STATE OF MICHIGAN
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GOVERNOR

DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS

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May 30, 2014

Dear Mayor Virg Bernero,

In response to your January 8, 2014 request, the Michigan Public Service Commission (MPSC) has completed its review of the Lansing Board of Water and Light's (BWL) internal review of its handling of the December 2013 ice storm and the review of the community review team (CRT) led by Brigadier General (ret) Michael C. H. McDaniel. The MPSC staff conducted a thorough review of all information, conclusions and recommendations contained within the final reports.

The MPSC agrees with all findings and recommendations made by the CRT. Additionally, the MPSC review (attached) contains 30 recommendations that the BWL should consider implementing to improve electric reliability and customer service.

The mission of the MPSC is to grow Michigan's economy and enhance the quality of life of its communities by assuring **safe and reliable energy**, telecommunications, and transportation services at reasonable rates (emphasis added). It is in this light that we gladly accepted your request (under MCL 460.54) to provide a review of the BWL and CRT's reviews of the December 2013 ice storm, a storm that affected many communities and the delivery of safe and reliable power.

The Commission recommends that you as the Mayor, the Lansing City Council, the Board of the BWL and the BWL itself deliberate and execute the recommendations provided by the CRT in its report and urges all parties to consider the MPSC's recommendations contained in its review. The outcome of those efforts will likely be a safer and more reliable electric system.

Sincerely,

John D. Quackenbush, Chairman
MPSC

Michigan Public Service Commission
Response to Lansing Mayor Virg Bernero's Request for Assistance
December 2013 Ice Storm

EXECUTIVE SUMMARY

The Michigan Public Service Commission (MPSC or Commission) does not regulate or control any municipally owned electric utility, such as the Lansing Board of Water & Light (BWL). Under MCL 460.54, however, the MPSC duties are extended to give advice and render assistance as may be reasonable and expedient with respect to the operation of any utility owned and operated by a municipality. On January 8, 2014, Lansing Mayor Virg Bernero, in a written letter, requested assistance of the MPSC in conducting an independent review of final reports performed internally by the BWL and externally by an independent Community Review Team (CRT). The MPSC appreciates the opportunity to provide assistance and extends thanks to Mayor Bernero and the City of Lansing for the opportunity to provide input in the matter of conducting a review of the final reports provided by the CRT and BWL.

A severe ice storm passed through the midsection of Michigan's Lower Peninsula on December 21 and 22, 2013, resulting in ice accumulations all across the mid-Michigan area. The BWL's electric service territory was adversely affected by this storm resulting in approximately 40,000 of its customers being without power. Published news releases indicate some customers experienced power outages for up to 11 days. The BWL reports it sustained over 2,400 downed power lines, and replaced over 5 miles of service lines in its restoration efforts.[1]

In addition to the extended restoration times, customers experienced frustration with long telephone wait times and difficulty contacting BWL customer service staff to inquire about their respective outages. BWL customers and local public officials were critical of the BWL's communication efforts to update the public on outage and restoration areas. The BWL conducted a special hearing to receive comments from customers on January 7, 2014, and subsequently held another meeting on January 14, 2014. Three Community Forums followed, occurring on January 15, 16, and 17, 2014, in East Lansing, Delta Township, and Lansing, respectively.

The BWL posted the results of its internal review in the *BWL December 2013 Ice Storm Outage Report* to the BWL Board (Board), the CRT, the MPSC, all BWL customers, and the general public via its website on February 18, 2014. The report identified 54 actions that the BWL has undertaken, is in the process of undertaking, or will undertake in the near future to improve its storm response.

[1] Lansing Board of Water & Light, *BWL December 2013 Ice Storm Outage Report*, February 18, 2014.

The CRT was led by retired National Guard Brigadier General Michael C.H. McDaniel and consisted of nine individuals with expertise ranging from an emergency manager, former elected local officials, a former Chair of the MPSC, and a director of a neighborhood association. The mission of the CRT was to conduct an independent, objective, and transparent review of the BWL's planning, preparation, response, and recovery prior to, during and after the devastating December 2013 ice storm. The CRT also focused on evaluating the strengths and weaknesses of the BWL's performance in order to enhance the BWL's capacity to respond more effectively to customer needs and expedite recovery following storms in the future. The comprehensive report made recommendations, in general, to the BWL, the City of Lansing, the BWL Board, and to other local governments. The CRT's report was released on May 5, 2014.

While the December 2013 ice storm may have been unprecedented in its scope and damage, severe weather events such as this are not uncommon in Michigan. The December 2013 ice storm was the largest ice storm that has occurred in Michigan in over a decade. The storm coated utility assets and nearby vegetation with ice accumulations of up to 0.5 inches in the Lansing area, overstressing and creating failures of wires, poles, and trees. The ice remained on utility assets and vegetation for a large part of the holiday week, resulting in increased difficulty for utilities to access equipment and dangerous conditions for workers attempting to restore service in a timely manner. This storm is categorized as a high impact, low frequency event when compared to historical storms, but there is no assurance that a similar event will not recur in the future. The MPSC's reviews of the final reports from the CRT and BWL along with additional audit responses conclude the following:

I. The BWL's internal report and 54 actions contain numerous aspiring phrases such as: plan to update, are in the process of implementing, will consider, will work to develop, will expand testing, is investigating, will solicit, will work with, will make part of, will aggressively pursue, etc. The MPSC recommends the BWL create a standing committee that would track the implementation of all recommendations and create a transparent process for reporting progress to the Board and the City of Lansing.

II. The MPSC agrees with all the findings and recommendations made by the CRT in its review. The MPSC would like to thank the CRT for selecting a team of experts with extensive experience and compliments them on their thorough and professional review and for volunteering their time. The CRT showed great wisdom and professionalism in this difficult task.

III. The MPSC commends all of the many BWL employees who worked tirelessly to restore power during the December 2013 ice storm.

IV. The BWL management and the Board fell short in their duties to their customers to be prepared for a catastrophic or extreme weather event and had not incorporated training, emergency exercises, or testing its emergency operations plan in its overall strategic planning for such an event. Indeed, the CRT found, and the MPSC agrees,

that the BWL had inadequate emergency procedures in place and strongly recommends that such plans and procedures be developed and tested.

V. The MPSC recommends that the Mayor of the City of Lansing, as the appointing authority to the Board, should appoint new member(s) with expertise related to the duties of the BWL.

VI. In addition to adopting the recommendations of the CRT, the MPSC makes the following recommendations:

1. Require specific customer service metrics as part of the BWL's Quality of Service best practices. The MPSC also recommends the BWL institute a billing credit.

2. Analyze and determine if the BWL's current budget and expenditures on vegetation management and maintenance of the distribution and transmission system are adequate to continue to provide safe and reliable service.

3. Analyze the reliability measurements of System Average Interruption Duration Index (SAIDI), System Average Interruption Frequency Index (SAIFI) and Customer Average Interruption Duration Index (CAIDI) on a circuit basis and expand the reporting of these indices to include each of the individual municipalities served by the BWL.

4. Develop metrics that allow the BWL to analyze the performance of all reliability investments.

5. Develop an annual reliability report that can be publicly available.

6. Develop an annual reliability spending report that focuses on current and future reliability project spending and analyzes customer benefits and the overall effectiveness of reliability projects.

7. Adopt Service and Reliability Standards similar to those ordered by the Commission in Case No. U-12270 (R 460.732), and include a customer catastrophic outage credit (R 460-744 - R 460.746), as well as comparable rules to the Unacceptable Levels of Performance for Electric Distribution Systems by regulated utilities (R 460.721 - R 460.724).

8. Develop a Communication Plan, as part of an overall emergency operations plan, aligning with industry best practices for customer service obligations for major service outage responses and during restoration periods.

9. Provide consumer education material through multiple media so that customers may be prepared to handle outages including free outreach to educate the public on electric line safety, preparation for storm events, and who to contact in the event of an outage.

10. Maintain a single customer phone number for all customer inquiries.

11. Identify the account holders who are seniors and maintain a database of facilities servicing vulnerable populations.

12. Provide training to the Board and identify resources and opportunities for Board members to gain experience and knowledge that will allow for greater control of current and emerging issues.

13. Expand emergency training and exercise programs to include the Board so they are educated on the BWL's electric system infrastructure and emergency operations plan.

14. Train and educate BWL staff so that experienced and knowledgeable staff can fill back-up roles in the event of an outage or energy emergency.

15. Consider use of the Local Energy Assistance Program (LEAP) process to serve as the conduit for establishing private-public partnerships focused on improving community resiliency to a prolonged energy disruption. The CRT was explicit in recommending that the BWL develop an emergency operations plan in the context of a regional plan. This would satisfy that suggestion.

16. Work in conjunction with the Michigan Municipal Electric Association (MMEA) to share the lessons learned and best practices with other municipal utilities within the state in an effort to improve the resiliency and outage response of all municipal utilities in Michigan.

17. Voluntarily report to MPSC Staff when outages affect more than 10 percent of its customers, when a significant event affects the operation of its system, or when there is loss of power to a critical facility or critical customer.

18. Keep the BWL Board and Lansing City Council continually informed on mutual assistance agreements should any contracts expire or have cause to be amended.

19. Perform its own action items 10 through 15 from the *BWL December 2013 Ice Storm Outage Report* regarding spotters and provide frequent update reports to the BWL Board and Lansing City Council.

20. Provide spotter training at least two times per year at a very minimum, once in the spring and once in the fall for respective storm events.

21. Survey several Michigan utilities to determine the industry best practice regarding the BWL “bird dogs” assisting mutual assistance crews.

22. Integrate the BWL’s Outage Management System (OMS) into an Emergency Operation Plan and test the system to its maximum capacity as recommended by the CRT.

23. Create a contingency process that will provide guidance to BWL staff in the event the OMS is not operational during an outage or catastrophic event.

24. Develop a procedure to collect system outage data during and post storm events for future reliability analysis.

25. Continue a rigorous tree trimming program and develop tree trimming practices that include overhead branch removal and hazardous tree removal.

26. Develop inspection procedures to ensure that companies who lease space on poles are clearing around communication lines.

27. Develop a comprehensive and transparent inspection and preventive maintenance plan that includes all equipment critical for maintaining system reliability.

28. Study all grid modernization and two-way communication technologies to develop a capital investment plan that maximizes reliability and customer benefit.

29. Continue to invest in assets that increase the overall strength and resiliency of the electric system when replacing assets that are at the end of their useful life.

30. Study its poorest performing distribution power lines to determine the costs and benefits of undergrounding such lines as compared to other options aimed at increasing reliability.

INTRODUCTION AND BACKGROUND

The Lansing Board of Water & Light (BWL) is a municipally owned public utility located in the greater Lansing area. It is governed by an eight member Board of Commissioners appointed by the mayor of Lansing, with the approval of Lansing City Council. Each Board member serves a four-year term. The Board has exclusive authority to set BWL's rates for all the services it provides. The BWL owns and operates an electric system that generates, purchases, and distributes electric power and energy to approximately 95,000 customers. In addition to being an electric service provider, the BWL affords services for water, steam, and chilled water.

A severe ice storm passed through the midsection of Michigan's Lower Peninsula on December 21 and 22, 2013. The impact of the storm resulted in a loss of power for an estimated 40,000 BWL residential and business customers. The storm also resulted in an estimated 2,400 downed power lines. While the outage duration varied among customers, many customers experienced extended outage times. Published news reports indicate some customers experienced power outages for up to 11 days.

On December 25, 2013, the BWL announced an initiative to conduct a top-to-bottom review of its response to the ice storm power outage. The internal review would allow the BWL to assess strengths, weaknesses and opportunities related to their restoration process. The report was released February 13, 2014.

On January 8, 2014, Mayor Bernero appointed retired Brigadier General Michael C.H. McDaniel to lead a community review team tasked with an assessment of the BWL's handling of the ice storm and its restoration performance in the aftermath of the December 2013 ice storm. The community review team's report was made publicly available on May 5, 2014. The total report consisted of 143 pages, with 75 pages dedicated to an executive summary, introduction, and comprehensive findings and recommendations regarding the BWL's planning and preparation, response and restoration, and recovery and mitigation. The remaining pages consisted of six appendices (A-F) that contained CRT members and staff biographies, the CRT's mission statement, community concerns, a detailed list of materials acquired from the BWL, transcripts of public hearings, and reference materials. The report provided recommendations for reforms and improvements intended to protect the community during similar events.

Mayor Bernero asked the Michigan Public Service Commission (MPSC) on January 8, 2014, for assistance in conducting a review of both parties' final reports. The MPSC has no formal regulatory authority over the BWL, as acknowledged by the Mayor in his letter to the MPSC. However, Section 4 of Public Act 419 of 1919, MCL 460.54, states: "it shall be the duty of said commission on the request of any city or village to give advice and render such assistance as may be reasonable and expedient with respect to the operation of any utility owned and operated by such city or village." Therefore, the MPSC is rendering assistance, as requested by the City of Lansing and is tasked with conducting a thorough review of all information, conclusions, and recommendations contained within the final reports.

Through this report, the MPSC fulfills its obligations and duties to the people of the state of Michigan and the Mayor's request for assistance. The MPSC agrees with all the findings and recommendations by the CRT in its review. In addition, the MPSC urges the BWL, the Lansing City Council, the BWL Board, and the Mayor to implement MPSC recommendations contained in this report.

HISTORY OF SIMILAR INVESTIGATIONS

The MPSC has formally investigated widespread and lengthy storm outages of several Michigan utilities for over 23 years. After investigating lengthy outages and storm response of Michigan's two largest utilities in the year 2000, Case No. U-12270 was initiated to investigate the service reliability for all of the regulated electric utilities. A number of service quality and reliability standards evolved out of Case No. U-12270, and subsequently, were approved by the Commission. Case No. U-12270 established many reporting standards as well as a catastrophic storm definition.[2] These standards were further refined and adopted as administrative rules R 460.701 through R 460.752. The administrative rules defined eleven service quality standards and added penalty and incentive provisions for affected customers.

The MPSC has continued to investigate power outages that impact Michigan customers as directed by Commission order in Case Nos. U-15605 (2008), U-16462 (2010) and U-17542 (2014). These investigations, in conjunction with annual reporting requirements, ensure that utility all-weather performance remains satisfactory and emergency response protocol is reasonable and efficient.

SYSTEM PERFORMANCE

One of the most important tools for improving distribution system reliability is tracking system performance through data driven analytics. Having accurate performance measures helps utilities pinpoint investment in the electric system to poorly performing areas, thereby maximizing the value of investments. In regard to outages, the Institute of Electrical and Electronics Engineers (IEEE) 1366-2003 "Guide for Electric Power Distribution Reliability Indices" standard is recognized as a best practice for the measurement of distribution system reliability. The three most common indices used by utilities to measure system performance are defined as follows:

The System Average Interruption Duration Index (SAIDI)

$$SAIDI = \left(\frac{\sum Customer\ Minutes\ Interrupted}{Total\ Number\ of\ Customers\ Served} \right)$$

The System Average Interruption Frequency Index (SAIFI)

$$SAIFI = \left(\frac{\sum Total\ Number\ of\ Customers\ Interrupted}{Total\ Number\ of\ Customers\ Served} \right)$$

[2] Catastrophic: 10 percent or more of the utility's customer base experience an outage.

The Customer Average Interruption Duration Index (CAIDI)

$$CAIDI = \left(\frac{Total\ Number\ Customer\ Minutes\ Interrupted}{Total\ Number\ of\ Customer\ Interrupted}\right)$$

According to the IEEE standard, these reliability metrics are provided for two distinct operating scenarios, normal operation and major event days (MED) or catastrophic event days. A catastrophic event is commonly understood as days on which the distribution system experienced stresses beyond that normally expected and planned for by the utility. Distinguishing between these two operating scenarios lets both regulators and utilities identify how the utility is performing from an outage frequency and duration standpoint during a typical day and a catastrophic storm such as the December 2013 ice storm. Analysis of these metrics in both operating scenarios provides insight into the state of utility operations and can help identify shortcomings in restoration operations during both day-to-day operations and catastrophic events.

The table below shows the BWL's IEEE 1366 outage metrics from 2006-2013.

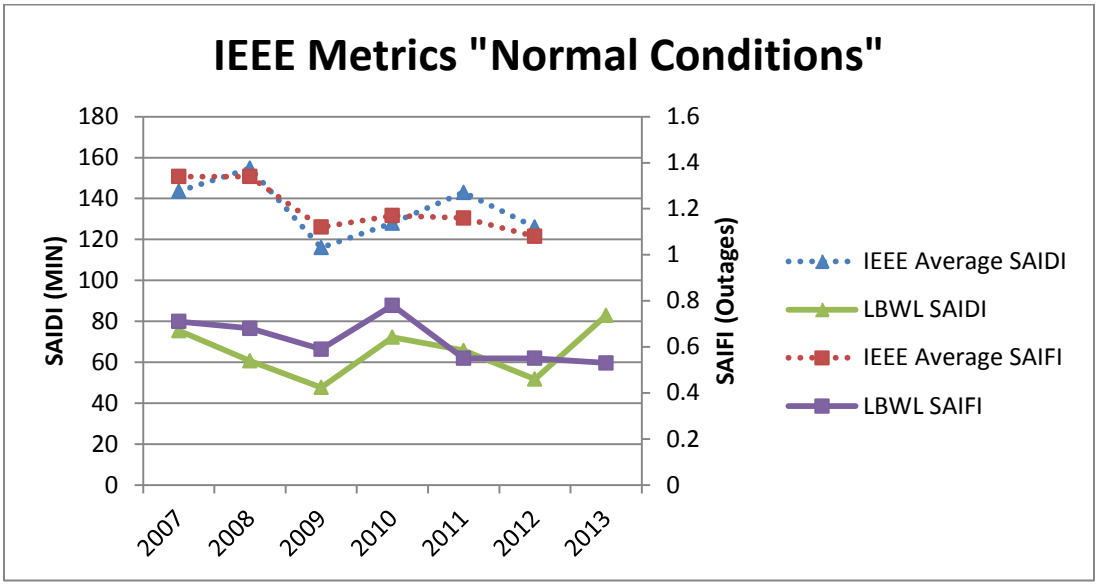
Year	All Conditions			Excluding Catastrophic		
	SAIDI	***SAIFI***	***CAIDI***	***SAIDI***	***SAIFI***	***CAIDI***
2006	61.43	0.81	76.27	na	na	76.27
2007	105.93	0.81	131.13	75.4	0.71	106.83
2008	459.76	1.16	397.07	60.65	0.68	89.44
2009	68.23	0.73	93.04	47.68	0.59	80.31
2010	79.82	0.9	88.39	72.26	0.78	93.15
2011	65.73	0.55	119.44	65.73	0.55	119.44
2012	57.89	0.74	78.33	51.72	0.55	93.6
2013	2326.78	0.9	2753.52	82.88	0.53	156.26

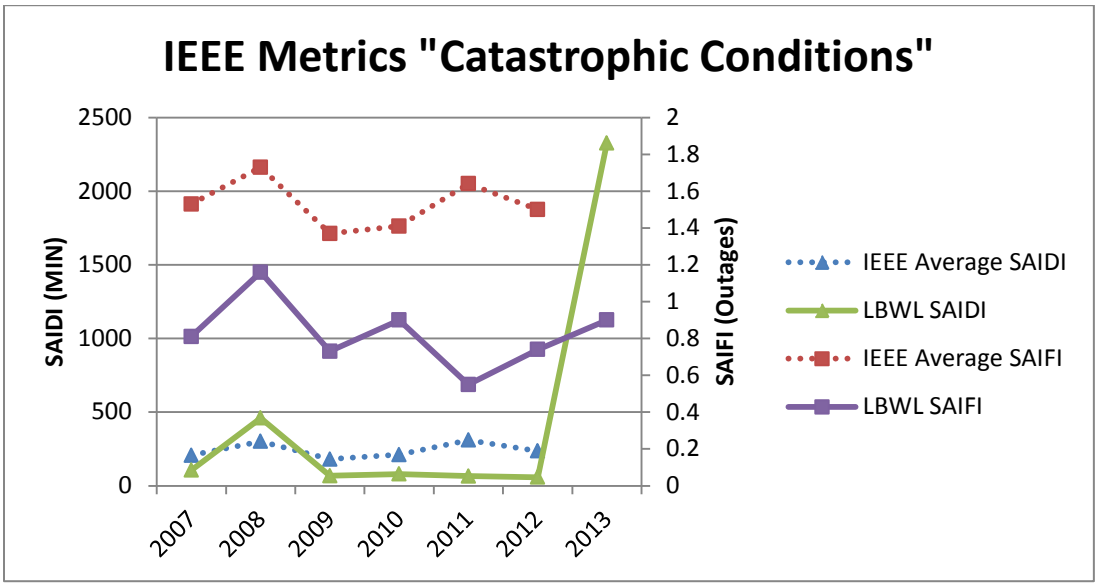
The MPSC analyzed the data provided by the BWL on these reliability indices in an effort to identify trends in outage duration and frequency occurring on the BWL system. The following are the results of the MPSC's analysis of the IEEE 1366 numbers provided by the BWL.

Normal Operations Performance

During periods of normal operations, the MPSC concluded that the BWL system has performed exceptionally well in comparison to other utilities benchmarked by IEEE. Analysis showed that the BWL was well under the industry average in both SAIDI and SAIFI the entire 2007-2013 period according to IEEE benchmarks for each of the metrics (see graph below). In fact, the BWL was ranked in the first quartile of reporting utilities for both SAIDI and SAIFI throughout the time period. The BWL's reliability during normal operations ranks among the highest in the

state and exceeds the Governor's performance goals of first quartile (SAIFI) and second quartile (SAIDI) for regulated utilities.[3]



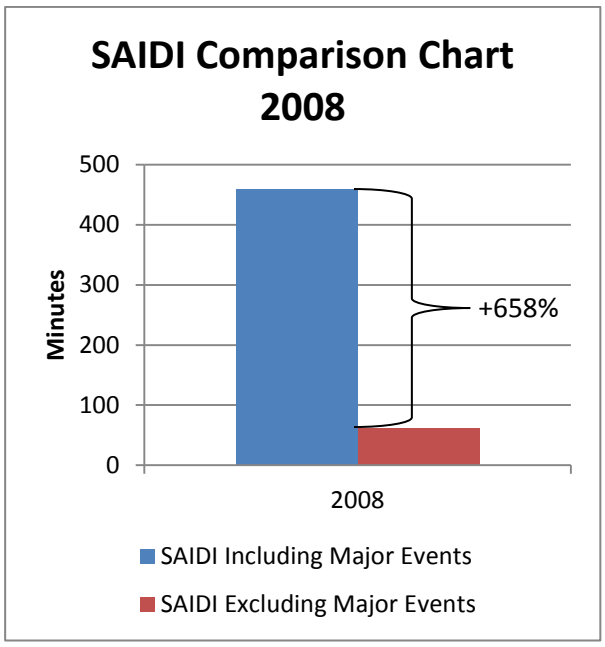


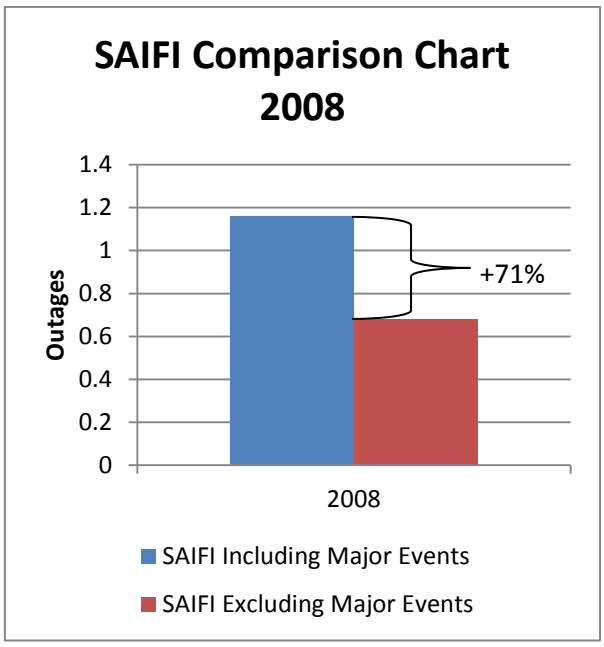
Major Events

When catastrophic events are included in the analysis, there is a large amount of variability from the "normal operations" metrics in 2008 and 2013. Except for the 2008 SAIDI results, the BWL was still well below the industry average for both SAIDI and SAIFI indices. The 2008 SAIDI

[3] *See* "Affordable and Reliable Energy: No Regrets for our Future" (December 19, 2013), available at: www.michigan.gov/energy.

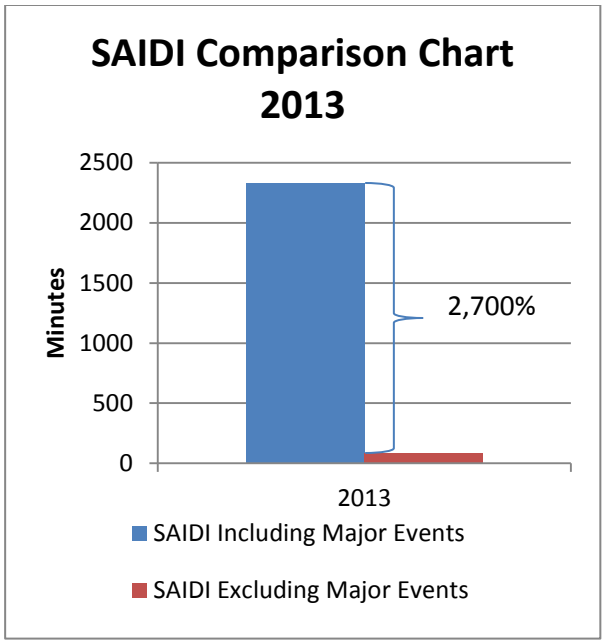
index was of interest due to the fact that it included the last large outage on the BWL system. On June 8, 2008, a tornado paired with high winds, left approximately 20 percent of the customer base without power.[4] In the aftermath of this storm, it took the BWL and its crews eight days[5] to fully restore power to its customers as evidenced by the large spike in the 2008 SAIDI graph above. Upon analysis of reliability metrics from 2008 and 2013, it appears that during major events that affect large portions of the customer base, the BWL struggles to amplify operations to react and restore power in a timely manner. This is evidenced by the fact that a 71 percent increase in frequency (outage occurrences) has a subsequent 658 percent increase in outage duration including major events compared to indices excluding these major events. Likewise for 2013, a 70 percent increase in frequency (outage occurrences) has a subsequent 2,700 percent increase in outage duration including major events. Ideally, these metrics would increase proportionately to one another conveying that as outage frequency (SAIFI) increased due to an event, the BWL would have an emergency procedure such as mutual assistance and increased staffing that would limit the outage duration (SAIDI). This disproportionate increase in SAIDI conveys that as outage frequency increases above day-to-day operation levels, the BWL did not have the appropriate emergency procedures in place to limit the subsequent duration of these outages.

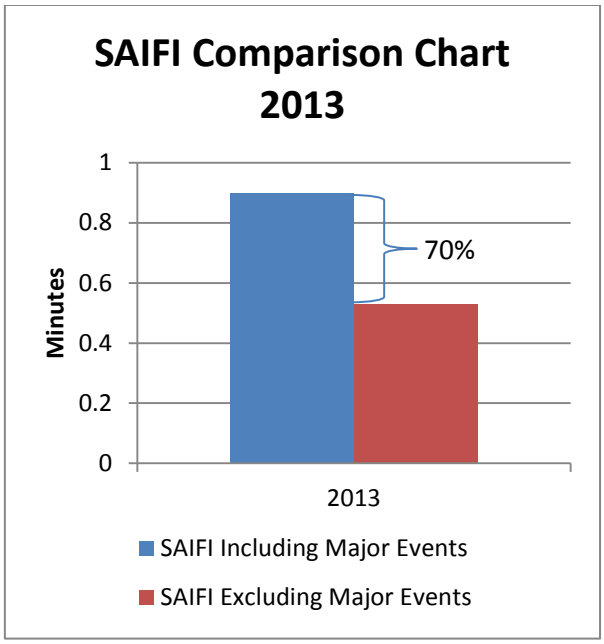




[4] http://www.lbwl.com/About-the-BWL/News/19,000-BWL-customers-without-power-due-to-Saturday%E2%80%99s-storm/

[5] http://www.lbwl.com/About-the-BWL/News/UPDATE--Power-Restoration/





Based on the analysis of the reliability metrics and the other findings related to the BWL's storm response, the MPSC concludes that the BWL is properly staffed and prepared to address day-to-day operations, but fails to effectively address outages in catastrophic conditions such as severe weather events.

Reliability Metrics

The BWL should continue to track IEEE reliability metrics for the system to help understand its performance in terms of outage frequency and durations and perform analyses similar to the MPSC's analysis. Since the footprint of the BWL ranges from urban to rural, these metrics should also be provided for each of the municipalities the BWL serves to avoid data skewing and to ensure consistent performance across the entire BWL footprint.

Reliability Standards

In the wake of the December 2013 ice storm, it became apparent that the public's expectations of the BWL and its capabilities were not aligned. To address this issue moving forward, the MPSC recommends the BWL consider the adoption of reliability standards similar to those used by the Commission in its Service Quality and Reliability Standards, 1999 AC, R 460.701 *et seq*.[6] (R 460.701) These generally applicable standards outline reasonable performance expectations for utilities during both normal operations and catastrophic events regarding service restoration, wire down relief, and call center operations. These standards help convey to the public the operational differences between normal and catastrophic outages and assist customers in understanding the timeline in which the utility is staffed to address each scenario. The use of these standards has proven valuable in helping regulated utilities properly develop

[6] http://www7.dleg.state.mi.us/orr/Files/AdminCode/107_98_AdminCode.pdf

reliability programs to align with public performance expectations. Below are the reliability standards[7] currently measured by investor owned utilities in Michigan that should be considered for adoption by the BWL.

Name	Description	Performance Standard
Call Blockage Factor	% customer calls that are blocked	Less than 5%
Complaint Response Factor	% complaints responded to within 3 business days	Greater than 90%
Average Customer Call Answer Time	Average time to answer customer call	Less than 90 seconds
Meter Reading Factor	% meters read within approved period	Greater than 85%
New Service Installation Factor	% services installed in 15 business days	Greater than 90%
Wiredown Relief Factor	% police/fire guarded wiredowns relieved in 4 hours within Michigan Metropolitan Statistical Areas (MMSA)	Greater than 90%
Wiredown Relief Factor	% police/fire guarded wiredowns relieved in 6 hours outside of MMSA	Greater than 90%
Service Restoration Factor for All Conditions	% of customers restored in 36 hours or less	Greater than 90%
Service Restoration Factor for Normal Conditions	% of customers restored in 8 hours or less	Greater than 90%
Service Restoration Factor for Catastrophic Conditions	% of customers restored in 60 hours or less	Greater than 90%
Same Circuit Repetitive Interruption Factor	% of customers with 5 or more interruptions	Less than 5%

Outage Credits

After the December 2013 ice storm, the BWL offered its customers a catastrophic storm credit of $25.00 for outages lasting 120 hours (five days) or more and an additional $5.00 per day over five days. This credit provides relief to customers who are most affected by the storm and helps offset the costs accrued by a customer during extended outages. The MPSC suggests that continuing to offer this credit for catastrophic conditions will provide internal incentive to quickly address large scale outages and potentially reduce response and restoration times.

The MPSC recommends the BWL:

- Require specific customer service metrics as part of the BWL's Quality of Service best practices. The MPSC also recommends the BWL institute a billing credit for extended outages.

[7] Service Quality and Reliability Standards for Electric Distribution Systems, R 460.722 – R 460.724.

Reliability Spend Study

In response to audit questions posed by the MPSC, the BWL conceded that it does not currently classify outages by cause. Identifying the root cause is common practice by Michigan's investor-owned utilities and serves as the basis for annual work plans and budgets. For instance, when the primary cause of outages in a service territory are trees within the right-of-way (ROW), this serves as an indication that current trimming cycles are inadequate and should be adjusted to avoid future outages. Exploring the root causes of outages in this manner will provide valuable insight into the effectiveness of reliability spending, and is helpful in properly allocating future funding to address system needs. The BWL should collect and study more granular outage statistics to align program spending with outage causation. This type of study will help determine if current budgets and spending on programs such as vegetation management, pole inspection, and asset replacement are adequate to provide safe and reliable service in the future.

The MPSC recommends the BWL:

- Analyze and determine if the BWL's current budget and expenditures on vegetation management and maintenance of the distribution and transmission system are adequate to continue to provide safe and reliable service.

Reliability Reporting

The MPSC recommends that the BWL prepare a public annual reliability report to help customers understand how the BWL system performed in the preceding year and how the implementation of post-storm procedures and programs are benefiting reliability. The report would also provide valuable information internally to help identify areas of poor performance and prioritize future reliability spending to maximize customer benefits.

Reporting requirements should contain the following:

- SAIDI and SAIFI indices for the entire system as well as for each of the municipalities served by the BWL individually.
- Results of the reliability spending study outlined above.
- Compliance with the Reliability Standards outlined above.
- Summary of Major Events that affected the system during the year.
- Planned reliability investments for the upcoming year.

The collection and proliferation of useful metrics and information outlined above will help customers, the Board, and BWL management understand the state of the distribution system and the needs driving future investment. This transparency will help convey that the BWL is focused on delivering safe, reliable, and affordable electricity to all of its customers by continuously tracking system performance and addressing reliability concerns as they arise.

The MPSC recommends the BWL:

- Analyze the reliability measurements of SAIDI, SAIFI and CAIDI on a circuit basis and expand the reporting of these indices to include each of the individual municipalities served by the BWL.
- Adopt reliability standards similar to those ordered by the Commission in Case No. U-12270 (R 460.722) and include a customer catastrophic outage credit (R 460.744 - R 460.746).
- Develop metrics that allow the BWL to analyze the performance of all reliability investments.
- Develop an annual reliability report that will be publicly available.
- Develop an annual reliability spending report that focuses on current and future reliability project spending and analyzes customer benefits and the overall effectiveness of reliability projects.

SERVICE QUALITY AND CUSTOMER COMMUNICATION

In its report, the BWL outlined 11 steps for action (numbered 44 to 54) as a more comprehensive community outreach effort and external communication plan. The CRT Report makes several sound recommendations for improved customer communication including creating a robust social media plan, requiring senior leadership undergo certified communication training, further refining a subsequent BWL Communication plan, and creating a crisis communication plan is an annex of the Emergency Operations Plan. The MPSC recommends the following best practices for customer service obligations in major service outage responses and restoration. Actions taken by the BWL in the future should have these best practices as a goal.

Major Service Outage Responses and Restoration Practices
Customer Service Obligations Best Practices

Comprehensive Crisis Communication Plan

- Includes residential customers, priority facilities and customers, seniors, large business customers, small and medium business customers, government/civic leaders, community leaders and organizations.

Consistent Timely Communication

- Outage updates, specific causes, outage size/scope, number of customers affected, accurate and timely estimates of restoration.
- Proactively respond to public concerns.
- Safety Tips-surviving outages, downed power lines, alternative heating sources.
- Common talking points should be distributed to all utility employees who may be in contact with customers or media.

Provide Two-Way Interaction with Customers

- Strive to use the best technology possible to share information.
- Call Centers, integrated voice response, interactive map, mobile applications, responding to social media.
- Outbound call or contact with priority customers-hospitals, law enforcement facilities, senior citizen residential facilities.

Media Relations

- Manage flow of factual information to the media.
- Develop a social media strategy that is proactive and responsive.

Additional Responsibilities

- Work with local communities as a partner in supporting the efforts to provide emergency services for customers.

The MPSC recommends the BWL:

- Adopt rules similar to the Service Quality and Reliability Standards for Unacceptable Levels of Performance for Electric Distribution Systems by regulated utilities (R 460.721 – R 460.724).

Customer Communication

During normal operations, the BWL Call Center is equipped to handle 23 calls simultaneously and put into "queue" an additional 43 calls. While the call center operations had functioned during previous storms, it was not capable of handling the large volume of calls that accompanied the December 2013 ice storm. The BWL contracts with Twenty-first Century Call Center to host a toll-free number for after-hour calls and to provide back-up support for the operator working on downed power line calls. The high call volume experienced during the December 2013 ice storm overwhelmed both the BWL Call Center and the contracted call center.

Due to the non-functioning of BWL's Outage Management System (OMS), the overwhelmed call centers, extensive news reports, and community leader frustration, customer public comments were centered on the inability to report outages and downed power lines or communicate with any BWL personnel to receive accurate restoration estimates. Adding to the confusion, customers were expected to know which of the BWL's two phone numbers, 517-702-6006 or 877-295-5001, should be used for reporting outages and or for downed power lines. Customers experienced long phone wait times and frequent busy signals. Both the *BWL Ice Storm Outage Report* and the CRT Report outlined the OMS and call center failures as the storm and the lengthy restoration period unfolded.

The link between the call center and the OMS, while tested before the storm, was not equipped to handle the call volume experienced, and data from thousands of customers was not sent from the call center to the OMS. Workers eventually resorted to paper systems and spreadsheets. Without real-time outage maps, customers, local leaders, and news media began relying on an interactive outage map created for the public by an East Lansing resident.

The MPSC recommends the BWL:

- Develop a Communication Plan, as part of an overall emergency operations plan, aligning with industry best practices for customer service obligations for major service outage responses and during restoration periods.
- Provide consumer education material through multiple media so that customers may be prepared to handle outages, including free outreach to educate the public on electric line safety, preparation for storm events, and who to contact in the event of an outage.
- Maintain a single customer phone number for all customer inquiries.

Seniors and Vulnerable Populations

Several comments from the public at the CRT Community Forums addressed concerns about the BWL not knowing which households were occupied by seniors or other vulnerable populations. Both MPSC rules and state law (PA 174 of 2009) require MPSC-regulated utilities and municipally owned electric utilities to provide seniors special protections from disconnection for non-payment during the heating season. There is an expectation that utilities be proactive in identifying customer households of seniors. The MPSC recommends the BWL consult with and purchase birth dates of its customers from a third party so that it can identify and maintain records of households with seniors. Additional positive steps to further engage with seniors and agencies that support seniors and other vulnerable populations are outlined in the CRT report.

The MPSC recommends the BWL:

- Identify the account holders who are seniors and maintain a database of facilities servicing vulnerable populations.

BWL Board Members

The City of Lansing Charter states that the BWL Board is an administrative board with responsibility beyond other city boards and is delegated executive and policymaking responsibilities for the operation of the BWL. The CRT Report recognizes that the City Charter grants “full and exclusive management” to the BWL Board over the essential duties and services of the BWL and states, “The Board needs to assert greater control over the short-term agenda, annual objectives, current and emerging issues, and the strategic direction of the BWL.” Asserting greater control over the Board’s agenda, objectives, issues and strategic direction will necessitate that the Board be comprised of members that bring professional experience and background in the broad array of topics related to utility management-system performance and reliability, generation and transmission issues, financial markets, skilled personnel, customer billing and communication, and future upgrades and grid investments. In addition to training

the Board about matters related to BWL infrastructure and emergency operations plans, the BWL should identify local, state and national resources and opportunities for Board members to be exposed and receive training on the wide array of issues necessary to assert greater control of current and emerging issues.

The MPSC recommends the BWL:

- Provide training to the Board and identify resources and opportunities for Board members to gain experience and knowledge that will allow for greater control of current and emerging issues.

The MPSC recommends the Mayor of the City of Lansing, as the appointing authority to the Board:

- Should appoint new member(s) with expertise related to the duties of the BWL.

EMERGENCY PLANNING AND RESPONSE

The MPSC agrees with the CRT's assessment of the BWL's state of energy emergency preparedness. The BWL did not have a comprehensive energy emergency strategy or a set of complete emergency operations plans. The BWL's plans were, in many cases, outdated and did not cover the circumstances in which the BWL found itself. For example, the BWL was not properly prepared to receive communication from customers or respond to customer inquiries during the storm or the lengthy restoration period. While the BWL has made an effort to put an improved communications plan into effect, this should become just one component of an overarching emergency operations plan.

Training & Exercises

In an effort to address a number of planning or communication deficiencies, the CRT recommends that BWL employees (operations staff, communications staff, and senior leadership) should be trained in emergency procedures and participate in exercises designed to test these procedures. The MPSC recommends that training and exercises conducted by the BWL should be available to and include the Board so they are knowledgeable of the electric infrastructure system and emergency operations plan. For instance, all Board members should receive a copy of the BWL's comprehensive emergency plan, be familiar with its contents, and participate in exercises when appropriate. Board members should be familiar with the National Incident Management System (NIMS) and should take at least the two introductory courses: Federal Emergency Management Agency (FEMA) IS-700j, NIMS An Introduction, and IS-100.PW-B, Introduction to the Incident Command System for Public Works.[8]

Additionally, with increased employee turnover, it is critical that the knowledge accumulated by the BWL workforce be retained through a formal training and exercise program. Critical

[8] FEMA offers a large number of training classes, either at its own centers, through programs at the state level, in cooperation with colleges and universities, or online.

operational tasks should be documented and serve as the basis of employee training. (Critical tasks are often defined as those tasks that ensure an essential community service be sustained over time.) Current employees not only need to be trained using the documented procedures, but evaluated and certified to the level of required competency. The documented operational controls should be written and annually reviewed by senior operators as a means of refining the task and retaining any associated knowledge. In addition, exercises designed to test operator performance on critical tasks will often identify areas of improvement. These improvements should be captured in each exercise's After Action Report and reflected in the revised task documentation. By continuously evaluating performance and refining task documentation, the associated knowledge is not only retained for use by future operators, but current staff is more likely to conduct the task as expected.

The MPSC recommends the BWL:

- Expand training and emergency exercises to include the Board so they are educated on the BWL's electric system infrastructure and emergency operations plan.
- Train and educate BWL staff so that experienced and knowledgeable staff can fill back-up roles in the event of an outage or energy emergency.

Community Partnerships

The CRT recommends that the BWL: "working jointly with local emergency planners and municipal governments, update the inventory of critical facilities, as part of a Regional Emergency Operations Plan."[9]

The MPSC suggests that its Local Energy Assurance Program (LEAP) [10] can serve as the conduit for establishing private-public partnerships focused on improving community resiliency to a prolonged energy disruption. The program brings together local governments, emergency management coordinators, energy providers, and key energy users within the region.

A LEAP is intended to better prepare communities for a prolonged disruption in energy supplies (i.e. electricity, natural gas, or petroleum). The desired outcome of a regional LEAP is a greater understanding of the interdependencies of the energy industry, emergency response organizations and the community – especially as they relate to emergency planning efforts. Community stakeholders not only have a shared responsibility regarding the community's ability to bounce back from a disaster, but when working together have been found to be the most effective. Under Presidential Policy Directive 8: National Preparedness, "entire communities are to be involved – not just the government— in a systematic effort to keep the

[9] Community Review Team, *Report on the Lansing Board of Water and Light's Response to the December 2013 Ice Storm*, May 5, 2014, p. 22

[10] Local Government Energy Assurance Guidelines, v.2. http://www.naseo.org/Data/Sites/1/documents/energyassurance/documents/pti_local_governement_energy_guidelines.pdf

nation safe from harm and resilient when struck by hazards, such as natural disasters, acts of terrorism and pandemics."[11]

A pilot LEAP effort is currently under way and focuses on the nine counties designated by the Michigan State Police as Region 1 and includes the service area of the BWL. The LEAP Planning Team, which includes two BWL staff members, focuses on a number of areas such as roles and responsibilities, understanding energy systems operating within the region, crisis communications, emergency response and recovery activities, and the mitigation of negative consequences through efforts such as back-up power generation, alternative energy supplies, mutual aid, and emergency fuel supplies. The MPSC recognizes the BWL's participation in this effort and believes the team is headed down the path the CRT envisions. Key to the success of LEAP, however, is an open sharing of information. Reluctance to discuss the location of critical infrastructure systems, to share information regarding key energy users, or to address difficult issues such as the prioritization of restoration activities to energy-dependent facilities or individuals within the community all undermine community resiliency and trust.

The MPSC recommends the BWL:

- Consider use of the LEAP process to serve as the conduit for establishing private-public partnerships focused on improving community resiliency to a prolonged energy disruption. The CRT was explicit in recommending that the BWL develop an emergency operations plan in the context of a regional plan. LEAP would also satisfy that suggestion.

Municipal Utilities

As the largest municipal utility in the state of Michigan, it is imperative for the BWL, in conjunction with the Michigan Municipal Electric Association (MMEA), to share the "lessons learned" and best practices developed in response to this crisis with other municipal utilities. The MPSC suspects that some of the municipal utilities in the state may not have emergency operations plans and procedures that meet the level of industry best practices as outlined in the CRT report. This is an opportunity to improve the resiliency of not just one, but all municipal utilities in Michigan. The MPSC suggests that the MMEA engage its members to ensure that all utilities review their storm preparedness plans and customer communication strategies in order to enhance their capacity to respond effectively during storm and extended recovery periods. All Michigan municipal utilities should be able to meet industry standards for best practices in customer communication during events and restoration periods.

The MPSC recommends the BWL:

- Work in conjunction with the MMEA to share the lessons learned and best practices with other municipal utilities within the state in an effort to improve the resiliency and outage response of all municipal utilities in Michigan.

[11] http://www.dhs.gov/presidential-policy-directive-8-national-preparedness

Energy Emergency Outage Communications

The MPSC Operations & Wholesale Markets Division has the primary responsibility of monitoring every emergency or potential emergency situation affecting Michigan's electric utilities. MPSC Staff serve as the primary point of contact for electrical and fuel shortage related situations. There are various internal and external communication requirements both in the normal course of events and in the event of power outages that MPSC Staff reports to the MPSC Commissioners, the Department of Licensing and Regulatory Affairs Director, the Michigan State Police (MSP), the State Emergency Operations Center, the Governor, and additional federal and state agencies when the situation warrants. Michigan regulated utilities report outages or system events that are significant or when they experience outages that affect greater than 5 percent of their customers.

The MPSC maintains this authority through both MPSC Commission order and State statute, specifically, the Emergency Management Act (PA 390 of 1976) [12] which provides for declaration of disaster and for planning, response, and recovery from disasters. PA 390 requires the establishment of the Michigan Emergency Management Plan (MEMP) [13] by the State Police. The MEMP states the following:

> *"The MPSC has ongoing responsibility for coordinating overall energy emergency preparedness and planning with [Emergency Management and Homeland Security] EMHSD/MSP and other affected agencies."*

In addition to the critical services the BWL provides to the local community, outages in the Lansing area can have a widespread effect on the State of Michigan through impacts to key elements of state government, including the Legislature, Executive Office, and MSP. Due to this additional responsibility and the critical impact[14] that even non-catastrophic outages can have, the MPSC recommends similar to other Michigan utilities, the BWL report to MPSC Staff when outages affect more than 10 percent of its customers, when a significant event affects the operation of its system, or where there is a loss of power to a critical facility or critical customer. This effort will ensure that the most up-to-date and contextually appropriate

[12] Emergency Management Act – An ACT to provide for planning, mitigation, response, and recovery from natural and human-made disaster within and outside this state; to prescribe the powers and duties of certain state and local agencies and officials; http://legislature.mi.gov/doc.aspx?mcl-act-390-of-1976

[13] The MEMP provides an organizational and operational framework to enable state departments and agencies to mitigate, prepare for, respond to, and recover from emergencies, disasters, threats or incidents – actual, imminent or potential – that could adversely impact the state of Michigan.
http://michigan.gov/documents/msp/MEMP_portfolio_for_web_383520_7.pdf

[14] For the purpose of this report, a critical impact is an outage at a critical facility or critical customer where the outage although directly impacting less than 10 percent of the customers served has a far more expansive impact upon the community as a whole (e.g. hospitals, emergency response facilities, universities, etc.).

information regarding electrical emergencies will be conveyed to the necessary parties in state government.

The MPSC recommends the BWL:

- Voluntarily report to MPSC Staff when outages affect more than 10 percent of its customers, when a significant event affects the operation of its system, or when there is loss of power to a critical facility or critical customer.

Mutual Assistance

It is critical for a utility to respond expeditiously following a major outage event. Planning restoration efforts begin with the familiarity and understanding of the utility's service area and distribution system.

The BWL was aware of the pending ice storm during the week leading up to the event. On Thursday, December 19, 2013, appropriate BWL staff was alerted to the storm and its possible damage during a staff meeting. The next day, BWL staff was again made aware of the weather predictions. Saturday, December 21, 2013, principal storm response managers held conference calls. However, the BWL's response was more reactive to the storm than proactive. The evening of the storm, it placed two more crews on call to have a total of three crews. It did not place additional office staff in on-call status or make any other preparations for the coming storm. Instead, the BWL was reactive to the storm, calling upon mutual assistance after the storm on Sunday, December 22. Six crews arrived or were in transit that day. It was not until five days after the storm that four additional MMEA mutual assistance crews arrived on December 27. Seven days after the storm, on December 29, two more mutual assistance crews arrived. Taking five and seven days to call in mutual assistance after a storm that affected 40 percent of the BWL's customers is ill-timed. However, the MPSC agrees with the CRT that the BWL has recognized this inefficiency and responded by its storm outage response action number 16 in its list of 54 items: "The BWL has expanded the number of utilities and non-utility electric service contractors with which it has mutual aid agreements or service contracts." Prior to the December ice storm event, the BWL had mutual assistance agreements with the MMEA, across 35 municipal utilities and Consumers Energy. Post-storm, the BWL now has the following mutual assistance agreements in place: MMEA, Consumers Energy, American Public Power Association, Asplundh, Kent Power, Hydaker-Wheatlake, and FEMA Mutual Aid (upon declaration of a State of Emergency). The BWL also has the following mutual assistance agreements pending: DTE Electric Company (DTE), Extreme Linework, Newkirk, NG Gilbert, and J Ranck. In addition to providing an increased number of resources, the new agreements are advantageous to the BWL in that they offer geographical diversity in bringing in assistance from a different number of states, or in some cases, anywhere in the United States.

The MPSC recommends the BWL:

- Keep the BWL Board and Lansing City Council continually informed on mutual assistance agreements should any contracts expire or have cause to be amended.

Spotters and "Bird Dogs"

The MPSC arrives at the same conclusion as the CRT, that perhaps the reason for the lagged mutual assistance calls is that the BWL did not have enough of its own staff responding in an efficient manner during the damage assessment phase of the BWL's reaction to the ice storm. Line crews cannot begin restoration of the system until the damage cause is evaluated and diagnosed. The BWL states that it has trained employees who are not members of a line crew to fill spotter roles such as engineers, designers, and electrical service workers and that annual spotter training sessions are held. The BWL did not have enough spotters, and as a result, much of the damage assessment was the obligation of the line crews in addition to their current repair responsibilities. This deficiency caused a delay in restoration times from inception of the storm.

The BWL in its *December 2013 Ice Storm Outage Report* on pages 33 and 34, part III.A.1, numbers 10 through 15 responds fittingly to its lack of spotters. The BWL has responded:

10. The BWL is in the process of carefully reviewing spotter duty during the ice storm and determining how many additional trained spotters would be needed to efficiently secure down lines and provide timely damage assessment during an event with the destructive impact of the ice storm. Based on this analysis, the BWL will survey its staff for additional personnel who would be suitable for spotter duty and train personnel for both spotter and damage assessment duty.

11. The BWL will also utilize retired line workers to perform damage assessment and serve as spotters.

12. The BWL will consider contracting with electric service firms for damage assessment services to supplement its own staff.

13. The BWL is developing common reporting forms and methods to be used by all spotters and damage assessors and will stress the importance of adhering to these during the annual training sessions.

14. The BWL will evaluate the use of damage predictive tools to determine if these tools could help in assessing possible damage earlier in a storm's approach.

15. The BWL will remind customers that lines marked with red and white tape are power lines and the tape indicates that the BWL is aware that the line is down. The BWL will publish this information on its website and Customer Connections newsletter.

In the event that the BWL calls upon mutual assistance, the BWL assigns "bird dogs" (a BWL employee who is familiar with the BWL primary electric system) to one or two mutual assistance crews. The policy of using "bird dogs" is a common practice within the electric utility industry as a way to manage the added mutual assistance crews in an efficient manner. The BWL has asserted that its current limit of one to two mutual assistance crews per BWL "bird dog" is to ensure the safety of the workers and is a stipulation in some mutual assistance contracts. The MPSC suggests that the BWL survey several of Michigan's utilities to determine the best practice regarding the use of the BWL "bird dogs" assisting mutual assistance crews. While there may be some parts of the system that require a one-to-one approach, the MPSC believes that most of the system can be managed by more mutual assistance crews per "bird dog." The MPSC is familiar with utilities that currently use four or five mutual assistance crews assigned to each "bird dog." If the BWL uses a similar policy, more mutual assistance crews can be brought in to assist during outage restorations.

The MPSC recommends the BWL:

- Implement and take action on all items 10 through 15 listed above. Specifically, for item 10, the MPSC recommends BWL perform the functions identified and report its progress (i.e. number of new spotters and damage assessors and training completions) to the Board and the Lansing City Council at least every six months or on an as-needed basis. For item 11, the BWL should perform the function identified and report its progress to the Board and the Lansing City Council at least every six months or on an as-needed basis with up-to-date information. For item 12, the BWL should not only "consider," but perform an assessment and report its findings (including, but not limited to, the firms contacted, number of spotters and damage assessors sought in bids, and probable contract terms) to the Board and the Lansing City Council. For item 13, the BWL should implement as identified. For item 14, the BWL should implement as identified and report findings to the Board and the Lansing City Council. For item 15, The BWL should implement as identified and keep the customer reminders frequent, especially prior to summer and winter months when storms and outages are most likely to occur.
- In addition to the aforementioned recommendations, the MPSC recommends that the BWL conduct biannual training sessions for spotters and damage assessors once in the fall, prior to the possibility of winter storms and outages; as well as during the spring, prior to the strong possibility of summer storms and outages. The Board should be apprised of the training sessions and given an update once each session is completed.
- Survey several Michigan utilities to determine the industry best practice regarding the BWL "bird dogs" assisting mutual assistance crews.

Outage Management System

In its own *December 2013 Ice Storm Outage Report,* the BWL stated, "the current OMS became operational in February 2013. As the BWL's operations staff began to use the new OMS, they encountered several issues requiring patches or documentation."[15] In May 2013, the BWL

[15] Lansing Board of Water & Light, *BWL December 2013 Ice Storm Outage Report*, p. 43.

discovered the OMS system was not functioning and actions were not completed to ensure a functioning OMS system going into the 2013/14 winter. Additionally the BWL did not have a contingency plan in place knowing that the OMS was neither operational nor fully tested to capacity.

The MPSC recommends the BWL:

- Integrate the OMS into an Emergency Operation Plan and test the system to its maximum capacity as recommended by the CRT.
- Create a contingency process that will provide guidance to BWL staff in the event the OMS is not operational during an outage or catastrophic event.

SYSTEM HARDENING AND RESILIENCY

As the distribution infrastructure continues to age, extreme weather can cause increased damage and extended outage periods. In order to maintain the high level of reliability that customers expect, utilities should take measures to harden the distribution system against extreme damage and increase the system's resiliency to quickly recover, should an extreme event occur. The importance of system hardening and resiliency becomes apparent during times of extreme weather such as the December 2013 ice storm.

The first step in designing a plan to address system hardening and resiliency is to understand and document the causes of outages that occur throughout the system. Quanta Technologies surveyed a number of utilities and reported post-storm data collection as one of the top 12 best practices.[16] The CRT noted the need for accurate data and documentation during power restoration and post-restoration.[17] Storm data is critical in establishing reliability goals and metrics which will continue to be used as improvements are made to measure system performance and customer benefit. Detailed outage data is also needed to provide a clear understanding of the causes and types of outages that occur and identify potential maintenance, capital investment and asset management projects that support system reliability. The MPSC urges the BWL to design a process that will allow the collection of post-storm data immediately following a storm event an in effort to document specific types of outages and equipment failures such as vegetation within the ROW vegetation outside of the ROW, damage due to dead ash trees, wind/weight loading on wires or poles, and equipment failure.

The Institute of Electrical and Electronics Engineers provides a clear methodology in a 2009 article, "A Reliability Improvement Roadmap Based on a Predictive Model and Extrapolation Technique." The use of a predictive tool may be helpful, but the statistics-based methodology

[16] Quanta Technologies, Storm Hardening the Distribution System, June 2010. Retrieved http://quanta-technology.com/sites/default/files/doc-files/TDW-Storm-hardening-paper.pdf, April 3, 2014.
[17] Community Review Team, *Report on the Lansing board of Water and Light's Response to the December 2013 Ice Storm*, May 5, 2014, p. 50-51.

illustrated in the article provides a clear quantitative analysis to evaluate the effectiveness of reliability improvements.[18]

The BWL discussed distribution system hardening in its *December 2013 Ice Storm Outage Report*. Below are specific aspects of distribution system hardening and resiliency that have been identified as critical to maintaining a reliable distribution system during times of catastrophic weather.

The MPSC recommends the BWL:

- Develop a procedure to collect system outage data by cause during and after storm events for future reliability analysis.

Vegetation Management

Tree and vegetation damage to power lines is the most common cause of electrical outages.[19] The MPSC agrees with the CRT's finding that vegetation management is an integral part of electrical system hardening for all electric utilities utilizing overhead construction. Robust vegetation management practices help to protect overhead lines from coming into contact with limbs during weather events and protect against the impact of broken or fallen limbs. Events such as the December 2013 ice storm stressed the distribution system beyond its design limits under the added loading of ice coated tree branches.[20] Consumers Energy's December 2013 ice storm report to the Commission noted a decrease in outage frequency of 30 percent after line clearing work was performed on a circuit.[21] Likewise, BWL indicated that the majority of the outages experienced by customers in the December ice storm were the result of falling branches and trees.[22]

Vegetation management is of critical concern in Michigan in part due to the effects of the emerald ash borer. Mature ash trees affected by the emerald ash borer can negatively impact the distribution system even though they are well outside of the ROW. DTE Energy estimates that the emerald ash borer is approximately 50 percent through its service territory so the disease is expected to be an ongoing concern.[23] There is also concern that the emerald ash

[18] Institute of Electrical and Electronics Engineers, *A Reliability Improvement Roadmap Based on a Predictive Model and Extrapolation Technique,* http://quanta-technology.com/sites/default/files/doc-files/Reliability_Improvement_Predictive_Model.pdf, Retrieved April 17, 2014.

[19] United States Environmental Protection Agency, *Integrated Vegetation Management (IVM) on Right-of-Way Fact Sheet,* retrieved April 3, 2014 from http://www.epa.gov/pestwise/htmlpublications/row_fact_sheet.html

[20] Lansing Board of Water & Light, *BWL December 2013 Ice Storm Outage Report*, p. 20-21.

[21] Michigan Public Service Commission Case No. U-17542, *Staff Report December 2013 Ice Storm*, p. 23.

[22] Lansing Board of Water & Light, *BWL December 2013 Ice Storm Outage Report*, p. 28.

[23] DTE Electric Company, *DTE Electric Company's Response to MPSC Order U-17542*, p. 8.

borer will jump to other tree species.[24] DTE also reports an additional threat to Michigan maple trees from the Asian long-horned beetle.[25]

In its *December 2013 Ice Storm Outage Report*, the BWL reported that its vegetation management policy is consistent with the standards developed by the American National Standards Institute (ANSI) ANSI 300 and ANSI 133.1. The BWL stated that its policy "is to create a buffer around its power lines to protect the lines from the movement of branches due to wind. It is not designed to protect the lines from falling branches located in the tree canopy above the power lines."[26] The BWL has reported that the typical ROW for overhead distribution infrastructure is 11-15 feet.[27] The BWL also informed the MPSC that it does perform line clearing on the service drop line that connects the customer to the distribution system.[28] Additionally, the vegetation clearing around the communication lines, located below the distribution lines, are the responsibility of the communication companies who lease those lines. However, the BWL may clear those areas if the vegetation interferes with access to lines or equipment or becomes a threat to the system.[29]

When asked by the MPSC, the BWL was unable to identify the number of outages due to vegetation such as dead ash tree fall-out or the number of outages caused by trees outside the ROW. The MPSC staff also observed vegetation lying on communication lines or densely intruding upon residential service lines. Detailed tree-related outage data collection is a practice employed by numerous utilities to help develop appropriate trimming cycles and understand how native vegetation impacts the distribution system in a specific service territory. Statistical analysis of such data provides a foundation for developing the appropriate long-term solution. The lack of data about the particular types of vegetation outages inhibits the BWL's ability to design an adequate program that will achieve its reliability goals and verify that the program itself is producing the desired results at some point in the future.

In response to the December 2013 ice storm the BWL has changed its internal vegetation management practices to "strictly adhere to a 5-year trimming cycle,"[30] increase transparency by publishing contact information for the supervisor responsible for tree trimming scheduling, and a change to multi-sourcing the contract trimming workforce.

The MPSC supports the CRT's vegetation management recommendations and urges the BWL to take additional measures. Adherence to a strict trimming cycle to trim re-growth alone will not

[24] Ontario Ministry of Natural Resources, http://www.mnr.gov.on.ca/en/Business/Forests/2ColumnSubPage/STEL02_166994.html
[25] DTE Electric Company, *DTE Electric Company's Response to MPSC Order U-17542*, p. 8.
[26] Lansing Board of Water & Light, *BWL December 2013 Ice Storm Outage Report*, p. 28.
[27] Lansing Board of Water & Light, PSC Staff Audit Questions to Lansing Board of Water and Light Response #70, p. 18.
[28] Lansing Board of Water & Light, PSC Staff Audit Questions to Lansing Board of Water and Light Response #70, p. 19.
[29] Lansing Board of Water & Light, PSC Staff Audit Questions to Lansing Board of Water and Light Response #70, p. 6.
[30] Lansing Board of Water & Light, *BWL December 2013 Ice Storm Outage Report*, p. 39.

likely produce the desired results during a severe storm event.[31] In addition to trimming re-growth, attention should be given to overhead branches, hazard tree removal, and communication lines. Special attention should be given to overhead branches because the added weight of the ice will strain and possibly break an overhead branch resulting in damage to the distribution system. Hazard tree removal involves the removal of trees that pose a hazard to the electric distribution system due to their size, location, or condition. This would include trees both within and outside of the ROW. Communication lines should be evaluated regularly to determine if vegetative growth will inhibit repair and restoration efforts in the event of an outage. If the BWL notices communication lines that are not being properly maintained in regard to vegetation management, notice should be sent to the owners of the communication lines. Large branches weighted with ice adding strain on communication lines ultimately stresses distribution poles that are already under heavy loading. The added weight could cause poles to break.

The MPSC recommends the BWL:

- Continue a rigorous tree trimming program and develop tree trimming practices that includes overhead branch removal and hazardous tree removal.
- Develop inspection procedures to ensure lease companies are clearing around communication lines.

System Inspection

Distribution system inspections are an inexpensive best practice that can easily be implemented. The MPSC understands that the banked secondary back-lot design and configuration of the BWL distribution system can present accessibility challenges during distribution system inspection. However, inspections often reveal lower cost repairs that are an integral part of maintaining a reliable system. Inspections also provide an opportunity to audit contractor work such as line clearing.

In response to a MPSC Staff inquiry, the BWL stated that "all electric distribution equipment, including lines, poles, transformers, breakers, etc. are inspected on at least a 12 year cycle. Some equipment is inspected more frequently for example, all poles are scheduled to be inspected in 2014."[32] Due to the BWL's lack of detail, MPSC interprets this to mean that all wood poles will be inspected this year, but may not be inspected again for 12 years. It is therefore recommended that the BWL re-evaluate its wood pole inspection cycle.
Quanta Technologies released a report in January 2012 that contained a survey of distribution wood pole management practices in the electric utility industry. The report indicates that the average wood pole inspection cycle among utilities is ten years.[33] The report also states that

[31] Public Utility Commission of Texas, *PUCT Project 38257*, p. 43.
[32] Staff Audit to BWL, Question and Response #40.
[33] Distribution Wood Pole Management Practices in the Electric Utility, January 2012 p. 8, retrieved from http://quanta-technology.com/sites/default/files/doc-files/Wood%20Pole%20Management%20Practices%20-%202012.pdf

although some regulatory jurisdictions have a mandated pole inspection period, more utilities conduct inspections than are required to do so. Of those utilities with regular inspection mandates, many inspect at a cycle more frequently than its mandate requires, especially in known problematic areas. According to this survey, utilities reported that they often conduct a visual inspection on a five-year cycle.

When asked to identify the cycle duration for all overhead line inspections and pole inspections of its entire distribution system, the BWL also gave no further detail about the regular inspection schedules specific to the other equipment on its system beyond the wood pole example.

The CRT recommends the BWL strive for a regular inspection of its entire distribution system on a two-year cycle.[34] The MPSC recommends the BWL develop a comprehensive inspection plan of all equipment that is critical for maintaining system reliability; poles, overhead conductors and cables, transformers, switching devices, protective devices, regulators, capacitors, and substations. There are several utility inspection standards and plans that can be used as benchmark information and industry best practice when developing a comprehensive inspection schedule. Pennsylvania Administrative Code 52 Pa. Code §57.198[35] mandated that all regulated utilities within the state file a plan for inspection of all equipment components listed above. Ohio Administrative Code 4901:1-10-27 provides guidance under their inspection, maintenance, repair, and replacement of transmission and distribution facilities (circuits and equipment) rule by requiring one-fifth of all distribution circuits and equipment to be inspected annually and substations to be inspected 12 times annually.[36] The *New Hampshire December 2008 Ice Storm Assessment Report* provides an in-depth survey into the actions of utilities resulting from the New Hampshire 2008 ice storm which includes utility best practices.[37] The report also recommends that utilities "strive for regular inspection of its entire distribution system on a two-year cycle, using a combination of circuit inspection, tree trimming inspection, and pole ground-line inspection."[38]

The MPSC recommends the BWL:

- Develop a comprehensive transparent inspection plan of all equipment critical for maintaining system reliability.

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[34] Community Review Team, *Report on the Lansing board of Water and Light's Response to the December 2013 Ice Storm*, May 5, 2014, p. 19.
[35] Pennsylvania Administrative Code 52 Pa. Code §57.198, http://www.pacode.com/secure/data/052/chapter57/s57.198.html , Retrieved April 17, 2014.
[36] Ohio Administrative Code 4901:1-10-27, http://codes.ohio.gov/oac/4901:1-10-27 , Retrieved April 17, 2014.
[37] NEI Electric Power Engineering, *New Hampshire December 2008 Ice Storm Assessment*, October 28, 2009, https://www.puc.nh.gov/2008IceStorm/Final%20Reports/2009-10-30%20Final%20NEI%20Report%20With%20Utility%20Comments/Final%20Report%20with%20Utility%20Comments-complete%20103009.pdf , Retrieved April 17, 2014.
[38] NEI Electric Power Engineering, *New Hampshire December 2008 Ice Storm Assessment*, October 28, 2009, p. VII-7.

Grid Modernization

The BWL has reported that its distribution system is designed to comply with the "heavy" National Electric Safety Code (NESC) standard for ice and wind. Additionally, the BWL employs the use of "Hendrix" wire as a means to reinforce lines in vulnerable areas.[39] The BWL also indicated the use of reclosers and the installation of 5-10 IntelliRupters® with several more waiting to be installed.[40] Reclosers and IntelliRupters® aid in quickly restoring power after a temporary fault has cleared, such as a tree limb that creates a fault then falls away from the line. Reclosers or IntelliRupters® will also allow the BWL to isolate a fault potentially restoring power to a portion of the circuit where a loop configuration or load shifting capability exists. The MPSC agrees that investments of this nature strengthen the distribution system and minimize outages experienced by customers. The MPSC encourages the Board and the BWL to develop procedures by which future reliability projects are planned based upon thorough evaluation of reliability metrics and outage data before and after project completion.

In addition to a physically robust system design, smart grid technologies that utilize two-way communication such as smart meter installation, distribution automation, substation automation and fault monitoring are widely recognized across the industry for their ability to minimize outage frequency and duration. The CRT suggests that the installation of smart meters will provide the BWL with an instantaneous and comprehensive view of outages and signal when power is restored. The BWL has plans to begin piloting smart meter technology in the summer of 2014.[41] The MPSC agrees that the BWL should explore and evaluate smart meter technology to determine the benefit and cost to its customers. It urges the BWL to review smart meter installation programs that are currently in process by other Michigan utilities to determine the total cost of such a project and the reliability of the meters and associated network to providing billing and outage data. A smart meter project would likely include software upgrades needed to obtain information from the meters and integrate them into billing and OMS systems.

The MPSC recommends the BWL study distribution automation, including automated substation technology and system fault monitoring to determine how these technologies enhance reliability and storm response. Approximately half of the U.S. Department of Energy Smart Grid Investment Grants (SGIG) received by utilities in Michigan were used for projects that included distribution automation as a means to reduce the frequency of both momentary and sustained outages, reduce the duration of outages and reduce the operations and maintenance costs associated with outage management.

The BWL identified the use of faulted current indicators throughout its system in areas that experience higher incidence of outages. Additionally, the BWL noted the use of digital two-way

[39] Lansing Board of Water & Light, *BWL December 2013 Ice Storm Outage Report*, p. 27.
[40] Community Review Team, *Report on the Lansing Board of Water and Light's Response to the December 2013 Ice Storm*, May 5, 2014, p. 134 as "smart reclosers detect everything."
[41] Community Review Team, *Report on the Lansing Board of Water and Light's Response to the December 2013 Ice Storm*, May 5, 2014, p. 60.

communication equipment to monitor power quality, providing audible and visual alarms, enabling the operator to make necessary adjustments and operate devices within substations. These are certainly helpful in identifying and correcting faults, however the BWL's distribution system appears to largely rely upon an operator to make these adjustments to equipment rather than utilizing distribution automation technologies including asset monitoring and automated feeder switching.

According to the initial results from the Department of Energy's Smart Grid Investment Grants program, investments such as automated feeder switching, equipment health sensors and outage detection devices can account for significant System Average Interruption Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI) improvements in both day-to-day operations and catastrophic events such as the December 2013 ice storm.

Outage detection devices provide location information enabling quick outage identification that does not rely upon customer outage notification. Each outage detection device has a specific identification number associated with a location. Upon experiencing an outage, the device sends a digital message which includes the device identification number and a time stamp. These devices can be integrated into the system as an advanced meter on an individual home or a device at a feed location, such as a transformer feeding several homes. Since the BWL does maintain GPS for its assets, outage detection would aid in identifying the exact location of an outage thereby reducing patrol time and allowing crews to be dispatched with greater efficiency.

Equipment health sensors and load monitors can provide information that reveal possible premature failure such as transformer insulation oil temperatures. These devices largely aid in maintenance planning and can help to identify an upcoming failure allowing for load switching and planned maintenance. Proper use of equipment health sensors can fully eliminate an outage event.

Automated feeder switches can open or close in response to a fault condition identified locally or to a control signal sent from another location. When combined with communications and controls, the operation of multiple switches can be coordinated to clear faulted portions of feeders and reroute power to and from portions that have not experienced faults. These coordinated actions are called fault location, isolation, and service restoration (FLISR).[42] Restoration time was reduced significantly with this technology.[43] Feeder switching technology combined with equipment health monitors and outage detection devices can greatly reduce the location identification, isolation, and repair of a fault.

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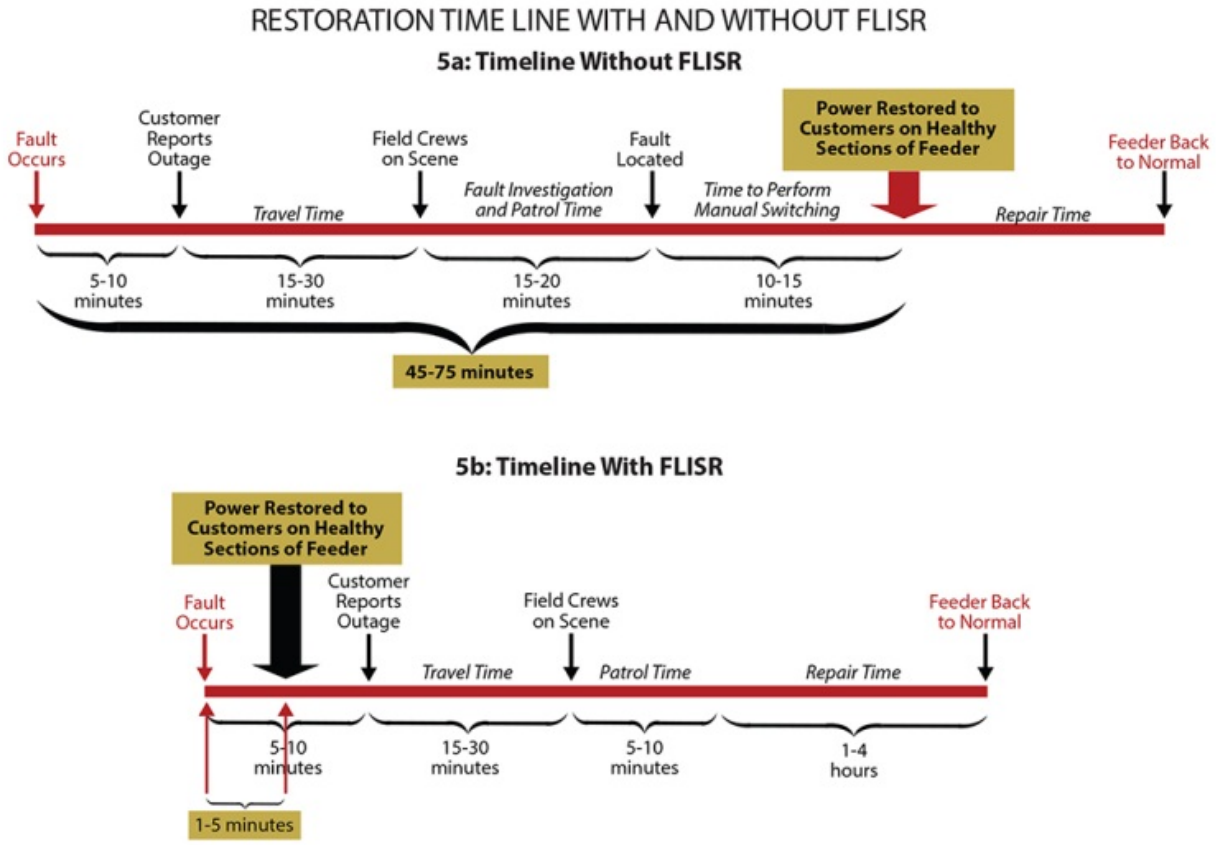
[42] United States Department of Energy. (2012). Reliability Improvements from the Application of Distribution Automation Technologies. Washington DC.

[43] Uluski, R. (2013, June 10). *Developing a Business Case for Distribution Automation*. Retrieved from http://www.elp.com/articles/powergrid_international/print/volume-18/issue-6/features/developing-a-business-case-for-distribution-automation.html?p=FLISR+benefit



Initial results from the SGIG report on Reliability Improvements from the Application of Distribution Automation Technologies concluded the following:

Reliability Indices	Description	Range of Percent Changes
SAIFI	System Average Interruption Frequency Index	-11% to -49%
MAIFI	Momentary Average Interruption Frequency Index (interruptions)	-13% to -35%
SAIDI	System Average Interruption Duration Index (minutes)	+4% to -56%
CAIDI	Customer Average Interruption Duration Index (minutes)	+29% to -15%

The results show significant improvement in reducing sustained interruptions, momentary interruptions, and average system interruption duration as calculated by changes in SAIFI, Momentary Average Interruption Frequency Index (MAIFI, and SAIDI respectively.[44] It should be noted that in some instances CAIDI metrics increase due to the fact that FLISR technology reduces the number of customer that experience an outage (numerator) by isolating the fault, however the repair duration needed to fix damaged equipment (denominator) did not decrease.

[44] United States Department of Energy. (2012).

The MPSC understands that the move to distribution automation technology and smart meter technology requires significant capital investment. Investment in all technologies simultaneously would result in significant rate impact. Therefore, the MPSC recommends that the BWL devise a strategic and detailed plan to deploy technology to maximize customer benefit. The BWL can also minimize rate impact to customers through the replacement of assets at the end of their useful life and by strategic placement of smart assets based upon outage data identifying poor performing areas of the system. This measured approach will result in the maximum benefit while minimizing the cost impact to customers.

The MPSC recommends the BWL:

- Study all grid modernization and two-way communication technologies to develop a capital investment project plan that maximizes reliability and customer benefit.
- Continue to invest in assets that increase the overall strength of the electric system when replacing assets that are at the end of their useful life.

UNDERGROUND POWER LINES

In May 2007, the Commission order in Case No. U-15279 directed MPSC Staff to study the costs and benefits associated with extending the Commission's existing underground line policy. In general, underground utility lines are required in new subdivisions and new commercial and industrial service areas within the Lower Peninsula. The Commission's administrative rules for underground electric lines, 1999 AC, R 460.511- 460.519, are posted on the Commission's website and have been in effect since 1971.[45]

The MPSC Staff's report found that underground lines cost significantly more than overhead lines, and that replacing existing overhead lines with underground lines will cost approximately $1 million per mile, totaling an estimated tenfold increase in cost as compared to the installation of overhead distribution power lines. The MPSC Staff determined that distribution rates could increase 80 to 125 percent if all overhead lines were replaced with an underground distribution system. The report also made the following four conclusions: (1) improved reliability can be achieved by options other than underground construction at a lower cost, (2) the cost of converting all overhead distribution lines to underground lines is not practical, (3) the cost for installing underground distribution lines should largely be allocated to the customers receiving the local benefits of the investment, and (4) if an outage should occur on an underground distribution line, the duration of a customer's average outage time would increase exponentially.

In 2007, the MPSC Staff's conclusion was that distribution line undergrounding for the sake of reliability does not appear to be economically justified. The largest benefits to underground distribution lines are those lines that impact the most customers, likely 3-phase feeder lines. In

[45] MPSC administrative rules – Underground Electric Lines, 1999 AC, R 460.511 – 460.519; http://www7.dleg.state.mi.us/orr/Files/AdminCode/107_96_AdminCode.pdf

addition, undergrounding would likely result in increased reliability if vegetation, certain weather events, or wildlife primarily caused outages, but vehicle-related outages may increase depending upon the placement of transformers and substation equipment.

The MPSC recommends the BWL:

- Study its poorest performing distribution power lines to determine the costs and benefits of undergrounding such lines as compared to other options aimed at increasing reliability.

CONCLUSION

The mission of the MPSC is to grow Michigan's economy and enhance the quality of life of its communities by assuring ***safe and reliable energy***, telecommunications, and transportation services at reasonable rates (emphasis added).

The MPSC takes its role in this review assignment very seriously since the December 2013 ice storm greatly affected Michigan communities and the delivery of safe and reliable power to them. The MPSC appreciates the opportunity to provide assistance and extends thanks to Mayor Bernero and the City of Lansing for the opportunity to provide input in the matter.

The MPSC appreciates the CRT for its assistance in this matter and for its excellence in executing its task. The MPSC would also like to extend recognition to the BWL team, including the hard working restoration crews and staff who assumed difficult roles and long hours during the holidays and to the community members who volunteered their time and effort during this catastrophic event.

The MPSC advises the mayor of Lansing, Lansing City Council, the BWL Board, and the BWL to deliberate and execute the recommendations provided by the CRT in its report and the supplemental recommendations rendered in this MPSC report.