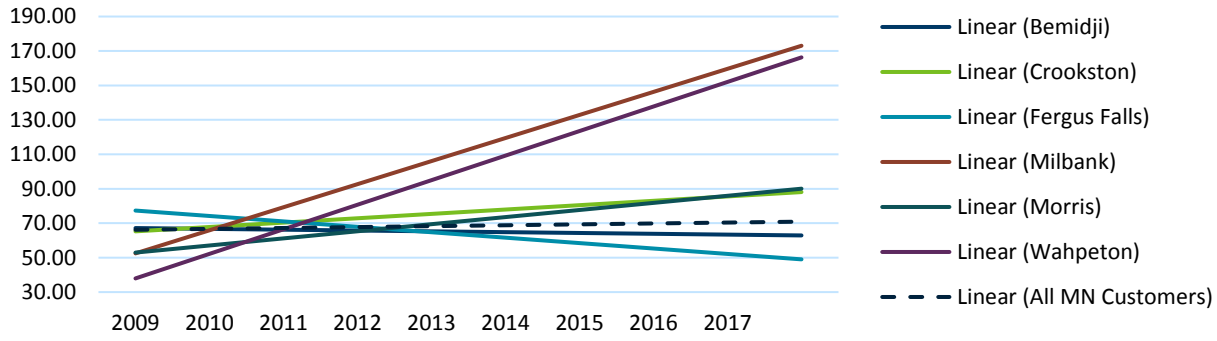


Figure 7: Otter Tail Power, SAIFI Trends, 2009-2018

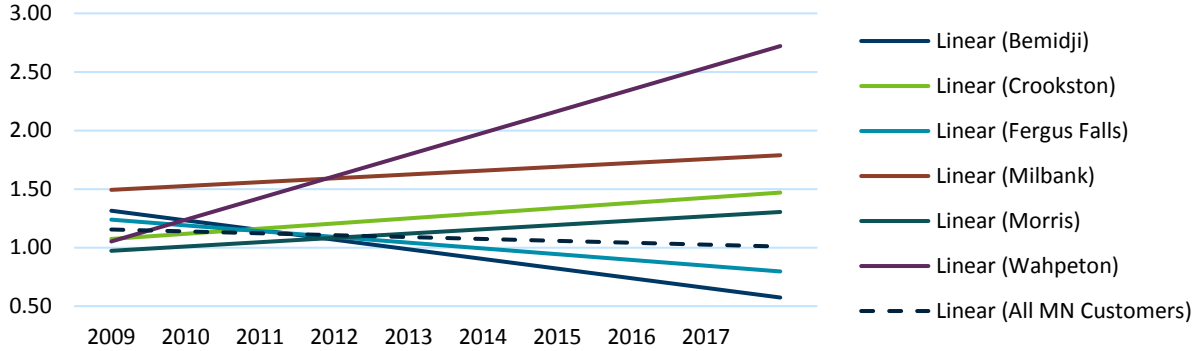
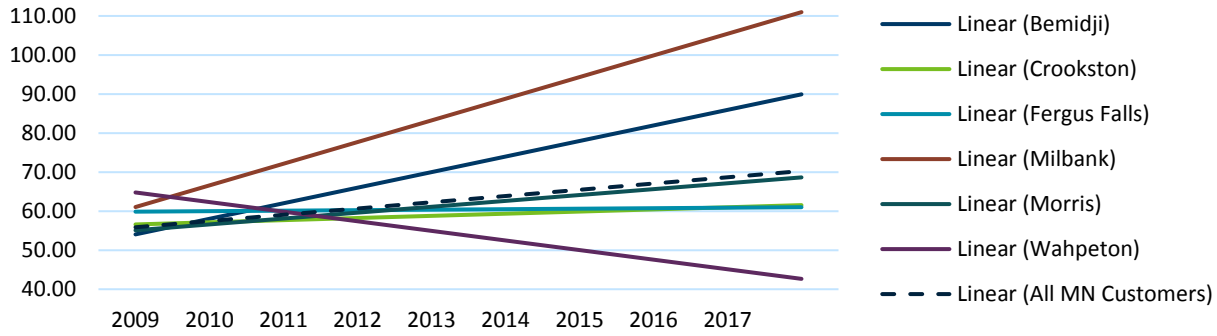


Figure 8: Otter Tail Power, CAIDI Trends, 2009-2018



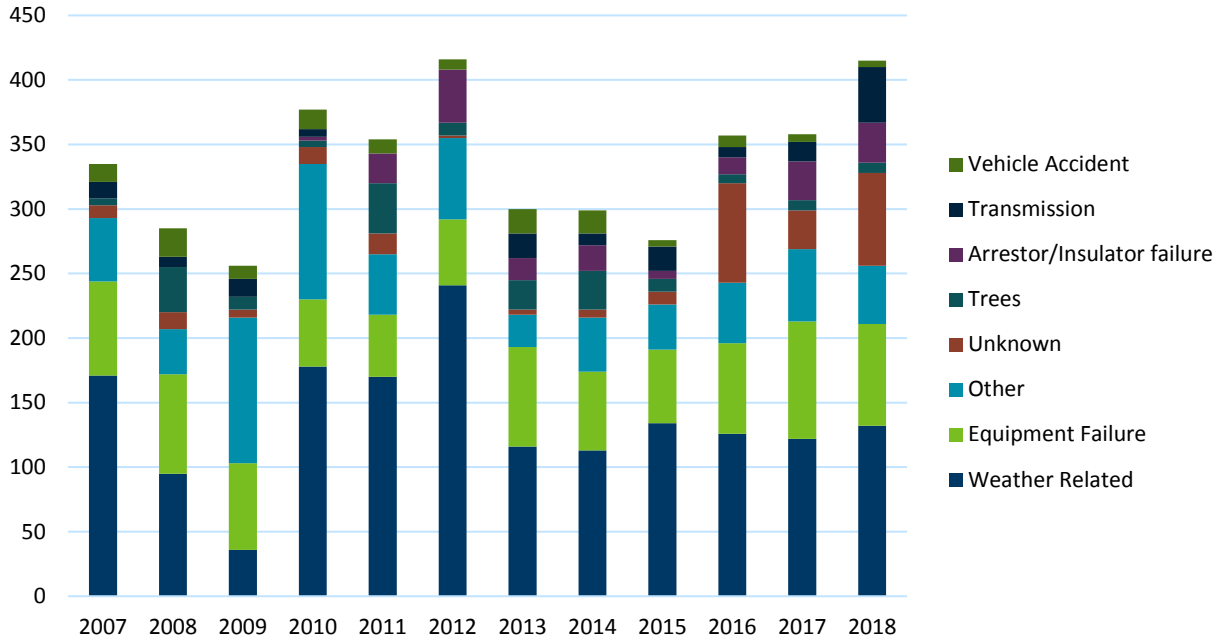
OTP uses the IEEE 1366 Standard for storm normalization, with one day qualifying as a Major Event Day for 2018. On that day, severe thunderstorms would have added over 20 minutes to OTP's SAIDI if not excluded.[12]

As in previous years, Otter Tail provided a table of outage causes by work center for its service area. Staff has compiled Figure 9 showing causes over the past decade. Weather and equipment failure are the most common causes of outages for OTP. The Department

[12] OTP, Initial Filing, Docket No. 19-260, p. 10

determined that OTP complied with the reporting requirements, however it noted that OTP has had increasing difficulty meeting it goals over the past 10 years.[13]

Figure 9: Otter Tail Power Outage Origins



*Other includes: investigated and unknown, animal, human error, underground, bulk power loss, bird, overload, flood, fuse, and vandalism

Staff Analysis

Staff concurs with the Department's and OTP's proposed standards for 2018. Staff appreciates Otter Tail's table format for outage sources, which makes it easy to identify trends among outage causes over time, and recommends the Commission require other utilities to report similar information. This could replace the previous discussion of leading causes of outages. Staff has included this modification in Attachment B (**Decision Option 2**). Staff also recommends the Commission require Xcel Energy and Minnesota Power to submit a compliance filing with historical data on outage causes (**Decision Option 4a**).

Staff does wish to note that although Otter Tail has had frozen standards since 2013, its overall reliability metrics have remained high in comparison to Xcel and MP, and to other investor owned utilities nationally (discussed further in the benchmarking section).

Xcel Energy

In its March 19, 2019 Order, the Commission required Xcel to change from its "Annual Rules" method of normalizing outages to the IEEE 2.5 Beta method used by other MN utilities, and Xcel in its Service Quality Plan tariff. Xcel provided a comparison of compliance under the two versions, and the Department concluded there was not a significant difference between compliance under the old normalization method and the IEEE 1366 Standard.[14]

[13] Department, Initial, Docket No. 19
[14] Department, Reply, pp. 3-4

Table 3: Xcel Energy 2017 Results and 2018 Proposed Standards[15]

Region	Metric	2018 Standard[16]	2018 Performance Results (normalized)	2018 Performance Results (non-normalized)	2019 Proposed Standard
Minnesota	SAIDI		96.07	125.00	
	SAIFI		0.89	0.95	
	CAIDI		107.39	131.22	
Metro East	SAIDI	86.05	**103.69**	112.11	89.78
	SAIFI	0.85	**0.93**	0.96	0.86
	CAIDI	101.31	**111.74**	116.71	103.94
Metro West	SAIDI	85.71	83.26	88.23	82.08
	SAIFI	0.84	**0.87**	0.92	0.82
	CAIDI	102.56	95.47	95.70	100.37
Northwest	SAIDI	87.33	**109.34**	109.50	85.86
	SAIFI	0.79	**0.87**	0.87	0.76
	CAIDI	110.81	**126.05**	126.02	113.01
Southeast	SAIDI	94.82	**118.80**	353.32	94.82
	SAIFI	0.76	**0.92**	1.15	0.76
	CAIDI	124.79	**129.64**	307.95	122.04

Xcel met 2 of its 12 reliability goals for 2018, both in the Metro West region, for a success rate of 17%. This is a noticeable decline from the previous three years, when Xcel achieved 83% (2017), 50% (2016) and 67% (2015) of its reliability goals. The Department summarized Xcel's action plan to improve reliability, and concluded that it was sufficient.

Past Commission orders have required Xcel to "incorporate into its next filing a summary table that allows the reader to more easily assess the overall reliability of the system and identify the main factors that affect reliability." Xcel filed a number of charts in Attachment M that show the primary causes of customer related outages over a historic five year period.

Staff Analysis

Xcel has seen overall improvements in its SAIDI and SAIFI numbers across the majority of its reporting work centers. However, the Southeast work center continues to see worsening SAIDI and SAIFI numbers. The Commission froze Xcel's SAIDI and SAIFI goals for the Southeast work center at 2017 levels in last year's report, and Staff recommends the Commission does the same here, as proposed by Xcel.

Additionally, some proposed goals for the Metro East and Northwest regions would increase in 2019, making them easier to meet. Utility goals sometimes rise slightly from year to year,

[15] Xcel, Initial Filing, Docket No. 19-261, p. 37

[16] In its March 19, 2019 Order, the Commission required Xcel to use the IEEE 1366 Standard for calculating major event days on a going forward basis. Therefore, the 2018 standard listed here has be recalculated using those numbers

making it important to look at the overall trend lines of goals and actual performance. Staff provides the following figures of SAIDI, SAIFI, and CAIDI actuals and goals. The first three graphs show *trends* of actual SAIDI, SAIFI, and CAIDI over time for Xcel's various service areas, not actual numbers.

The Southeast work center trends indicate that unlike other areas of the state, its reliability has worsened or remained stagnant over the past 9 years under SAIDI, SAIFI, and CAIDI. The Metro West region has seen the greatest improvements in all categories, and is the only service region to see improvement in CAIDI.

As discussed in the next section, the Commission is looking into locational reliability for Xcel as a part of its Performance Metrics docket (17-401). Staff anticipates this discussion can assist in parsing out the differences in reliability numbers between different service centers, and within service centers.

It is also important to note that Xcel has renewed its request for a FLISR system (Fault Location, Isolation, and Service Restoration), which is a grid modernization initiative to improve reliability. From its 2017 review of the FLISR proposal, and a brief review of the 2019 proposal, Staff understands all feeders receiving FLISR would be implemented in the Metro West and Metro East service centers, which have the best service quality. As the Commission and stakeholders review Xcel's FLISR proposal, Staff believes having additional information, as discussed in the locational reliability section below, will be helpful in assessing the Company's request.

Figure 10: SAIDI Trends (actual), 2010-2018

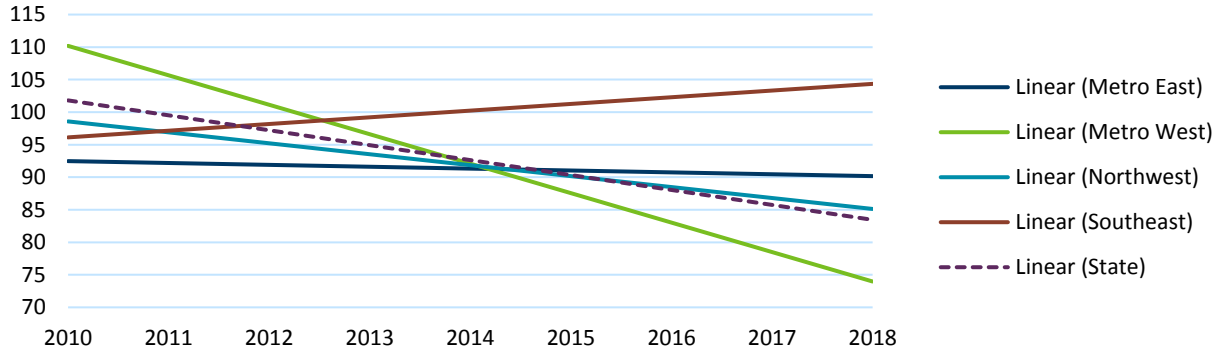


Figure 11: SAIFI Trends (actual), 2010-2018

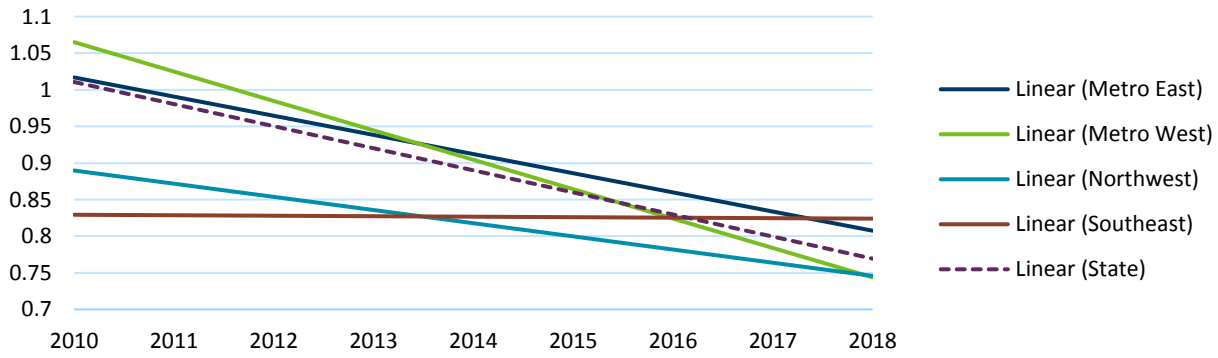
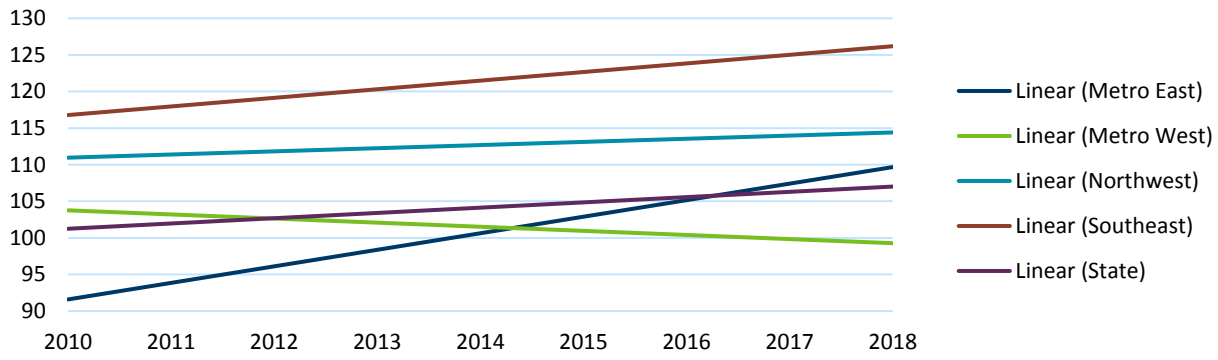


Figure 12: CAIDI Trends (actual), 2010-2018



In terms of goals, the first two charts indicate that while SAIDI and SAIFI goals can see periodic increases, they do not typically occur for more than one or two years in a row, aside from the Southeast Region, for which the Commission froze standards in 2018 at 2017 levels. However, CAIDI goals have either stagnated, or started to creep slowly upwards. In last year's report, the Department provided analysis around the increase in CAIDI numbers, summarized on pages 13 to 15 of Staff briefing papers.

Figure 13: SAIDI Goals, 2015-2019

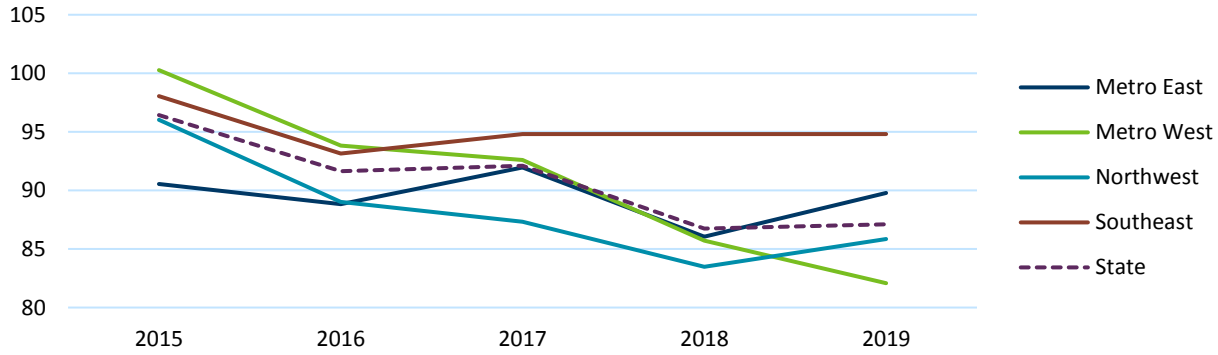


Figure 14: SAIFI Goals, 2015-2019

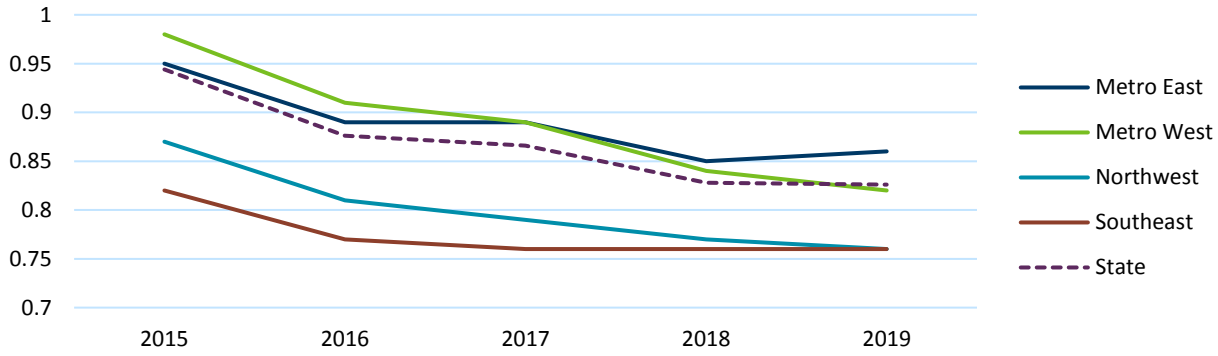
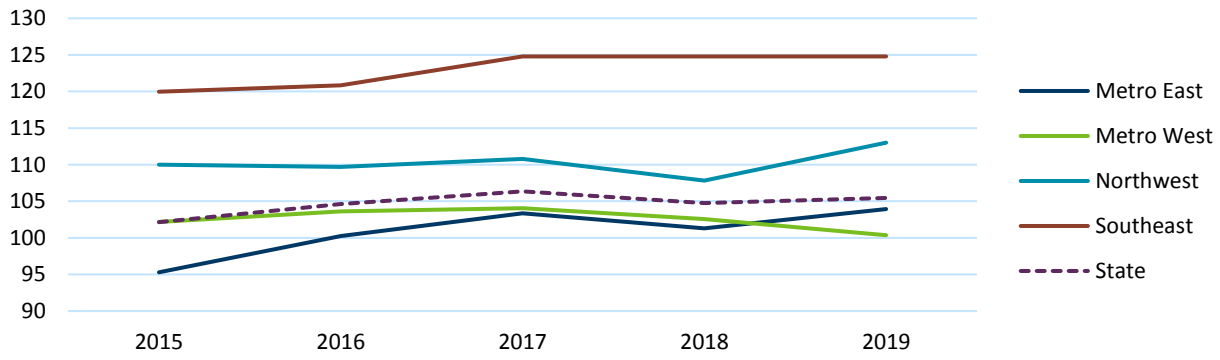


Figure 15: CAIDI Goals, 2015-2019



Locational/Equity Reliability

The Commission's September 18, 2019 Order identifies future metrics on: "locational reliability" and "Equity – reliability by geography, income, or other relevant benchmarks" (Equity Reliability) under the "Reliability" outcome of its Performance Metric docket.[17] Commission Staff indicated to Xcel before it filed its additional set of metrics that the locational reliability piece would be better examined in the Company's annual reliability report (the current docket.) Upon review of Xcel Energy's initial set of metrics filing in the Performance Metric docket[18], Staff determined the Equity Reliability metric was closely tied to locational reliability, and issued a Notice proposing to discuss both locational reliability and Equity-Reliability in the present docket.[19]

Below, Staff provides framing around both locational and Equity Reliability; as well as, a proposal for future reporting that will assist stakeholders and the Commission in crafting the future locational and Equity Reliability metrics.

The industry standard reliability metrics are SAIDI, SAIFI, and CAIDI, and to a certain extent, MAIFI. Other metrics the Commission requires utilities to report on include CEMI and CELI, although these tend to be reported on a system-wide basis.

- SAIDI is the System Average Interruption Duration Index, or the average length of a system outage.
- SAIFI is the System Average Interruption Frequency Index, or how frequently a point in the system experiences an outage.
- CAIDI is the Customer Average Interruption Duration Index, or the average length of an outage a customer experiences
- MAIFI is the Momentary Average Interruption Frequency Index, or how frequently a point in the system experiences an outage lasting less than five minutes
- CEMI is Customers Experiencing Multiple Interruptions, a measure what percentage of customers experience more than a specified number of outages in a year

[17] MN PUC, Order Establishing Performance Metrics (September 18, 2019), Docket No. E002/CI-17-401, Ordering Paragraph 1(b)(ii)(2&4)
[18] Xcel Energy, Proposed Metric Methodology and Process Schedule, October 31, 2019, Docket No. E002/CI-17-401
[19] MN PUC, Notice – Staff Recommendation on Equity Metric (November 12, 2019), Docket No. E002/CI-17-401

- CELI is Customers Experiencing Lengthy Interruptions, a measure what percentage of customers experience more than an outage of a specified length (ex, 12 hours, 24 hours)

The more granular reliability reporting gets, the more susceptible it is to isolated, localized events, such as animal-related outages, weather, or human interference. Additionally, system reliability is heavily influenced by the type of system that exists in a particular area:

- Is the system primarily overhead or underground?
- What is the age of the system?
- Is there a large amount of vegetation?
- Is it a radial feeder or are there options for switching customers to a different substation during times of system stress?
- What mix of customers are on the feeder?

To-date, the Commission receives limited information on locational reliability and outages. Xcel currently reports the 25 "worst performing feeders" per service region on an annual basis, however it notes that these are not always classified as poor performers under its own internal review process. The Commission has received detailed information on Xcel's outages in the past upon request. For example, in the docket on Xcel's 2017 Biennial Distribution Grid Modernization Report, Xcel provided a list of sustained outages from 2010 through 2016, included the following information[20]:

- The number of customers out (SCI = Sustained Customer Interruptions)
- Customer Minutes Out (CMO)
- Duration Actual Minutes – the duration of the outage
- Feeder ID
- Outage Level (where on the distribution system
- Primary Event Index
- Region
- Whether the event occurred on a Major Event Day (MED)
- State
- Primary Cause of the outage
- Start Month
- Start Day
- Outage Count

Staff believes Xcel should be able to report this data, and based on stakeholder input in the Performance Metric docket, is of great interest to customers and parties in Xcel's service territory. The current status of reporting (described above) is one aspect, creating a metric to adequately gauge if reliability issues are tied to factors like location or customer income level is even more challenging.

[20] Xcel Energy, Response to PUC IR 3, Docket No. E002/M-17-776

A perpetual challenge exists in aligning utility data with other data sources as utility service territory boundaries do not align with any other geographic divisions (zip code, county, census tract, etc.). For example, in the RENEWs pilot annual reporting, the Commission requested SAIDI, SAIFI, and CAIDI data for the Railroad Island neighborhood, where the program would be located. However, as Xcel noted in its report, the feeder that serves Railroad Island has customers outside of the neighborhood, making it difficult to isolate the reliability solely for the study area.[21] Staff invites parties with more expertise to share ways of integrating existing equity data with Xcel's service quality data. One possible source is the Minnesota Pollution Control Agency's "Understanding environmental justice in Minnesota" map that incorporates census track data on poverty, people of color, and federally recognized tribal areas.[22]

Staff appreciates Xcel's offer to map reliability, and suggests that an interactive tool be developed that allows interested parties or individuals to see the reliability in their neighborhood. One way to visualize the data would be through an online heat map that shows reliability. This would be more accessible to members of the general public than a list of numbers, as is currently provided in the worst performing feeder list and service center level reporting. Minnesota Power provided similar feeder level maps of its reliability in its 2017 annual report.[23]

Staff has compiled a straw proposal of data points Xcel would submit in future reports in Attachment C, and suggests the Commission seek comment on this reporting proposal. These data points are based on what is currently reported under the "worst performing feeder" requirement in the instant docket, information received in response to Staff Information Request 3 in Docket 17-776, and other factors that impact locational reliability. Staff also proposes Xcel develop a map-based tool that allows customers, cities, and other interested stakeholders to view the reliability for a particular area. Staff recognizes that some of this information may be classified as privacy data, and in the notice would request Xcel identify which information it feels is non-public. In the notice for comment, Staff would also solicit input on the appropriate equity measures to overlay the reliability metrics, but defers to stakeholders with more experience.

Work Center Staffing Levels

Minn. Rules 7826.0500 Subp. 1K requires utilities to report "data on staffing levels at each work center, including the number of full-time equivalent positions held by field employees responsible for responding to trouble and for the operation and maintenance of distribution lines." The Department acknowledged compliance with Minnesota rules by all three utilities.

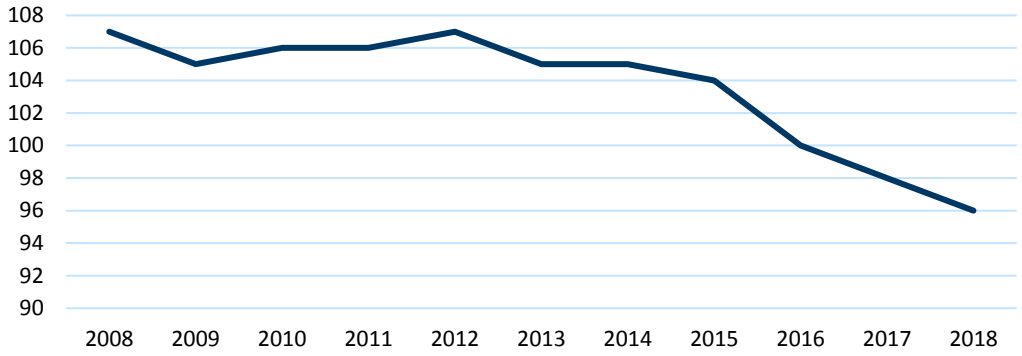
Minnesota Power

Minnesota Power reported 111 full time field worker positions, 96 of which are responsible for operation and maintenance of the distribution system.[24] Minnesota Power has seen a slow

[21] Xcel, 2018 Annual Report, Docket No. 17-527, p. 6
[22] http://mpca.maps.arcgis.com/apps/MapSeries/index.html?appid=f5bf57c8dac24404b7f8ef1717f57d00
[23] MP, Initial Filing, Docket 18-250, pp. 169-171
[24] MP, Initial Filing, Docket No. 19-254, p. 16

decline in the number of line workers over the past few years, which continued in 2018. Figure 16 depicts the ongoing decline in line workers.

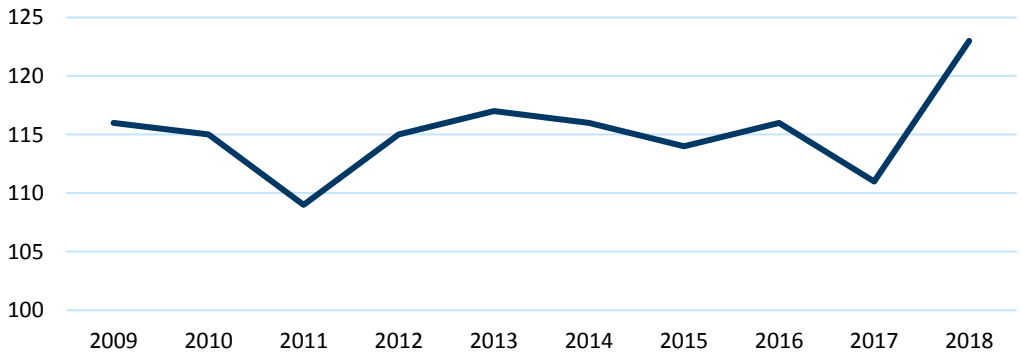
Figure 16: MP Line Workers (FTE), 2008-2018



Otter Tail Power

Otter Tail increased the number of line workers available to handle problems in the field in 2018, depicted in Figure 17.[25] Otter Tail also provided the number of office staff that support its line workers for each service center, along with its customer care and relations team, which has increased overall since 2009.

Figure 17: OTP Line Workers (FTE), 2009-2018



Xcel Energy

Xcel added two positions since 2017, but still has lower total numbers than its historical average. Additionally, the Southeast work center lost one position, continuing its decline in service personal. The Southeast work center has lost 27% of its staff since 2009, the largest drop of any service center. The Southeast region also has the poorest service quality numbers of the four work centers. In contrast, Metro West has seen an overall increase in staff since 2009, and has the best service quality of the four work centers, meeting its reliability goals 74% of the time, versus 48% for the Southeast. Staff emphasizes that there are many factors that influences reliability outside of staffing levels, however the downward trend in the Southeast region is concerning.

[25] OTP, Initial Filing, Docket No. 19-260, p. 22

Table 4: Xcel Energy Staffing Levels, 2009-2018[26]

Year	Metro East	Metro West	Northwest	Southeast	Other*	Total
2009	133	173	37	61	61	465
2010	139	189	32	64	46	470
2011	138	190	33	63	46	470
2012	134	190	34	58	44	460
2013	136	195	34	54	51	470
2014	129	197	35	57	56	474
2015	132	201	35	55	54	477
2016	129	202	32	50	55	468
2017	121	195	34	49	56	455
2018	125	195	34	48	55	457
Historical Average	132	192	34	57	53	468
% change from 2009	-6%	11%	-9%	-27%	-11%	-2%
% reliability goals met, 2009-2018	64%	74%	55%	48%		

* Xcel Energy field employees associated with the Fargo and Sioux Falls Service Centers respond to trouble and perform distribution line operation and maintenance in western Minnesota and the Dakotas.

Staff Analysis

Minnesota rules require utilities to break out the number of staff responsible for directly responding to outages as full time equivalent positions (FTEs). Minnesota Power and Otter Tail Power both break this number out, giving office staff and linemen for each service center. However, Xcel provides a single number, and it is unclear to Staff whether this is the number of line workers, or total employees per service center. Staff requests all utilities clarify this in future reports, and provide a breakdown of line workers versus dispatch staff. Utilities should report this as a part of their report under 7826.0500 Subp. 1, J, and not as a separate attachment, similar in format to Otter Tail's annual report.[27] This is included in Decision Option 2, Attachment B.

IEEE Benchmarking

In its March 19, 2019 Orders accepting the utility reports, the Commission required the utilities to benchmark their performance to the IEEE reliability standards. Currently, only Xcel participates in the IEEE reliability benchmarking study, however Minnesota Power and Otter Tail Power participate in the Edison Electric Institute (EEI) benchmarking group.

Minnesota Power

Minnesota Power indicated that it does not currently participate in IEEE reliability benchmarking, but will start to do so in 2019. However, MP does participate in the Edison

[26] Department, Initial, Docket No. 19-261, p. 10
[27] OTP, Initial Filing, Docket No. 19-260, p. 22

Electric Institute (EEI) reliability benchmarking, and in 2017 was in the second quartile for SAIDI, SAIFI, and CAIDI, and in the third quartile for MAIFI.[28]

Otter Tail Power

Like Minnesota Power, Otter Tail does not currently participate in the IEEE benchmarking study. OTP provided information from the 2017 EEI Reliability Survey indicating that it was in the first quartile for CAIDI, third quartile for SAIDI, and fourth quartile for SAIFI. Additionally, it noted that it was in the fourth quartile for MAIFI but EEI sees very few respondents for the MAIFI portion of its survey.[29]

Xcel Energy

Xcel also provided charts from the 2017 IEEE Reliability Survey. The rankings were divided by Xcel operating companies, with NSPM SAIDI and SAIFI ranking in the first quartile.[30] Xcel did not provide CAIDI or MAIFI quartile rankings.

Staff Analysis

Staff also examined the EIA 2018 reported reliability numbers, using the IEEE normalized/non-normalized data sets. Staff then looked at where Minnesota Power, Otter Tail Power, and Xcel Energy fell within the quartile ranking of similarly sized investor owned utilities (using IEEE normalized value from the 2018 EIA 861 reports).

Table 5: Benchmarking with EIA data

	SAIDI	SAIFI	CAIDI
Minnesota Power	3rd Quartile	4th Quartile	2nd Quartile
Otter Tail Power	2nd Quartile	3rd Quartile	1st Quartile
Xcel Energy	2nd Quartile	2nd Quartile	2nd Quartile

Staff recommends Otter Tail join the IEEE benchmarking group in future years, and recommends all utilities report on benchmarking for SAIDI, SAIFI, CAIDI, and MAIFI (**Decision Option 2**, Attachment B)

Reliability by Class

In its March 19, 2019 Order, the Commission required the utilities to provide information on how different customer classes are impacted by outages.

Minnesota Power

Minnesota Power calculated averages of the time customers were served by taking outage numbers from each class and determining their overall reliability by time served, depicted in below. This metric is also known as the Average Service Availability Index, or ASAI, and represents the percentage of time that power was available.

[28] MP, Initial Filing, Docket No. 19-254, p. 21
[29] OTP, Initial Filing, Docket No. 19-260, pp. 28-30
[30] Xcel, Initial Filing, Docket No. 19-261, Attachment Q

Table 6: Minnesota Power Reliability by Customer Class[31]

Customer Class	Residential	Commercial	Industrial
ASAI	99.97500%	99.99558%	99.99992%

The Department requested additional information on how MP performed these calculations, with the Company providing details on how it apportioned customer counts per feeder to derive outages based on customer classes.[32]

Otter Tail Power

OTP indicated that it does not have the ability to differentiate reliability by customer class due to the retirement of its old Interruption Monitoring System (IMS). The Company's new IMS system will be able to provide reliability details by customer class starting in reporting year 2019. OTP requested more clarity on what class types, and how the Commission would like reliability by customer class reported. [33]

Xcel Energy

Xcel indicated that it does not currently track customer reliability by class on a feeder level basis. However, Xcel provided the following analysis:

> We did attempt to segregate feeders that were predominately residential compared to feeders that were predominately commercial. In 2017, we found that feeders primarily serving commercial customers in general had a SAIDI value that was significantly better than the feeders serving primarily residential customers. The 2018 data showed a similar result. Although not studied, this is likely due to several items including: less vegetation in industrial and commercial areas, shorter feeders due to higher load density resulting in less exposure to the environment, and higher percentage of customers with underground service. We do not expect this general performance to vary much from year to year, and therefore the Company respectfully requests that it not be required to perform this analysis in future annually filings. Beyond this general view we don't believe providing detailed data is appropriate since it was based on assumptions and judgement.[34]

The Department agreed with Xcel that it would be appropriate to discontinue this reporting requirement until the Company has better reporting capabilities.[35]

Staff Analysis

Staff disagrees with the Department and Xcel on discontinuing the reliability by class reporting requirement, as Minnesota Power has demonstrated what seems to be a reasonable way of approximating reliability by class by looking at the proportion of residential, commercial, and industrial customers on individual feeders. However, since the Commission will already be addressing granular reliability reporting for Xcel as part of its look at locational reliability, that

[31] MP, Initial Filing, Docket No. 19-254 p. 17
[32] MP, Reply, Docket No. 19-254, Attachment
[33] OTP, Initial Filing, Docket No. 19-260, p. 33
[34] Xcel, Initial Filing, Docket No. 19-261, p. 30
[35] Department, Initial, Docket No. 19-261, p. 23

may be a more appropriate place to have this conversation. Otter Tail requested additional clarity on what exact metrics the Commission would like to see, and indicated it would be able to provide the data with its 2019 report.

Staff recommends the Commission provide more clarity on what metric it would like utilities to report by class, and what customer classes utilities should report. Staff recommends utilities report in the following format:

		ASAI	SAIDI	SAIFI	CAIDI	MAIFI
Residential	Non-normalized					
	Normalized					
Commercial	Non-normalized					
	Normalized					
Industrial	Non-normalized					
	Normalized					

Staff expects, at a minimum, Xcel will be able to report this data when it implements its new AMI system and other associated grid modernization improvements. This modification is included in **Decision Option 2** (Attachment B).

MAIFI

MAIFI (Momentary Average Interruption Frequency Index) in consists of interruptions lasting less than five minutes, which are excluded from SAIDI, SAIFI, and CAIDI calculations. These types of interruptions tend to have a more disproportionate impact on commercial and industrial customers for whom even a 30 second lapse in power can cause hours of lost productivity as machinery restarts. Xcel and Otter Tail reported both normalized and non-normalized data. Minnesota Power reported normalized data. All three utilities report MAIFI, however staff notes that it appears to have been inadvertently omitted from the March 19, 2019 Order. Staff proposes adding MAIFI, both normalized and non-normalized, to the permanent reporting requirements (included in Attachment B).

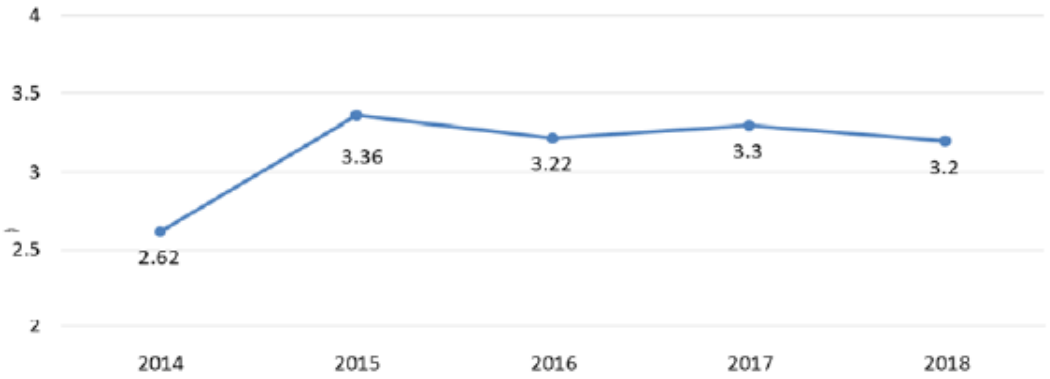
Minnesota Power

MP indicated that while it has tracked MAIFI for the past decade, it acknowledged that its data collection will be incomplete without a significant investment in further sensing technology. Approximately 30 percent of MP's data is collected by its SCADA system with the rest collected manually, either via customer calls or when device maintenance is done.[36]

Figure 18 from MP's report indicates its storm excluded MAIFI results over the past 5 years.

[36] MP, Initial Filing, Docket No. 19-254, p. 12

Figure 18: Minnesota Power MAIFI[37]

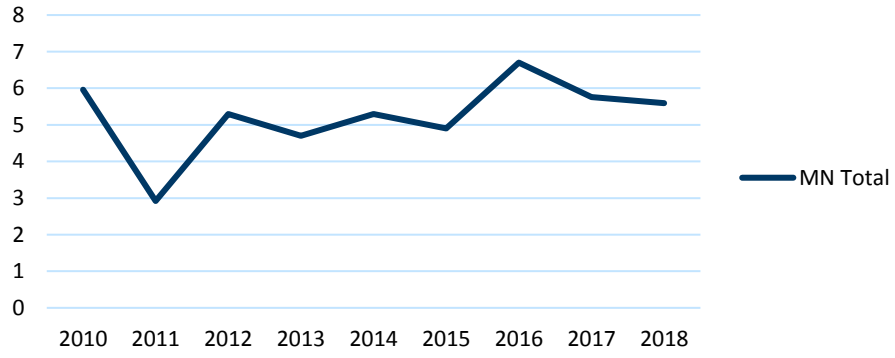


Otter Tail Power

OTP indicated that it uses MAIFI as a predictor of future SAIDI values, and analyzes line sections with high MAIFI for additional vegetation management or infrastructure investments. OTP indicated that in 2019 its new IMS system will be available for MAIFI calculations. Table 7 depicts OTP's 2018 and historic MAIFI values.

Table 7: Otter Tail Power MAIFI (non-normalized)[38]

Customer Service Center	MAIFI
Bemidji	4.95
Crookston	5.14
Fergus Falls	5.18
Milbank	8.95
Morris	6.71
Wahpeton	7.57
MN Total	5.59



Xcel Energy

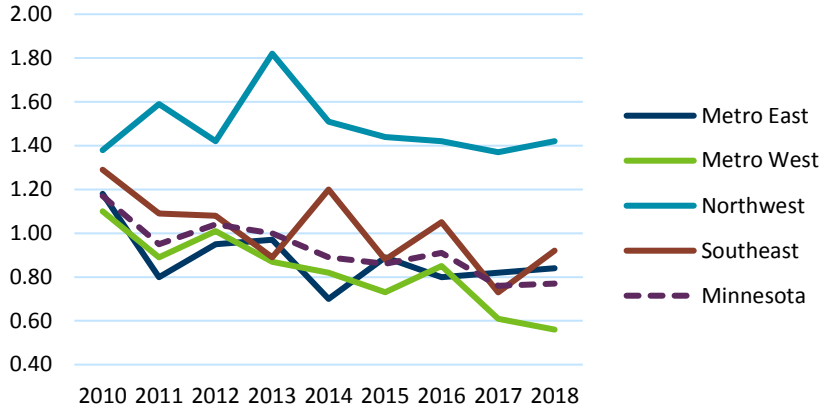
Xcel provided three MAIFI calculations for its feeders that are SCADA enabled using the IEEE Momentary Interruption Event Definition. Xcel noted that "momentary outage information is available at the Feeder-level and above, by Feeder circuit, and only on Feeders that are located in substations with Supervisory Control and Data Acquisition (SCADA) capability. With current distribution infrastructure, we are able to report MAIFI at the distribution Feeder level for approximately 92 percent of our retail customers."[39]

These calculations depended on which method the Company used: non-normalized, IEEE, or QSP method.[40] Table 8 depicts Xcel's non-normalized 2018 results.

[37] *Id.*, p. 13
[38] OTP, Initial Filing, Docket No. 19-260, p. 6
[39] Xcel, Initial Filing, Docket No. 19-261, Attachment N, p. 3
[40] Xcel, Initial Filing, Docket No. 19-261, Attachment N, p. 3

Table 8: Xcel MAIFI (non-normalized)[41]

Region	MAIFI
Minnesota	0.77
Metro East	0.84
Metro West	0.56
Northwest	1.42
Southeast	0.92



CEMI and CELI

CEMI (Customers Experiencing Multiple Interruptions) and CELI (Customers Experiencing Lengthy Interruptions) are additional ways of measuring how customers are impacted by outages. Unlike CAIDI, these metrics focus on customers who deal with repeated or longer than average outages. The Commission required utilities to report on CEMI and CELI in its March 19, 2019 Order. The percentages represent the number of customers who experience multiple or lengthy outages during the reporting year. The Commission required reporting at the following intervals:

> CEMI – normalized and non-normalized, percent of customers experiencing more than 4, 5, or 6 outages in a year.
>
> CELI –percent of customers experiencing outages lasting longer than 6 hours, 12 hours, and 24 hours.

Minnesota Power

Minnesota Power calculated CEMI and CELI at the feeder level, as it does not currently have the ability to do so for individual customers.

[41] Xcel, Initial Filing, Docket No. 19-261, Attachment N1, p. 1. Xcel did not update the chart on Attachment N, pg. 3

Figure 19: MP Non-normalized CEMI

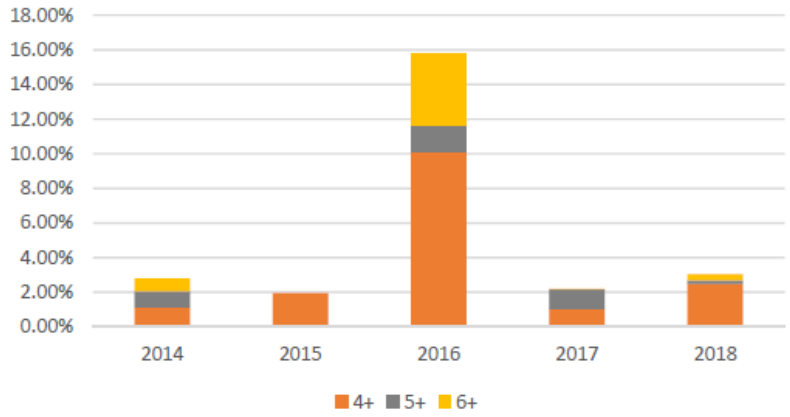
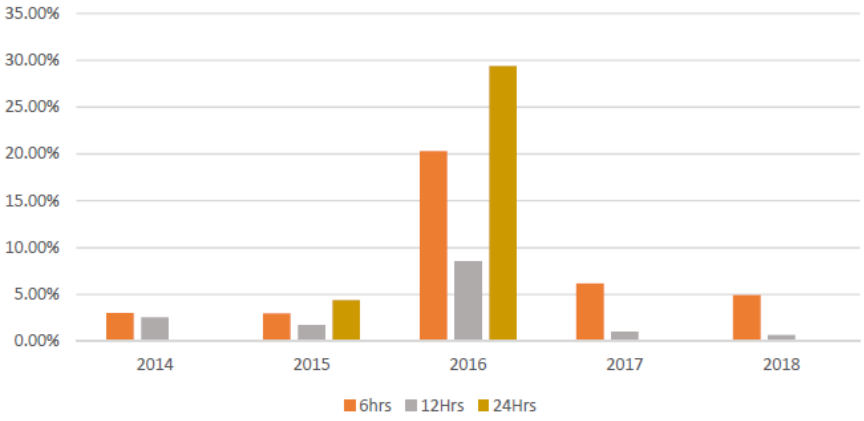


Figure 20: MP Non-normalized CELI



Otter Tail Power

OTP provided a summary of CEMI 4+, 5+, and 6+ and CELI 6/12/24 hours, (Table 9) noting that its new monitoring system will be able to give more granularity for CEMI 5+, but would require software upgrades for CEMI 4+, CEMI 6+, and CELI. Otter Tail did not indicate whether these were normalized or non-normalized values.

Table 9: OTP 2018 System CEMI and CELI

CEMI	
CEMI 4+	7.69%
CEMI 5+	2.39%
CEMI 6+	1.73%
CEMI 7+	0.70%

CELI	
CELI – 6	5.26%
CELI – 12	1.25%
CELI – 24	0.00%

Xcel Energy

Figure 21 shows Xcel's non-normalized CEMI performance over the past five years for customers experiencing 4, 5, or 6+ outages in a year. Xcel noted it participates in an EEI CEMI benchmarking study, but the results are only available to study participants. [42]

Figure 21: Xcel CEMI (4+ Interruptions, non-normalized)[43]

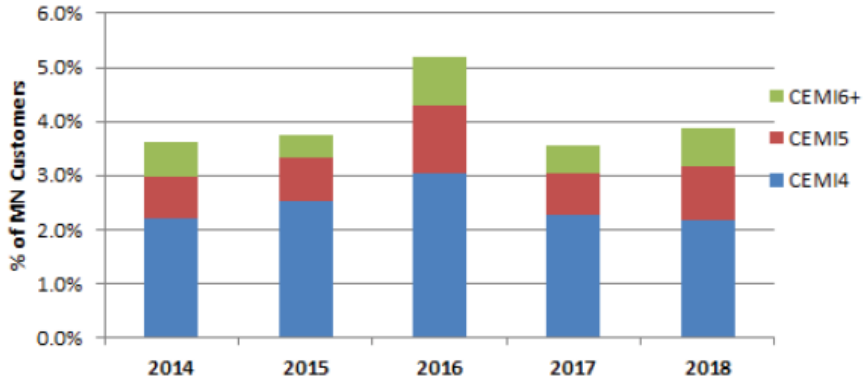
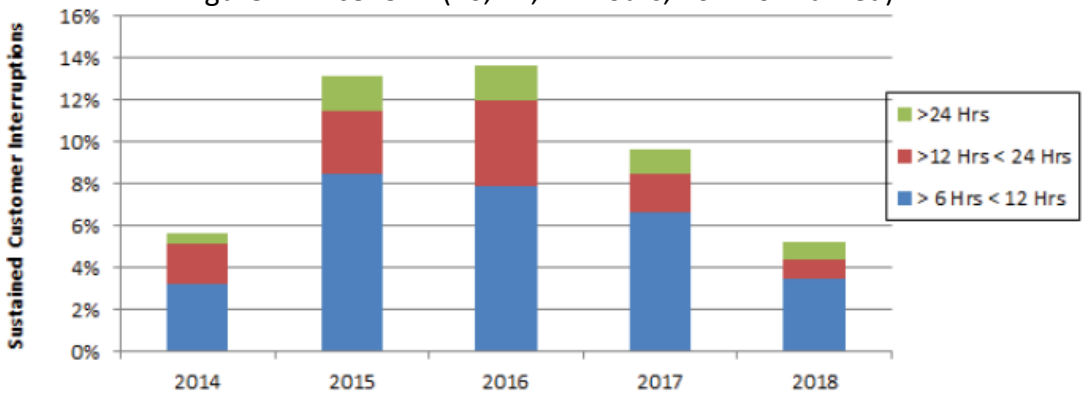


Figure 22 indicates the percentage of customers experiencing outages of 6, 12, or 24 hours or longer for 2014-2018.

Figure 22: Xcel CELI (>6, 12, 24 Hours, non-normalized)[44]



Staff Analysis

Staff recommends in addition to the graphs, utilities provide numeric percentage values, similar to how Otter Tail provided its CELI/CEMI data on an annual basis. In a compliance filing, utilities should provide historic normalized and non-normalized values back to 2010 (or if not available, through at least 2013), in the following format (**Decision Option 4b**):

[42] Xcel, Initial Filing, Docket No. 19-261, Attachment P, p. 1
[43] Xcel, Initial Filing, Docket No. 19-261, Attachment P, p. 2
[44] Xcel, Initial Filing, Docket No. 19-261, Attachment P, p. 4

	2010	2011	2012	2013	2014	2015	2016	2017	2018
CEMI 4+									
CEMI 5+									
CEMI 6+									
CEMI 7+									
CELI – 6									
CELI – 12									
CELI – 24									

Estimated Restoration Times

In its March 2019 Order, the Commission required utilities to report on the accuracy of their estimates for when power will be restored to customers who have lost service.

Minnesota Power

Minnesota Power does not currently track the differences between estimated restoration time and actual restoration time, but plans to implement it during 2019.[45]

Otter Tail Power

Otter Tail appears to have misunderstood what the Commission asked for with this reporting option, and interpreted it as asking for CAIDI values.[46]

Xcel Energy

Xcel's restoration accuracy has remained consistent over the past four years, at around 45%. Xcel uses a window of 90 minutes before the estimated restoration time up until the actual time (-90 to 0). Xcel explained customer satisfaction drastically drops off once the restoration time exceeds the estimate, hence its use of the -90 to 0 window. The Company continues to refine its algorithm to enhance its accuracy.[47]

Staff Analysis

While Xcel stated it preferred to only report accuracy for a window of time that exceeds its original estimate, Staff believes for the Commission, having the +30 minute range would provide a helpful comparison point. Staff has provided this clarification in Attachment B (Decision Option 2). While Otter Tail Power did not report on its estimated restoration times this year, Staff is fine with the Company providing the information in its 2019 report, as there is now additional clarification around what the Commission is looking for.

Staff notes both OTP and MP use social media to update customers on outages, while Xcel does not currently do so. All three utilities provide outage maps on their websites.

[45] MP, Initial Filing, Docket No. 19-254, pp. 21-22
[46] OTP, Initial Filing, Docket No. 19-260, p. 33
[47] Xcel, Initial Filing, Docket No. 19-261, p. 24-27

Worst Performing Feeder

Minn. Rules 7826.0500 Subp. 1H requires utilities to file, "to the extent technically feasible, circuit interruption data, including identifying the worst performing circuit in each work center, stating the criteria the utility used to identify the worst performing circuit, stating the circuit's SAIDI, SAIFI, and CAIDI, explaining the reasons that the circuit's performance is in last place, and describing any operational changes the utility has made, is considering, or intends to make to improve its performance."

The Department acknowledged that all 3 utilities fulfilled the reporting requirement.

Minnesota Power

The Company identified its four worst performing feeders, two urban and two rural.[48] The Department identified concerns about the Colbyville 240 feeder, as it had appeared on the list of poor performing circuits four out of the past ten years. In response, Minnesota Power detailed the upgrades performed on the line in 2018, along with plans to install remote operated switching devices in 2020.[49] The Department was satisfied with the response, and recommended the commission direct MP to provide an update on the feeder in its next report **(Decision Option 6)**

Otter Tail Power

The Company identified its worst performing feeders in each work center.[50] The Department provide the following analysis of OTP's historical worst feeder performance.

> The Department notes that, according to OTP's annual reports over the years, there is no apparent trend in terms of outage causes or continuing poor performance for any particular feeder. The Department uses historical data to identify potential areas of concerns regarding any feeders that appear multiple times as a worst performing feeder. After reviewing 13 years of historical data, the Department concludes that there is no concern with any specific feeder at this time.[51]

Xcel Energy

The Department provided the following analysis of Xcel's "Worst Performing Circuits"

> The Department used historical data to identify potential areas of concerns regarding any 2018 feeders that are identified multiple times for similar reasons as a worst performing feeder. The Department identified four different feeders through its historical tracking, each of which has been listed in the past as a poorly performing feeder. Of the four feeders Xcel mentioned from the four work centers, Feeder A from the Metro East work center has been identified as a poor performer each year since 2014. Xcel stated the following regarding the feeder:

[48] MP, Initial Filing, Docket No. 19-254, p. 10
[49] MP, Reply, Docket No. 19-254, p. 6
[50] OTP, Initial Filing, Docket. No. 19-260, p. 17-18
[51] Department, Initial, Docket No. 19-260, p. 8

This is a long feeder that is located on a hilltop in a rural and rustic area surrounded by rough terrain and trees. The area is sparsely populated without a tie to another source available. In 2018, a section of the mainline that had many splices was replaced with new conductor. Also, a portion of the feeder was transferred onto a new feeder out of a different substation. This will reduce exposure and customer count affected by outages. Compared to 2017, the total customer minutes out (CMO) came down greatly from 1,930,902 to 500,459, almost a 75 percent reduction. Most of the CMOSs in 2018 were due to vegetation. The five-year tree trimming cycle was completed on December 18, 2018, which should result in improvements for 2019. In addition, a project is planned for this feeder in 2019 to replace five bad crossarms and install 10 clampstars to reinforce auto splices, scheduled to be completed in June 2019. The location of this feeder creates challenges to improvement; however, we will continue to monitor it and determine if other actions can improve its reliability. For the remaining feeders on the worst performing list, Xcel's 2017 Report indicated that remedial actions were taken to improve the feeders' performance.[52]

Major Service Interruptions

Minn. Rules 7826.0500 Subp. 1G requires utilities to file copies of reports submitted to the Commission's Consumer Affairs Office under 7826.0700. Utilities must provide the following information on major service interruptions:

A. the location and cause of the interruption;
B. the number of customers affected;
C. the expected duration of the interruption; and
D. the utility's best estimate of when service will be restored, by geographical area.

All three utilities provided the required reports, and the Department acknowledged fulfillment of the reporting requirement.

Xcel Energy

Xcel reported 243 major service interruptions for 2017. Of these, 6 were not contemporaneously reported to the Commission's Consumer Affairs Office, around 2% of total events. According to the Department's analysis, Xcel has had similar levels of unreported outages in prior years, most resulting on days with especially heavy storm activity.[53]

Bulk Power Interruptions

Minn. Rules 7826.0500 Subp. 1F requires, "to the extent feasible, a report on each interruption of a bulk power supply facility during the calendar year, including the reasons for interruption, duration of interruption, and any remedial steps that have been taken or will be taken to prevent future interruption."

[52] Department, Initial, Docket No. 19-260, pp. 9-10
[53] Department, Initial, Docket No. 19-261, p. 15

OTP had one bulk power supply interruption for 2018 due to a phase to ground fault on an 115KV transmission line, resulting in a 14 minute interruption to Minnesota customers.[54]

Minnesota Power had eight bulk power supply interruptions in 2017, four caused by weather, one by a vehicle accident, one from an unknown cause, and two due to equipment failure. All issues were fixed and did not require follow up.[55]

Xcel did not have any generation outages for 2018. It listed 36 transmission outages during 2018, and indicated "since the incidents shown were reactionary due to storms, public damage, or other activities associated with random and unforeseen events, no plans have been developed to address the specific issues encountered."[56] 16 of the outages occurred from equipment failure, 3 from public damage, 5 unknown, and the remaining 12 from storms or debris in the line, including two instances where balloons were the source of the outage.[57]

The Department acknowledged that all three utilities fulfilled the reporting requirement.

Voltage Violations

Minn. Rules 7826.0500 Subp. 1I requires utilities to submit "data on all known instances in which nominal electric service voltages on the utility's side of the meter did not meet the standards of the American National Standards Institute for nominal system voltages greater or less than voltage range B."

The Department acknowledged that all three utilities fulfilled the reporting requirement.

Minnesota Power

Minnesota Power reported six ANSI Voltage Range B violations in 2018. The Department noted that after several years with numbers of voltage violations, 2018 is in line with the historical average of six instances a year.[58]

Otter Tail Power

The Department provided the following analysis on OTP's voltage violations in 2018:

> OTP provided a table listing the feeders and number of known occurrences where the voltage fell outside the American National Standards Institute (ANSI) voltage range B in 2018. OTP noted that most of the feeders with numerous occurrences were feeders serving a single large customer with a very large load (mostly pipelines). The Department observes no significant trend regarding this metric.[59]

[54] OTP, Initial Filing, Docket No. 19-260, p. 16
[55] MP, Initial Filing, Docket No. 19-254, Appendix A, pp. 9-10
[56] Xcel, Initial Filing, Docket No. 19-261, p. 11
[57] Xcel, Initial Filing, Docket No. 19-261, Attachment C
[58] Department, Initial, Docket No. 19-254, p. 13
[59] Department, Initial, Docket No. 19-260, p. 9

Xcel Energy

Xcel reported 300 investigations for voltage violations in 2018. Of these, 59 resulted in actual voltages problems, typically due to equipment malfunction. In those instances, the Company replaces or upgrades the necessary equipment.[60]

Discussion of Grid Modernization Impacts on Reliability Metrics

In its March, 2019 Order, the Commission requested utilities discuss the impact of grid modernization investments on measures of reliability, along with investments that could improve tracking of outages or power quality issues.

Xcel Energy

Xcel noted that with AMI they would receive quicker notification of when a customer was without power. However, it explained during a storm event, it may receive a more complete picture of outages, including some that may have gone previously unreported, making their reliability numbers look worse, when actually the numbers are now more reflective of system conditions. Xcel posited the same would be true for MAIFI, which is currently only reported at the feeder and substation level.[61]

Xcel is again seeking approval in other dockets for FLISR (Fault Location, Isolation, and Service Restoration), an automatic switching tool meant to increase reliability.[62] While FLISR is expected to decrease SAIDI and SAIFI, many previously sustained outages would become momentary, increasing MAIFI. Finally, Xcel reiterated discussions around how CAIDI can rise if SAIDI and SAIFI do not experience proportional declines.[63]

Minnesota Power

Minnesota Power is the only IOU that has started AMI implementation. The Company hypothesized the start of AMI implementation in 2011 has led to an increase in reported customer minutes out, negatively impacting its reliability results. [64]

Otter Tail Power

Otter Tail echoed Xcel's remarks, indicating increases system visibility through grid modernization improvements could give the appearance of worsening reliability numbers. The Company gave an overview of its efforts to increase communications infrastructure capabilities to support future grid modernization investments.[65]

Staff Analysis

The utilities discussed having more in depth discussions in their distribution systems plans, or in specific grid modernization investments. While Staff does not object to this information being included in those filings, the annual reliability reports are a more appropriate forum to focus on

[60] Xcel, Initial Filing, Docket No. 19-261, p. 16
[61] Xcel, Initial Filing, Docket No. 19-261, p. 31
[62] See Staff Briefing Papers in Docket 17-776, pp. 15-16 for an explanation of how FLISR works
[63] Xcel, Initial Filing, Docket No. 19-261, p. 32-34
[64] MP, Initial Filing, Docket No. 19-254, p. 8
[65] OTP, Initial Filing, Docket No. 19-260, pp. 34-35

the specific impacts grid modernization has on longstanding reliability metrics and measures of customer satisfaction.

Staff proposes that as utilities institute grid modernization improvements that impact reliability metrics, they provide a comparison of the reliability of feeders with grid modernization investments, such as AMI or FLISR, to the historic averages for the same feeders. For example, Minnesota Power has implemented AMI for approximately 50% of its customers. The Company would report if feeders with AMI implemented saw a noticeable change from the pre-AMI reliability metrics. Staff recommends utilities report on the feasibility of this metric in their next annual report (**Decision Option 3**).

Safety

Utilities report two categories in their annual safety reports:

1. Occupational Illness and Injuries: summaries of all reports filed with the United States Occupational Safety and Health Administration and the Occupational Safety and Health Division of the Minnesota Department of Labor and Industry during the calendar year (Minn. Rules 7826.0400, Part A)
2. Property Damage Claims: a description of all incidents during the calendar year in which an injury requiring medical attention or property damage resulting in compensation occurred as a result of downed wires or other electrical system failures and all remedial action taken as a result of any injuries or property damage described. (Minn. Rules 7826.0400, Part B)

The Department acknowledged each utility had fulfilled the necessary reporting requirements.

Minnesota Power

The Department provided the following summary of MP's safety results:

> MP stated that there were no incidents in 2018 in which injuries requiring medical attention occurred because of downed wires or other electrical system failures.
>
> Between 2017 and 2018, there was a 150% increase in the number of claims filed and 413% increase in the dollar amount paid for claims. A majority of the claims paid in 2018 ($15,210.52, or 68%) were as a result of "vehicle damage." This is unlike many past years, where a majority of claims filed were due to "work procedure."[66]

Otter Tail Power

The Department provided tables showing OTP's historic incident rate, which indicated that 2017 was in line with or well below on every category for the past 10 years. Property damage claims were similarly low, with 1 reported incident at total level of $100.[67]

Xcel Energy

The Department provided the following summary of Xcel's safety results:

[66] Department, Initial, Docket No. 19-254, pp. 3-4
[67] Department, Initial, Docket No. 19-260, pp. 3-4

Xcel provided summaries of 2018 data requested by the U.S. Department of Labor. This information reflects safety information on a random selection of the Company's plants and is therefore not necessarily comparable year to year.

Xcel reported no payments in compensation for injuries requiring medical attention resulting from downed wires or other electrical system failures in 2018.

The Department notes that property damage due to overhead conductors has been the most costly category for eight of the last 16 years. Overall, the number of claims and the amounts paid have stayed within a relatively consistent range, and do not show any indication of systematic increases.[68]

Staff Recommendation

Staff recommends adopting all decision options as described below, however no decisions are dependent on one another. The Commission must accept or reject the annual reports (Decision Option 1) and must set reliability standards for 2019 (Decision Options 5, 8, and 9).

Decision Options 1, 5, 8, and 9 accept the 2019 reports and set reliability standards at levels agreed to by the utilities and Department. Staff has not listed alternatives, as all parties are in agreement for these items, however the Commission could reject the reports or set different standards.

Decision Option 2 adopts Attachment B modifies ongoing permanent reporting requirements:

- Formalized MAIFI (inadvertently omitted)
- Clarify the CELI requirement to include normalized and non-normalized values
- Provides direction on reliability by customer class
- Clarifies what the Commission is looking for with estimated restoration times
- Modifies the "discussion of leading causes of outages" to include quantitative instead of qualitative data
- Adds a requirement for utilities to provide a complete table of contents that references Commission rules and order points, and has a single complete set of page numbers for easier reference (for example, Xcel uses almost 20 appendices, each with their own set of page numbers, which can be difficult to locate and reference)

Staff does not believe any of these changes to be controversial, but recommends the Commission confirm with utilities at the agenda meeting.

Decision Option 3 is a one-time reporting option, asking utilities to respond to a staff proposal on tracking the impacts of grid modernization on reliability metrics.

Decision Option 4 requires compliance filings with additional historical data on CEMI, CELI, and leading causes of outages. Note that 4a is only for Minnesota Power and Xcel Energy, as Otter Tail Power has historically included this information. The Commission may wish to confirm with utilities that they are able to provide the data for the requested historic period.

[68] Department, Initial, Docket No. 19-261, pp. 3-4

Decision Options 6 and 7 adopts two additional Department reporting recommendations for Minnesota Power.

Decision Option 10 delegates authority to the Executive Secretary to establish a comment period on Attachment C, a Commission Staff proposal on Locational/Equity reliability metrics.

Decision Options (Combined from Volumes 1 and 2)

1. Accept Xcel Energy's, Otter Tail Power's, and Minnesota Power's annual Safety, Service Quality, and Reliability reports for 2019. *(Department, OTP, MP, Xcel)*

2. Clarify the following reporting requirements from the Commission's March 19, 2019 Order, as specified in Attachment B. Delegate authority to the Executive Secretary to establish final report formatting and make minor clarifications where necessary. *(Staff)*

3. In their 2020 reports, utilities shall discuss the feasibility of the following metric, and if the utility does not think the metric is feasible, provide an alternative:

   Provide a comparison of the reliability (SAIDI, SAIFI, CAIDI, MAIFI, normalized/non-normalized) of feeders with grid modernization investments, such as AMI or FLISR, to the historic 5-year average reliability for the same feeders before grid modernization investments. *(Staff)*

4. Require the utilities to make a compliance filing, within 30 days of the order, with additional historical data as follows:
   a. For Minnesota Power and Xcel Energy, causes of sustained customer outages, by service center, from 2010 to 2018, as a spreadsheet, (.xlsx).
   b. CEMI (4+, 5+, 6+) and CELI historical data (6, 12, and 24 hours), both normalized and non-normalized, from 2010 to 2018, as a spreadsheet, (.xlsx). *(Staff)*

Minnesota Power

5. Set Minnesota Power's Reliability Standards for 2019 at the 2016 levels. *(Department, MP)*

	SAIDI	SAIFI	CAIDI
2016 Standard	98.19	1.02	96.26

6. Direct Minnesota Power to provide an update on the Colbyville 240 feeder in next year's report, specifically to note whether any work on the feeder has made an improvement in reliability. *(Department)*

7. Request that Minnesota Power include specific number of calls received and calls answered within 20 seconds, both for business and non-business hours and by type in accordance with Minnesota Rules 7826.1700 and 7826.1200 in future SQSR annual reports. (*Department*)

Otter Tail Power

8. Set Otter Tail Power's Reliability Standards for 2019 at the levels set for 2013. *(Department, OTP)*

Work Center	SAIDI	SAIFI	CAIDI
Bemidji	70.64	1.26	56.06
Crookston	69.33	1.19	58.26
Fergus Falls	55.97	1.11	60.33
Milbank	75.49	1.82	41.48
Morris	55.78	1.01	55.23
Wahpeton	57.24	1.13	50.65
All MN Customers	64.95	1.13	57.48

Xcel Energy

9. Set Xcel Energy's Reliability Standards for 2019 at the following levels. *(Department, Xcel)*

Work Center	SAIDI	SAIFI	CAIDI
Metro East	89.78	0.86	103.94
Metro West	82.08	0.82	100.37
Northwest	85.86	0.76	113.01
Southeast	94.82	0.76	122.04

10. Delegate authority to the Executive Secretary to put out for comment the staff proposal on locational reliability and equity in reliability, as described in Attachment B. *(Staff)*

Appendix A

Ruels or Order?	Reporting requirement		Minnesota Power		Otter Tail Power		Xcel Energy	
			Included	Dep	Included	Dep	Included	Dep
Minn. Rules 7826.0400, A	Summaries of reports files with OSHA		Yes	Yes	Yes	Yes	Yes	N/A
Minn. Rules 7826.0400, B	Incidents involving injury requiring medical attention or property damage		Yes	Yes	Yes	Yes	Yes	N/A
Minn. Rules 7826.0500 Subp. 1, A	SAIDI	normalized	Yes	Yes	Yes	Yes	Yes	Yes
March 19, 2019 Order, 3a		non-normalized	Yes	Yes	Yes	N/A	Yes	N/A
Minn. Rules 7826.0500 Subp. 1, B	SAIFI	normalized	Yes	Yes	Yes	Yes	Yes	Yes
March 19, 2019 Order, 3a		non-normalized	Yes	Yes	Yes	N/A	Yes	N/A
Minn. Rules 7826.0500 Subp. 1, C	CAIDI	normalized	Yes	Yes	Yes	Yes	Yes	Yes
March 19, 2019 Order, 3a		non-normalized	Yes	Yes	Yes	N/A	Yes	N/A
Individual Prior Orders	MAIFI	normalized	Yes	N/A	Yes	N/A	Yes	N/A
		non-normalized[1]	No	N/A	Yes	N/A	Yes	N/A
March 19, 2019 Order, 3c	CEMI	normalized	Yes	Yes	Yes	N/A	Yes	N/A
		non-normalized[1]	Yes	Yes	No	N/A	Yes	N/A
March 19, 2019 Order, 3d	CELI	normalized	Yes	Yes	Yes	N/A	Yes	N/A
		non-normalized[1]	Yes	Yes	No	N/A	Yes	N/A
March 19, 2019 Order	Estimated Restoration Times		No[2]	Yes	No	N/A	Yes	N/A
March 19, 2019 Order	IEEE Benchmarking		No[2]	Yes	No[2]	N/A	Yes	N/A
March 19, 2019 Order	Performance by Customer Class		Yes	Yes	No[2]	N/A	No[2]	N/A
March 19, 2019 Order	Discussion of leading causes of outages and mitigation strategies		Yes	Yes	Yes	N/A	Yes	N/A
March 19, 2019 Order	Discussion on grid mod and reliability		Yes	Yes	Yes	N/A	Yes	N/A
Minn. Rules 7826.0500 Subp. 1, D	Explanation of storm normalization method		Yes	Yes	Yes	Yes	Yes	Yes
Minn. Rules 7826.0500 Subp. 1, E	Action plan for remedying noncompliance with 7826.0600		Yes	Yes	Yes	N/A	Yes	Yes
Minn. Rules 7826.0500 Subp. 1, F	Bulk power supply interruptions, and remedies		Yes	Yes	Yes	Yes	Yes	Yes
Minn. Rules 7826.0500 Subp. 1, G	a copy of each report filed under part 7826.0700;		Yes	Yes	Yes	Yes	Yes	Yes
Minn. Rules 7826.0500 Subp. 1, H	Worst performing feeder data		Yes	Yes	Yes	Yes	Yes	Yes
Minn. Rules 7826.0500 Subp. 1, I	Voltage violations		Yes	Yes	Yes	Yes	Yes	Yes
Minn. Rules 7826.0500 Subp. 1, J	Staffing levels		Yes	Yes	Yes	Yes	Yes	Yes
Minn. Rules 7826.0500 Subp. 1, K	Other information (not required)		N/A	N/A	Yes	Yes	N/A	N/A
Minn. Rules 7826.0600, Subp. 1	Proposed reliability standard		Yes	N/A	Yes	N/A	Yes	N/A

N/A indicates the Department omitted a determination on whether the utility had complied with the Commission's order, or a determination was not required.

[1] Not explicitly required by Commission Order due to inadvertent omission

[2] Utility provided an explanation as to why the data was not available

Attachment B: Updated Annual Reporting Requirements

1. Non-normalized SAIDI, SAIFI, and CAIDI values.
2. SAIDI, SAIFI, and CAIDI, MAIFI, CEMI, and CELI normalized values calculated using the IEEE 1366 Standard.
3. MAIFI – normalized and non-normalized.
4. CEMI – at normalized and non-normalized outage levels of 4, 5, and 6 interruptions.
5. CELI – at normalized and non-normalized intervals of greater than 6 hours, 12 hours, and 24 hours.
6. A breakdown of field versus office staff as required Minn. Rules 7826.0500 Subp. 1, J.
7. Estimated restoration time accuracy, using the following windows:
    a. Within -90 minutes to 0 of estimated restoration time
    b. Within 0 to +30 minutes of estimated restoration time
8. IEEE benchmarking results for SAIDI, SAIFI, CAIDI, and MAIFI from the IEEE benchmarking working group
9. Performance by customer class:

		ASAI	SAIDI	SAIFI	CAIDI	MAIFI
Residential	Non-normalized					
	Normalized					
Commercial	Non-normalized					
	Normalized					
Industrial	Non-normalized					
	Normalized					

If reporting by class is not yet possible, an explanation of when the utility will have this capability.

10. Causes of sustained customer outages, by service center.

Attachment C: Locational/Equity Reliability Staff Proposal

Items in italics are new from previously reported data. Section 1 is based on Xcel's response to Commission IR 3 in Docket 17-776. Section 2 is based on Xcel's current "worst performing feeder" reporting in the present docket list.

1. Xcel shall provide, on an annual basis, a list of all sustained outages greater than 5 minutes in length with the following information:
    a. Customers Out
    b. Duration of outage, in actual minutes
    c. Customer Minutes Out
    d. Feeder ID
    e. Substation
    f. City or area in which the feeder is primarily located
    g. Reliability reporting region
    h. Outage Level
    i. Primary Event Index
    j. Whether or not the event was excluded as a major event day under the IEEE
    k. The primary cause of the outage
    l. The start day, month, *and year* of the outage
2. Xcel shall provide the following information, by feeder, for the calendar year:
    a. Reliability reporting region where the feeder is located
    b. The substation the feeder is on, with its full name
    c. The city or area in which the feeder is primarily located
    d. The number of customers on the feeder, including the proportion of residential to commercial and industrial
    e. Whether the feeder is overhead or underground
    f. SAIDI, SAIFI, and CAIDI, normalized (IEEE 1366 Standard) and with Major Event Days
    g. Number of outages, total customer outages, and total customer-minutes-out for the following situations:
        i. All levels, All Causes included
        ii. Bulk Power supply - All causes, distribution, substation, transmission substation, and transmission line levels
        iii. All levels, no "planned' cause, includes bulk power supply
        iv. All levels, "planned" cause only, includes bulk power supply
3. A publically available online map showing reliability by feeder that allows interested individuals to zoom in to a neighborhood level, and if possible, the ability to have pop-ups that indicate reliability values, except to the extent that publicly disclosing this data would violate specific data privacy requirements or pose a significant security risk to Xcel's system or its customers. If Xcel withholds any information on this basis, Xcel shall provide the Commission with a full description and specific basis for withholding the information, including any Trade Secret claims.