



AUSTIN ENERGY

FEBRUARY

WINTER STORM MARA

AFTER-ACTION REPORT



FEBRUARY 2023 WINTER STORM MARA

AFTER-ACTION REPORT

January 30 - February 12





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The ice buildup on electric equipment and trees from Winter Storm Mara caused widespread damage and outages.

I. EXECUTIVE SUMMARY

Even through extreme conditions, Austin Energy strives to provide reliable power to its customers. Winter Storm Mara was a catastrophic, hurricane-level ice storm that greatly impacted Austin Energy's customers in February 2023. In the wake of the storm, a peak of more than 170,000 customers were without power, 10.5 million trees were damaged, and call center representatives received 370,000 calls. Austin Energy understands the loss of power disrupted daily lives and hindered the ability of customers to carry out essential activities. The utility deeply regrets the hardships customers endured. Following the storm, Austin Energy worked through the root causes of the difficulties encountered in its response activities to draw valuable lessons to improve future performance.

Austin Energy is committed to the community it serves. This After-Action Review (AAR) Report demonstrates the utility's focus on learning, growth, and resilience as it analyzes its response to the extraordinary challenges posed by February's winter storm.

Key Observations and Recommendations

Austin Energy's response to the February winter storm effectively mobilized additional personnel, requested mutual aid, and restored power without any reportable safety incidents. Other areas of response, though, need improvement. This report identifies those areas and provides recommendations for Austin Energy to enhance its operations and better serve the community. At a broad level, this report found the following categories in need of improvement:

- 1. Communications and Customer Experience:** The ice storm and extended outages significantly impacted customers, causing extreme hardship. For example, Austin Energy did not provide an accurate estimation of when power would be restored. As crews made initial assessments on Wednesday, February 1, the first day of the storm, Austin Energy communicated that some customers may be without power for 12 to 24 hours. Later that same day, that messaging progressed to power may be out until Friday, February 3 – assuming this was like other storms where restoring a locked-out circuit restores nearly all customers served by that circuit. This underestimated the number of customers impacted by damaged equipment, downed wires, and fallen trees on downstream portions of the circuits. The extreme damage caused by the ice storm required multiple repairs on all parts of a circuit in order to bring all customers back online. As a result, Austin Energy created customer expectations that were not met. Had Austin Energy performed a full system assessment prior to announcing an estimated time of restoration, the extent of the damage would have been clearer, leading to a better understanding that it was going to take more than a week to fully restore power.
Further, Austin Energy's outage map and outage reporting tools did not function as expected. This impeded Austin Energy's ability to provide timely, informative, and accurate customer updates. For example, some customers experienced "timeouts," which bumped them off the system when trying to interact with the two-way texting feature of the outage map and reduced the functionality of the automatic, two-way texting tool. Customers were also unable to determine if their outage was showing up on the map, which led to multiple outage reports. Austin Energy will continue to work with the outage map vendor to implement outage map enhancements and improve automated messaging platforms to improve customer engagement and transparency.
- 2. Emergency Preparedness:** Ice storm conditions and the volume and extent of damage to the electrical distribution system were challenging for Austin Energy's emergency response. Austin Energy was prepared for a short-duration outage event, like what the utility experiences during a severe thunderstorm with extreme winds. This event had vastly different challenges. For example, ice and trees continued to affect the electric system after the weather passed through the area, and the extent of damage to equipment and individual customers' service created longer timelines to restore power. Adjusting the restoration process in real-time to match these conditions while making repairs created inefficiencies in Austin Energy's response. Further, Austin Energy's emergency preparedness drills had not simulated long-duration outage emergencies. Austin Energy is coordinating with peer utilities with experience in significant long-duration outages to enhance risk assessment and restoration methodologies and refine emergency plans for extreme weather events to improve response effectiveness in the future.

- 3. Storm Response and Coordination:** Austin Energy faced operational challenges due to the lack of clear escalation protocols and seamless hand-offs between line crews and tree crews. For example, Austin Energy initially assigned more tree trimming crews than necessary to deploy with line crews and repair fully de-energized circuits. This delayed repairs on circuits with only partial outages. Austin Energy will focus on minimizing outage durations by improving the overall response and recovery process. This involves re-evaluating storm prioritization processes and defining restoration activities according to phases, which will better match the response to the current situation.
- 4. Collaboration with Stakeholders:** Austin Energy experienced challenges in establishing and maintaining effective communication protocols and coordination with other City of Austin departments, emergency management agencies, other city officials in our service area, and neighboring entities. For example, expectations for coordination with the Communication and Public Information Office (CPIO) for a long-duration outage were not clearly defined. In a typical emergency situation, Austin Energy manages customer communications, regularly sharing updates and messaging with CPIO. At the start of this event, the lack of initial alignment of those expectations led to inefficiencies in collaboration.

Further, the power source location for traffic signal infrastructure is not well mapped for many locations. As a result, there were locations where Austin Energy and Transportation Public Works crews needed to conduct field research to identify the correct power source location for some traffic signals, leading to delays in addressing issues.

Since the February 2023 ice storm, CPIO has established new guidelines that all emergency communications, including with elected officials, be integrated with the EOC/JIC. Through continued communication and the establishment of common operating procedures, Austin Energy will strengthen its relationships with stakeholders to better facilitate common information, swift restoration, and effective use of resources during future events.

- 5. Infrastructure Resilience:** While power outages from extreme weather cannot be eliminated, the February ice storm exposed vulnerabilities in Austin Energy's infrastructure. Austin Energy will investigate measures to improve its infrastructure such as conducting a third-party study of burying power lines, adjusting tree-trimming policy to increase effectiveness, and enhancing operational resilience to reduce the impact of future extreme weather events and increase service reliability.

Extreme weather will affect the Austin area again. While Austin Energy cannot eliminate the possibility of long-duration outage events, the utility can work to minimize the impact to customers and provide better information in a more timely manner. Austin Energy is committed to a culture of learning and to applying the lessons from this event to drills, exercises, and training programs to mitigate risks and customer impacts of future events. The utility will continue to refine response procedures, strengthen decision-making processes, and foster innovation and adaptation.



POWER LINE SAFETY

NEVER approach a downed power line or tree limb in contact with a power line.

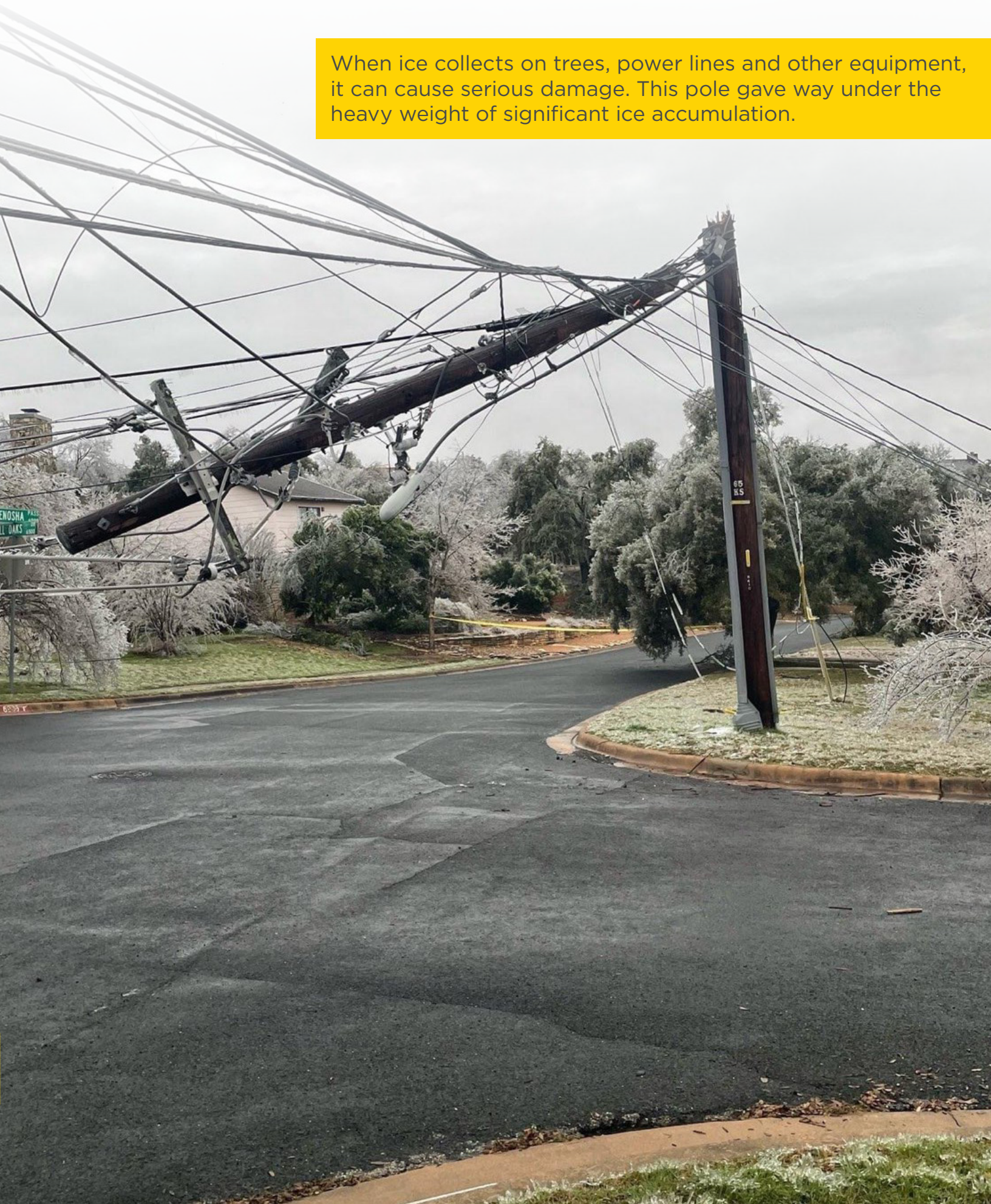
Assume downed power lines are energized and stay away from them.


Customer Driven.
Community Focused.
austinenergy.com

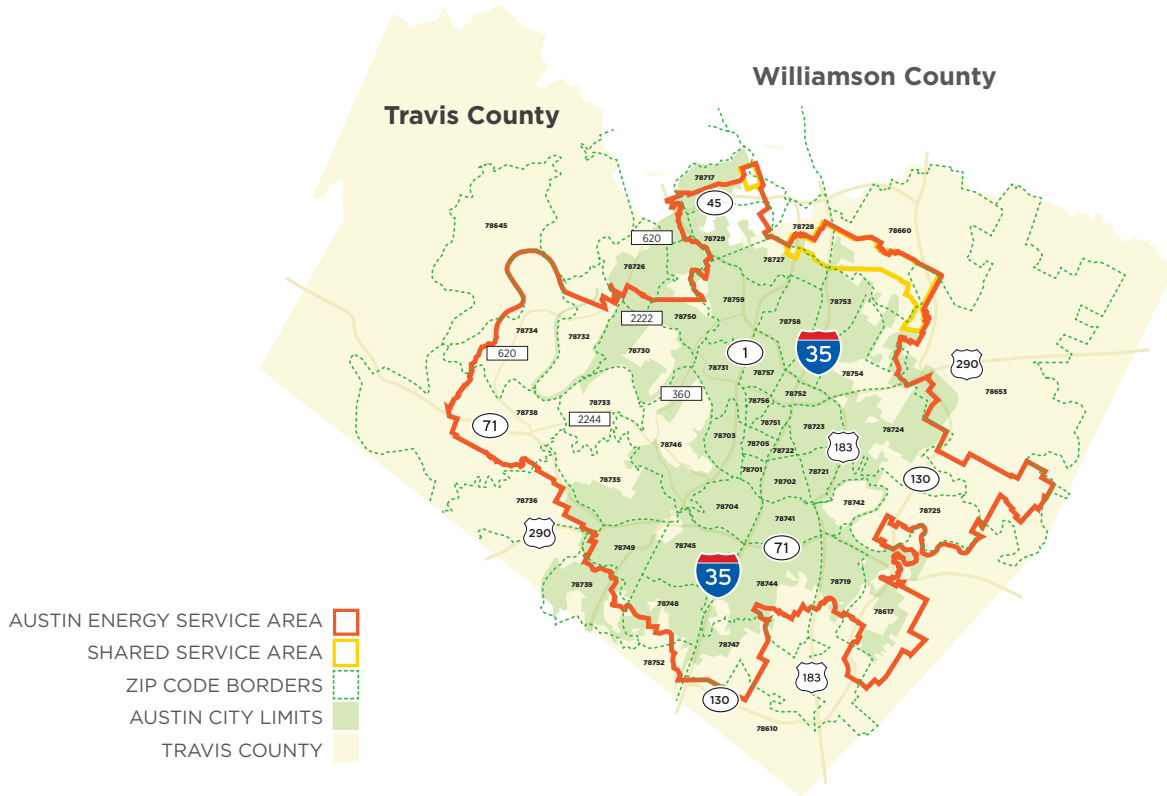
This video illustrates the damage ice accumulation can cause.

© Austin Energy

When ice collects on trees, power lines and other equipment, it can cause serious damage. This pole gave way under the heavy weight of significant ice accumulation.



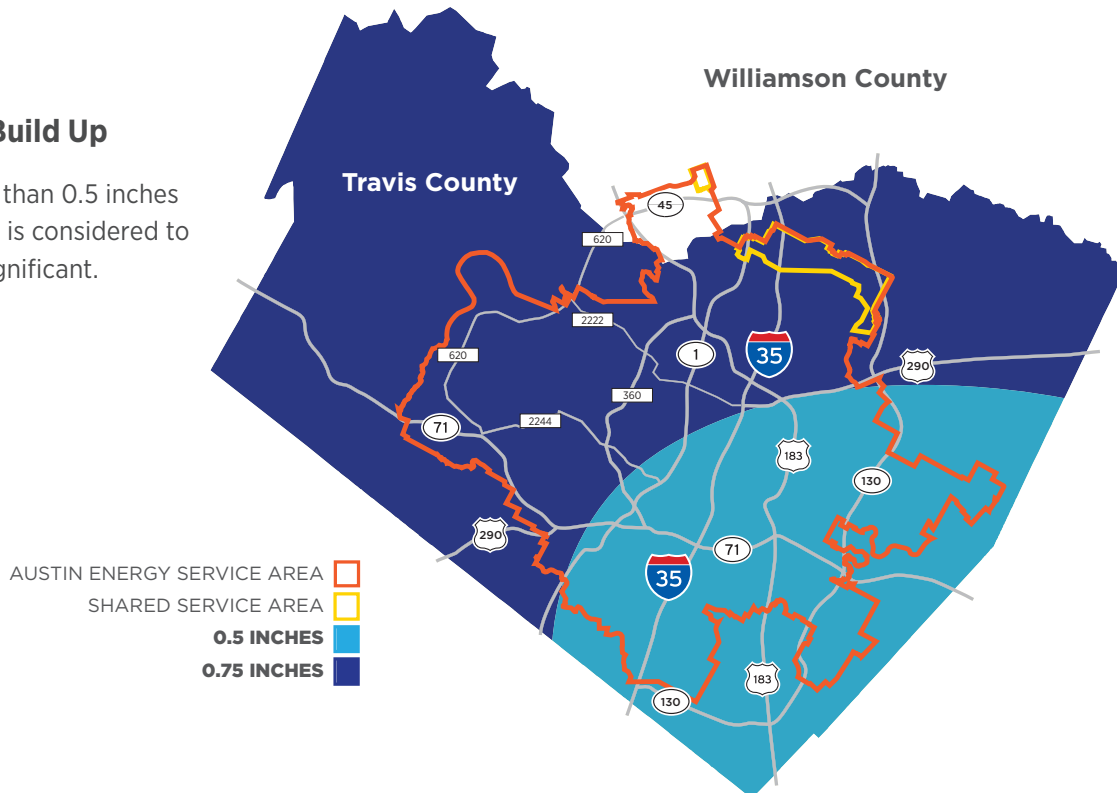
Austin Energy Service Area 437 Square Miles



Ice Build Up over the Austin Energy Service Area

Ice Build Up

More than 0.5 inches of ice is considered to be significant.





II. EVENT DETAILS

As the weather system approached the Austin area on Monday, January 30, Austin Energy and its teams closely monitored weather forecasts in preparation for the severe weather. Initial projections put ice accumulation at one-tenth of an inch in western Travis County, but as weather drew closer, this increased to the possibility of a one-half inch of ice, mostly north and west of the Austin Energy service area.

Austin Energy monitored the developing weather conditions and began communicating storm updates to customers on Monday, January 30 through news interviews, a news release and social media messaging urging customers to prepare for possible outages. As part of its monitoring, the utility also conducted situational awareness calls with its Incident Command team. Incident Command is a group of trained Austin Energy employees responsible for incident response once activated. The team assessed the conditions, and Austin Energy mobilized additional line crews and tree trimmers to quickly respond if needed.

On Tuesday, January 31, in advance of the extreme weather, Austin Energy activated Incident Command. Beginning early Wednesday, February 1, the ice storm moved into the region. It developed as a low-pressure system, causing temperatures to plummet and turning precipitation into freezing rain. As the weather system progressed, ice accumulated, causing hazardous road conditions, power outages, and damage to trees and equipment.

The amount of ice that blanketed the area was more than forecasted. Ice accumulation reports of more than one-half inch extended across Austin Energy’s eastern service area. In the western part of the utility’s service area, ice accumulation amounted to more than seven-tenths of an inch. This was one of the highest ice accumulation amounts in Austin’s history.

The same day the storm swept through the area, Austin Energy experienced its peak number of outages, affecting 32% of customers. Austin Energy recognized the severity of the situation and requested mutual aid as soon as outages began. The first round of mutual aid personnel arrived later that day, Wednesday, February 1, and continued arriving throughout the week.

Winter Storm Mara brought a challenging and dangerous environment for crews and power restoration. The storm affected about 10.5 million trees in the City of Austin, according to a damage assessment from Texas A&M Forest Service. Throughout Austin Energy’s entire response, the utility replaced 101 distribution poles and 52 transformers. The utility had more than 1,600 personnel in the field working to respond and restore power as quickly as possible. This included employees, contractors, tree trimmers and 455 mutual aid personnel, the most in Austin Energy’s history.

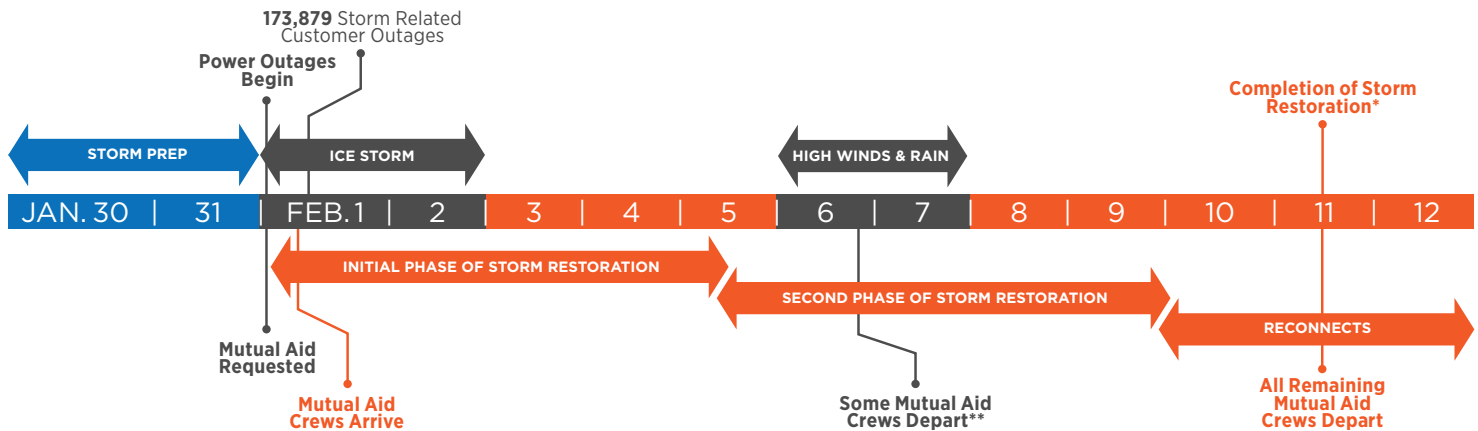


Winter Storm Mara brought half an inch to three-fourths of an inch of ice to the Austin area when it went through, causing significant damage.





Winter Storm Mara Timeline



*For customers who are able to safely receive power

**Increased contract company personnel when utility personnel needed to return to their home utility in anticipation of Feb. 7 weather

Phase 1 Restoration Efforts

Between Wednesday, February 1 and Sunday, February 5, Austin Energy performed initial-phase restoration efforts. During this first phase, Austin Energy focused on critical load customers, such as hospitals, water treatment plants and other life-safety facilities. This phase also involved mainline circuit restoration, which means closing the circuit breakers connecting distribution circuits to the substations.

In other storms, repairing those circuits and closing the circuit breaker typically restores almost all of the customers served by that circuit. That is, thousands of customers would be restored at a time. Austin Energy estimated Winter Storm Mara would be a similar restoration effort at the start of the event, but as time passed it realized this storm was different.

Based on those factors, Austin Energy communicated that some customers may be without power for 12 to 24 hours on Wednesday, February 1 — the first day of the storm. Later that same day, that messaging progressed to power may be out until Friday, February 3.

Winter Storm Mara was not a typical outage emergency situation, however. At the start of Austin Energy’s restoration efforts, much of the work crews accomplished was undone as trees and branches continued to fall on electric equipment, causing new outages. When repairs did hold, crews found that full circuits were not restored. There was more damage further down the line, like broken equipment, downed wires, and fallen trees on lateral portions of the circuit. To further explain, a distribution circuit has many laterals, each serving multiple customers. It is like a power strip with many devices plugged into it. These off-shoots from the main power strip are considered laterals, and if there is an issue between the plug at the power strip and the device needing power, restoring electricity to the power strip will not restore power to the device. It will remain without power until the problem causing the lateral outage is addressed. Because of that, multiple repairs were needed to bring customers back online, taking more time and effort.

Though Austin Energy encountered these different issues as it worked through repairs, it did not have a clear picture of the extent of this damage across its entire electric system. During the first-phase restoration efforts, it was difficult to compile a full damage assessment. The level of ice created hazardous driving conditions, making access for patrollers difficult. Where patrollers could assess the system, Austin Energy did not have established procedures for this type of situation, outlining what information to report back to Incident Command so that the team could create an accurate picture of the damage to the system and how long total restoration would take.

Because of this situation, Austin Energy could not meet the Friday expectation it had set. Once that was realized, the utility retracted the deadline but was unable to provide an updated restoration estimate right away. On Sunday, February 5, as it neared the end of the first phase of restoration, Austin Energy announced a new system-wide restoration time of Sunday, February 12.



Phase 2 Restoration Efforts

Between Monday, February 6 and Thursday, February 9, Austin Energy continued into a second phase of restoration with the following prioritization:

1. Outages affecting the most customers.
2. Outages with the longest duration.
3. Smaller yet more complex outages.

During this time, there remained thousands of outages, each requiring a line and/or tree crew to resolve the issue and restore power. While it seemed like outage restoration slowed, each job affected fewer customers than in the initial phase, but each outage still required approximately the same amount of work and time to resolve. This is the nature of a long-duration outage event, but it is unlike any Austin Energy customers have experienced before.

As crews continued restoration efforts, they also worked through what are known as nested outages. A nested outage occurs when there is a smaller, more localized outage nested within a larger outage. That is, there are multiple issues along a circuit that need to be repaired before power is restored to everyone on the circuit. Normally, when there is an outage and a smart meter loses power, the Austin Energy outage management system sees it as a change of state to the meter and records the issue. In the case of a nested outage, the meter change in state occurs at the start, when the larger outage exists. Once the larger outage is resolved, but the nested outage remains, there is no change of state in the meter, so the system cannot always recognize all the outages.

For Austin Energy to know there is still an outage down the circuit, affected customers need to re-report their outage. For example, when repairs are made for the larger outage, an automated text goes out to customers in that area saying that power to part of the system has been restored, but to text **"OUT"** if they were still experiencing an outage. This is the best way the utility can know more work is needed to fully restore customers' power.

Many customers attempted to report their outage again; however, the tools customers used to report outages quickly became overwhelmed with the volume of reports. The system did not have the capacity to handle the number of customers trying to use it, and the processing time for those reports was too short to handle that increased use. After reporting **"OUT,"** some customers received error messages that their texts were not getting through to the system.

Austin Energy worked with the vendor for the system to resolve the issue, and throughout the restoration process, Austin Energy received thousands of outage reports through inbound calls, texts and the outage map. However, these issues frustrated customers.

There were other areas where the unprecedented nature of this storm exceeded the utility's existing preparedness and planned response. For typical storm responses, a troubleshooter will first assess the cause of an outage, noting if the outage requires specific work. This allows Austin Energy to dispatch the correct type of crew and equipment to make the needed repairs like a tree crew to remove tree limbs from electric equipment or line crews to rebuild equipment and restore power.

That type of sequence was ineffective for a long-duration outage. The severity and extent of the damage as well as the number of outages required Austin Energy to find a different operational approach while continuing to restore power. In some cases, Austin Energy combined many tree and line service crews into a larger workforce, so they could work multiple outages on a circuit in a coordinated fashion. In other cases, tree crews were dispatched without line crews to address areas with particularly large or complex vegetation jobs. Furthermore, Austin Energy pulled some crew leads from their usual line crew to pair them with several mutual aid crews and work in other areas.

Tracking the work from these different configurations made the restoration effort more complex. Crews used different electronic systems for tracking and updating progress, and some crews had to track their work on paper. These factors contributed to a more complex restoration effort, one where teams had to adjust over time to find effective solutions and continue making repairs.

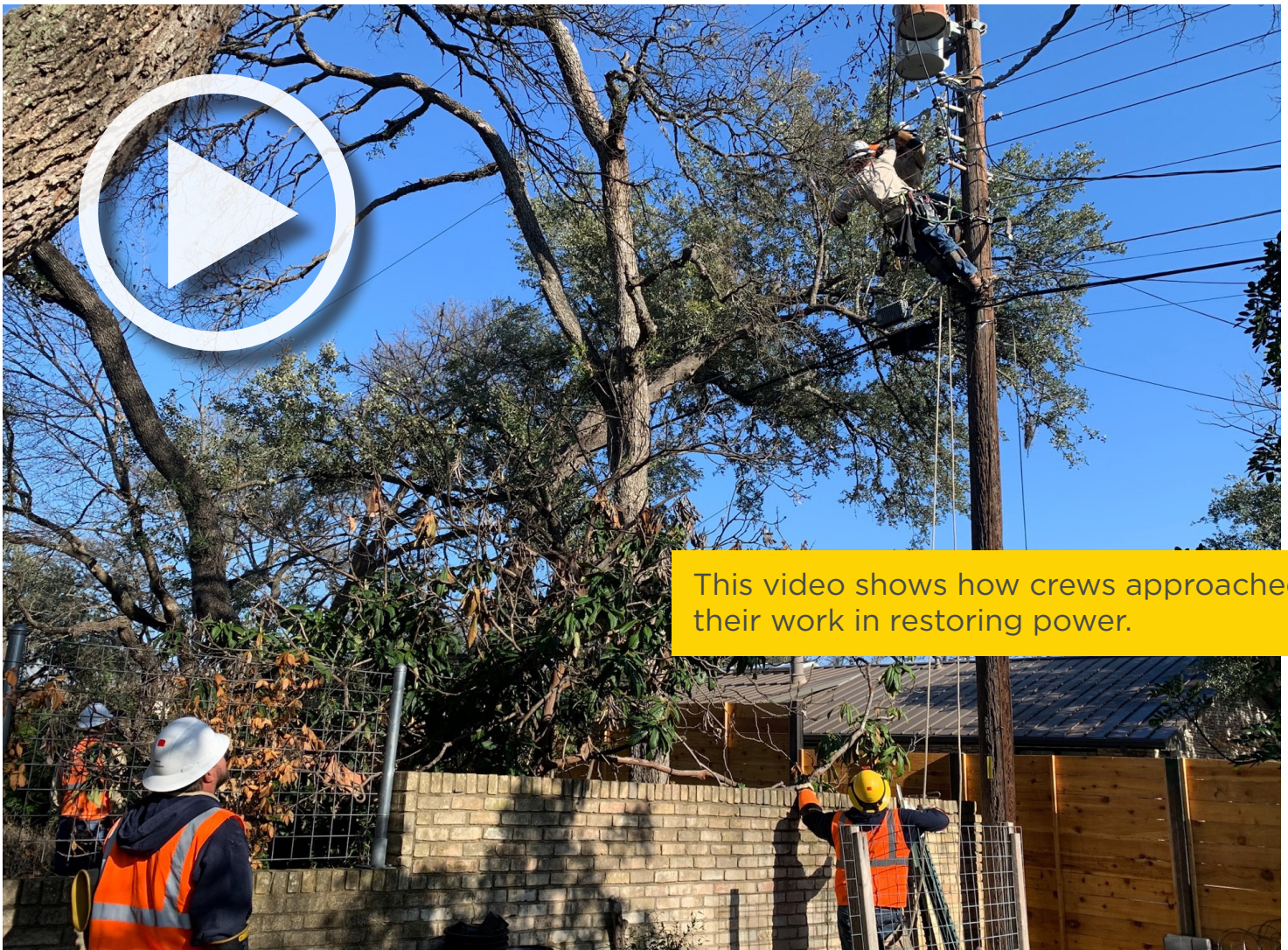
Phase 3 Restoration Efforts

On Friday, February 10, Austin Energy entered into the third and final restoration phase, single outages. Restoring these customers involved more work per customer, sometimes requiring crews to replace poles and rebuild service drops one by one. Each completed job restored a single customer.

In many cases, Austin Energy could not safely restore power due to damage to customer-owned equipment that connected their premise to the Austin Energy system, such as weather heads, electrical panels, and meter boxes. In those cases, the customer needed to hire a licensed electrician to repair their equipment. Austin Energy provided information to customers regarding necessary repairs and expedited processes along with fellow City departments, but power could not be restored without customer action.

Complicating the effort, Austin Energy does not have an automated way of determining whether single outages are customer-sided or utility-sided. Each outage requires the utility to send a person or crew to make that determination. In addition, tracking customers that require work on their equipment is a manual and ever-changing process. All of this slows restoration progress and makes these single outages time- and labor-intensive.

By Saturday, February 11, Austin Energy had restored 99.93% of affected customers. At that time, Austin Energy demobilized mutual aid personnel and deactivated Incident Command, but continued power restoration efforts in the weeks that followed as customers completed repairs to customer-owned equipment so Austin Energy could safely restore power.





Crews worked through hazardous conditions to restore power after a "hurricane-level ice storm."



III. IMMEDIATE ACTIONS

Immediately following the February 2023 winter storm, Austin Energy acted on several improvements. The following measures have already been completed or are currently in progress:

- **Emergency Management Leadership:** Recognizing the importance of effective emergency management, Austin Energy hired a director to lead its Emergency Management Team. This dedicated leadership role will ensure a more streamlined and coordinated response during emergency situations. Further, the director initiated the hiring process for two additional emergency management personnel. Previously, Austin Energy had only one Emergency Management Coordinator.
- **Peer Utility Visits:** Austin Energy is collaborating with peer utilities with experience in long-duration outage events to learn about their operational processes and best practices. Specifically, Austin Energy met with Jacksonville Electric Authority due to their experience with hurricane response, Southern California Edison due to their experience with wildfire, Long Island Power Authority due to their experience with cold weather and tropical cyclones, and others. Discussions have focused on many topics including damage assessments and calculating system-wide estimated times of restoration, allowing Austin Energy to inform and improve its estimation practices and provide more accurate information to customers.
- **Outage Map Improvements:** Austin Energy completed improvements to the outage map functionality. These improvements will allow more time for the information transfer between customers interacting with the map and Austin Energy's system. This allows the system to handle more outage reports at one time, specifically during a storm when there is high use of the outage map.
- **Improved Citywide Communication Planning:** Austin Energy participated in the City's emergency communication plan efforts. This collaboration aims to improve overall preparedness, coordination, and information sharing during emergencies.
- **Vegetation Management Contract Improvements:** Austin Energy established a contract to secure additional staffing resources to bolster vegetation management efforts. This will ensure more tree trimming and vegetation clearing near power lines can occur despite labor shortages, reducing the risk of outages caused by fallen trees during severe weather events.
- **Distribution Underground Feasibility Study:** Austin Energy is initiating a study to assess the feasibility of placing distribution lines underground. This study will identify the cost and effectiveness of burying lines to improve infrastructure resilience and minimize the impact of future weather events on power distribution.



IV. OBSERVATIONS & FOLLOW-UP ACTIONS

COMMUNICATION & CUSTOMER EXPERIENCE

Effective communication is always important, but it becomes even more crucial during emergencies and long-duration outage events. It requires clear channels of communication, established protocols, and a well-functioning downstream process, with teams working together seamlessly. Austin Energy recognizes missed opportunities in these areas, impacting smooth and efficient communication with customers during emergency situations. Several observations were identified and listed below, and Austin Energy is dedicated to implementing measures to address these observations. This will ensure customers receive timely and accurate updates during emergencies and long-duration outage events.

Observation 1 — Establishing Estimated Times of Restoration (ETR)

Austin Energy understands customers need information about when power will be restored and makes every effort to arrive at a realistic estimated restoration time based on:

- The number of lineworker crews available.
- The extent of the damage.
- The safety of our employees and customers.

As a situation evolves and the extent of the damage becomes clearer, the estimated time of restoration can change. When a systemwide ETR is calculated, it is based on the best available information at that time. As crews made initial assessments on Wednesday, February 1 — the first day of the storm — Austin Energy communicated some customers may be without power for 12 to 24 hours. Later that same day, Austin Energy stated power would not be restored until Friday evening. That estimation was based on the number of circuit lockouts. A circuit lockout is similar to a breaker tripping in your home to isolate the trouble spot and protect the rest of the system. In the case of the electric grid, the system is designed to de-energize at the substation if something happens on the circuit, enabling crews to make necessary repairs. Austin Energy estimated restoring a locked-out circuit would restore nearly all customers served by that circuit, which is fairly typical during storms. This approach underestimated the number of customers experiencing an outage impacted by damaged equipment, downed wires, and fallen trees on downstream portions of each circuit. A full system assessment prior to establishing estimated restoration times would have shown that additional time was needed to fully address all outages. In making this early announcement, Austin Energy created expectations that were not met.

On Thursday, February 2, Austin Energy gained a better understanding of the severe damage to the system. The utility realized it needed to retract the Friday restoration date but was unable to provide a specific timeline.

On Sunday, February 5, Austin Energy communicated it would be able to restore power to nearly all remaining customers who were able to safely receive power by Sunday, February 12.

Austin Energy recognizes several areas that impacted the ability to establish an accurate estimated time of system restoration:

Key Findings

1. **Incomplete Damage Assessment:** Austin Energy patrollers did not perform an effective damage assessment of the entire system because of a lack of established procedures and unclear expectations on what and how to report back to Incident Command. This meant Austin Energy did not have the information, such as severity of damage at each location, needed to establish an accurate systemwide estimated time of restoration.

2. Lack of Formal, Systemwide ETR Calculation Process: Whenever Austin Energy determines that the number and complexity of power outages will exceed the capability of available personnel to restore power within the restoration timeframes provided on the outage map, Austin Energy changes the individual outage ETR to state, “Crews need more time to restore power safely.” This is called “storm mode” in Austin Energy’s Advanced Distribution Management System (ADMS), the software that interacts with Austin Energy’s outage map. The practice is industry standard, especially during storms, to avoid communicating inaccurate information. However, this also means less information for customers experiencing outages and trying to make decisions regarding relocation, food, and family. Due to the number of outages experienced and their unknown complexity, it is nearly impossible for Austin Energy to provide individualized outage ETRs during long-duration outage events. However, Austin Energy can calculate and communicate some form of systemwide ETR, but it lacks a formal process to do so.

Follow-Up Actions

- AI 1.1** - Establish and train on a damage assessment process for emergency response.
- AI 1.2** - Coordinate with peer utilities to discuss best practices for calculating systemwide estimated times of restoration.
- AI 1.3** - Establish an operational procedure to produce systemwide estimated times of restoration for long-duration outage events. Consider a phased approach as Austin Energy gains better information about the extent of the damage during an event.
- AI 1.4** - Evaluate different ADMS storm mode levels.



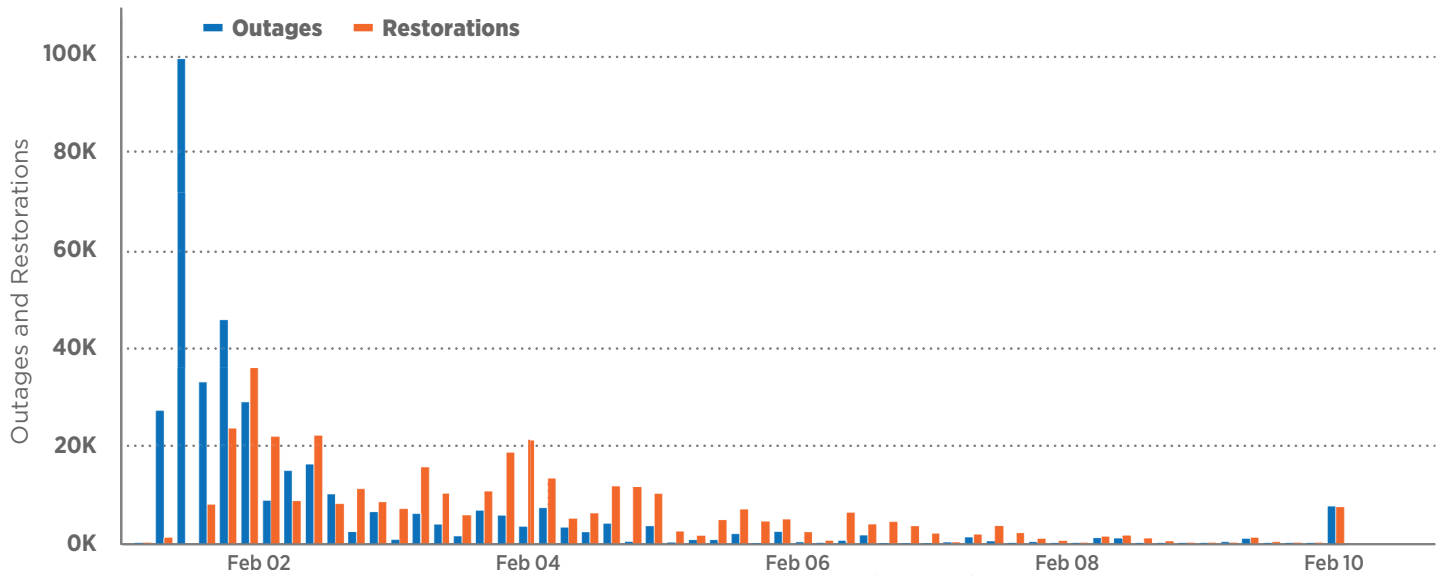
Before crews could begin repairs, they had to inspect equipment and assess the damage.

Hundreds of pounds of ice forced a communications tower to collapse, bringing down nearby power lines.



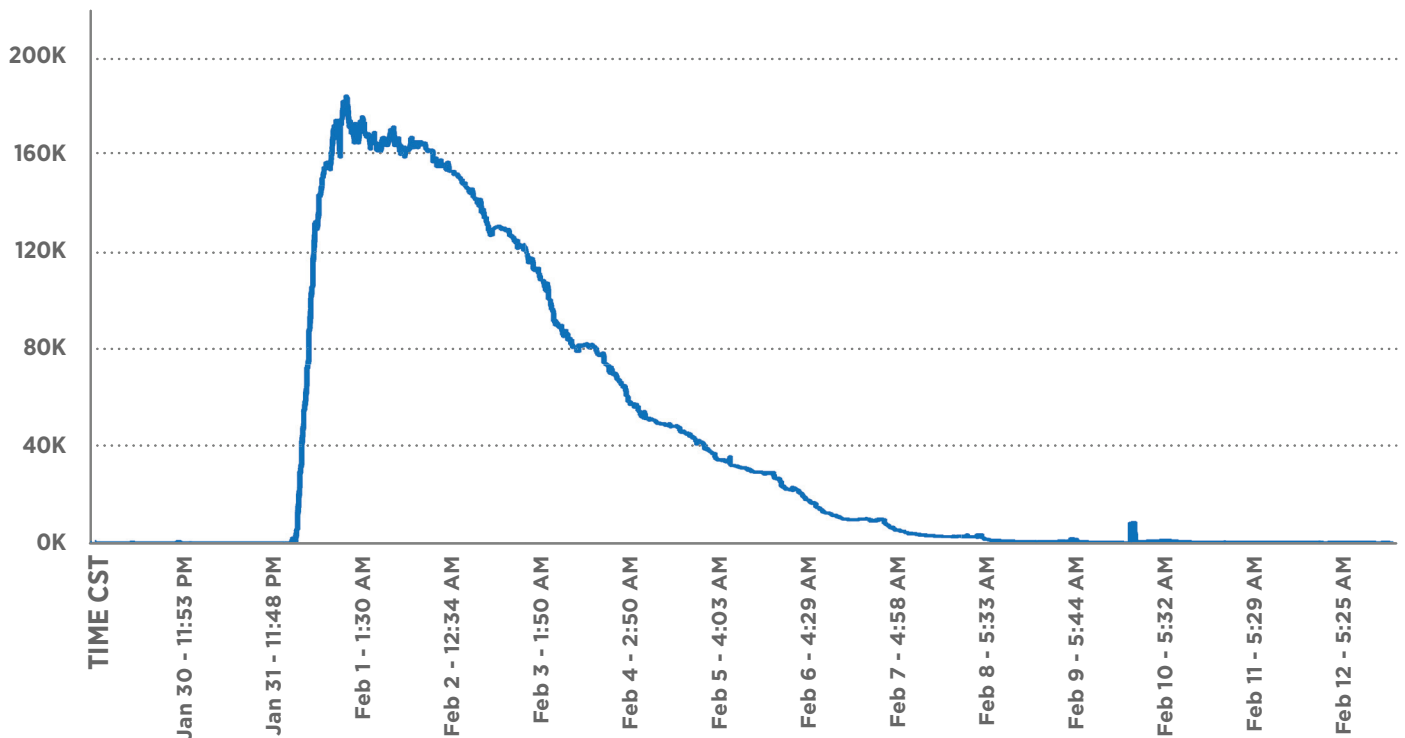


Repeated Outages on Restored Lines



Peak Conditions:

173,879 customer outages / 32% of customers



Observation 2 — Communication Systems & Customer Experience

Technology systems enable real-time communication and coordination within Austin Energy and between the utility and the community. This allows for efficient sharing of critical information, updates, and instructions, facilitating a well-coordinated response to the emergency.

Austin Energy's outage map is a valuable tool used to provide real-time information to customers and stakeholders during power outages or service interruptions. Its primary purpose is to enhance communication, transparency, and customer awareness by displaying outage-related data in an easy-to-understand visual format and providing outage notifications via text.

The Advanced Distribution Management System (ADMS) is an integrated software platform that provides real-time information — such as power outage data — and decision support for Austin Energy operations during normal and emergency events. As part of the Incident Command System, ADMS plays a critical role in helping Austin Energy respond to and manage outages.

While many Austin Energy technology systems operated as expected, there were challenges identified that are essential to improving the utility's emergency response:

Key Findings

- 1. Customer Outage Recording in the Outage Map:** The high volume of customers reporting outages through the outage map exceeded the map's timeout threshold. That means there were limitations capturing complete outage data from customer submissions. In some cases, customers received error messages without knowing if their message went through the system. This prompted customer concerns regarding the reporting of their outages and Austin Energy's awareness of the outage status.
- 2. Communicating Nested Outages:** A nested outage occurs when there is a smaller, more localized outage nested within a larger outage. In these instances, customers may receive a message that power has been restored to their area but still be without power. When this happens, Austin Energy asks customers to report that they are still experiencing an outage. Making repeated outage reports led to a frustrating and confusing experience for customers. During a multi-day event, this feels like an endless loop to customers, and the nested outage explanation is not clear or easy to understand.
- 3. Managing High Customer Demand on the Outage Reporting Platform:** The outage reporting platform experienced a surge in customer demand for premise-specific outage information, surpassing its configured volume. This presented challenges in displaying real-time outage data and increased call center customer inquiries.
- 4. Text Message Traffic Handling:** During Winter Storm Mara, many customers tried to report an outage or check an outage status via text message. The unprecedented volume of text message traffic during the event exceeded the capacity limit, resulting in error messages being sent to Austin Energy customers.
- 5. Unconfirmed Outages Showed Restored Prematurely:** A software bug occurred causing unconfirmed outages to show up as restored before the restoration was system verified if their upstream breaker opened (power interrupted) and closed (power restored).
- 6. Limited User Base for Complex Tools During Long-Duration Outage Events:** The outage map system and ADMS are highly complex, requiring trained personnel to use. Austin Energy relies on in-house and vendor expertise. During Winter Storm Mara, customer-facing groups within the utility required support from personnel knowledgeable of these systems, but because of limited resources, it was not readily available causing delays in communicating key information.



- 7. Inconsistency in Internal Understanding and Communication of ADMS Status:** Workgroups receiving information from ADMS to support customer inquiries required a more consistent understanding of the terms and components of ADMS. This inconsistency posed challenges in accurately communicating with customers, regulatory bodies, and elected officials, leading to misunderstandings and miscommunications.
- 8. Limited Access Rights Provided in ADMS:** The lack of permissions or access rights of support groups resulted in limited information in the ADMS system during storm mode. For example, the Key Accounts team was unable to remotely check meters for information and support large customers during the storm. This impacted the efficient management and accurate communication of outages during the event.
- 9. General Locations for Outages Displayed on Outage Map:** Because outages often affect several homes and businesses at a time, icons on the map may not appear directly over the exact location of a home or business. For any given outage, the outage symbol is placed at a center point on the map in relation to all customers affected by that outage. The outage may cover several blocks or even larger areas. While this information is available in the outage map FAQ, some customers did not realize this is how the outage map was intended to work.

Follow-Up Actions

Outage Map

- AI 2.1** - Increase the customer data roundtrip timeout limit from the outage map to Austin Energy.
- AI 2.2** - Evaluate the outage map platform for additional outage alerting capability.
- AI 2.3** - Reconfigure the outage map platform notification quota (traffic volume capacity) to max settings.
- AI 2.4** - Review any new outage map platform features list for optimization opportunities.
- AI 2.5** - Partner with outage map vendor, KUBRA, to identify visual solutions to improve customer experience.

WebDMD/WebCC (ADMS modules)

- AI 2.6** - Train additional personnel on ADMS’s modules to establish subject matter experts within essential sections of Incident Command.
- AI 2.7** - Ensure essential Austin Energy employees have the capability to access ADMS’s modules.

ADMS

- AI 2.8** - Evaluate ADMS integrations to optimize communications with interfacing systems, such as Mobile Workforce Management (a work management ticket system) and Customer Care & Billing (the customer information system).
- AI 2.9** - Apply ADMS updates to correct software bug causing unconfirmed outages to show up as restored prematurely.
- AI 2.10** - Create a glossary of ADMS system components and types of outages to assist customer-facing teams within the utility in their communications with customers.

Text Messaging

- AI 2.11** - Review and update workflows associated with restoration text alerts. Determine all the causes that can trigger the system to believe an outage is restored, and review operator processes that merge, close, or group outage incidents that could impact restoration alerts to customers.



Process

- AI 2.12** - Evaluate and improve upon people, process, and technology gaps related to end-to-end technical communication channel monitoring and analysis.
- AI 2.13** - Provide advance notification to key technology vendors prior to severe weather or anticipated long-duration outage events so they are available to monitor and adjust configurations if needed.
- AI 2.14** - Ensure data management and governance is established and reinforced across all lines of business.
- AI 2.15** - Review access requirements for internal teams and grant appropriate access to support emergency response.
- AI 2.16** - Review and update procedure to validate technology readiness for Incident Command activation.

Observation 3 - Public Communication

The Public Information team plays a crucial role in managing communications and distributing accurate and timely information to the public, especially during an emergency. The team's primary responsibilities include creating and delivering clear and concise emergency messages, acting as the primary point of contact for media, serving as official spokespersons, coordinating public briefings or news conferences, managing social media accounts and websites with real-time information, and promoting preparedness and safety campaigns before and after emergencies.

During emergency situations, much of the specific information on system conditions, recovery, and restoration that public-facing teams need to communicate with the public comes from the operations and field teams. The Public Information team shares what information is available, along with additional messaging that is helpful and useful to the public, through numerous channels.

Working alongside the Public Information team, Austin Energy's Local Government and Regulatory Affairs teams coordinate with local, state, and federal officials to provide timely and accurate updates regarding recovery and restoration efforts. This messaging closely aligns with the information the Public Information team compiles during an emergency and may include information of specific interest to those stakeholders.

During Winter Storm Mara, the Public Information team performed the following actions:

- Began sharing storm messaging starting Monday, January 30 through a news release, media interviews and social media updates.
- Conducted more than 300 TV, radio, and print interviews in English and Spanish.
- Shared more than 300 social media posts related to ongoing restoration and recovery efforts.
- Updated an Austin Energy dedicated web page daily with restoration and recovery information.
- Helped coordinate daily city-wide news conferences.
- Created and sent daily text messages to customers enrolled in Austin Energy's Outage Alert program who were without power.
- Sent daily emails to all customers with an email on file.
- Provided regular updates to the Communication and Public Information Office (CPIO), Homeland Security and Emergency Management (HSEM) and other City departments.
- Where feasible, provided emergency messaging in Spanish, Vietnamese, Simplified Chinese, Korean and Arabic.
- Participated in multiple community events to help those without power.



Sampling of Communications Messaging During Winter Storm Mara

ABOVE-GROUND ELECTRIC SERVICE

What's yours? What's ours?

Austin Energy maintains the wires and facilities that deliver electricity and the meters that measure electricity use. The graphic shows an above-ground residential electrical system and who is responsible for the various parts of it.

Austin Energy maintains the items in ORANGE. You maintain the items in YELLOW.

- SERVICE DROP:** Austin Energy repairs the wire that runs to your home, but we do not trim trees along the service drop. We will shut off the power at your request so trees can be trimmed safely.*
- POINT OF ATTACHMENT:** You are responsible for the anchor that attaches the service drop to your home.
- SERVICE ENTRANCE CABLE:** You are responsible for the wire that runs along the outside of your home into the meter and from the meter to your service panel or fuse box.
- METER:** Austin Energy owns the meter(s) that measures electricity use or solar production.
- METER BASE:** You are responsible for the metal box that houses the meter.
- SERVICE PANEL OR FUSE BOX:** You are responsible for the box(es), the circuit breakers or fuses, and all of the wiring in your home.
- SOLAR / BATTERY:** You are responsible for any solar equipment or home battery storage system.

*A fee will apply and wait times may vary.

The drawing above shows a standard residential electrical system and is provided for illustrative purposes only. For detailed information on this and other electrical system design types, please refer to the Austin Energy's Design Criteria Manual and Distribution Interconnection Guide, both accessible at austinenenergy.com/go/design.

If you plan to repair, replace or upgrade electrical equipment, please contact a licensed electrician.

City of Austin Utilities Customer Service:
512-494-9400 (Austin)
Email customer-care@austinenenergy.com

To report power outages, text **OUT** to 287846 or visit outagemap.austinenenergy.com.

Call 3-1-1 to get information and report problems. Call 8-1-1 before you dig!

© Austin Energy, a City of Austin program.

UNDERGROUND ELECTRIC SERVICE

What's yours? What's ours?

Austin Energy maintains the wires and facilities that deliver electricity and the meters that measure electricity use. The graphic shows an underground residential electrical system and who is responsible for the various parts of it.

Austin Energy maintains the items in ORANGE. You maintain the items in YELLOW.

- METER:** Austin Energy owns/maintains the meter(s) that measure electricity use or solar production.
- METER BASE:** You own/maintain the metal box that houses the meter (meter base).
- SERVICE PANEL OR FUSE BOX:** You are responsible for the box(es), the circuit breakers or fuses, and all of the wiring in your home.
- CUSTOMER CONDUIT:** You own/maintain the conduit from the meter base to where it enters the transformer.
- CABLE INSIDE CONDUIT:** Austin Energy owns/maintains the cable inside the conduit from the transformer to the meter base.
- TRANSFORMER:** Austin Energy owns/maintains the transformer mounted on the pad.
- AUSTIN ENERGY CONDUIT:** Austin Energy owns/maintains the conduit and cable from the transformer back to the source.
- SOLAR / BATTERY:** You are responsible for any solar equipment or home battery storage system.

The drawing above shows a standard residential electrical system and is provided for illustrative purposes only. For detailed information on this and other electrical system design types, please refer to the Austin Energy's Design Criteria Manual and Distribution Interconnection Guide, both accessible at austinenenergy.com/go/design.

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AUSTIN ENERGY OUTAGE EVENTS DUE TO TREES

You share a circuit with thousands of residents; whatever happens on the circuit happens to you.

- If a tree touches the power line in any way, this contact can create a power outage for anyone connected to this circuit.
- An outage event on the main line will cause power loss to the customers downstream from the event.
- In the situation shown here, a tree causing an additional outage closer to the home may not be detected until power is restored to the main line.
- Depending on the severity and cause of an outage, multiple crews may be dispatched to the source of the outage to restore power. However, crews may be delayed due to safety conditions such as weather, fire or equipment access.
- Larger weather-related events may spread restoration crews across a broad area, which can impact response times.

POWER GENERATION (Factory icon)

TRANSMISSION TOWER (Tower icon)

SUBSTATION (Box icon)

UTILITY POLE (Pole icon)

CREW IN FIELD (Truck icon)

HOME (House icon)

TREE (Tree icon)

STORM (Storm cloud icon)

BREAK OR SHORT CIRCUIT IN THE LINE (Lightning bolt icon)

Austin Energy takes each outage seriously, assessing the best way to restore power as quickly as possible. Austin Energy teams prioritize customer and work crew safety during any outage.

© 2023 Austin Energy

Sampling of Communications Messaging During Winter Storm Mara

Cold Load Pickup

When power is restored, circuits can become overloaded because of lights, electronics and thermostats left on prior to the outage. This is called **cold load pickup** and can cause a second outage. Customers currently without power can help us avoid cold load pickup by:

- Turning off their thermostats.
- Turning off or unplugging any fixtures or appliances.
- Only leaving on one light to indicate when the power is back on.

Recolección de Carga Eléctrica en Frío

Cuando se restablece la energía, los circuitos pueden sobrecargarse debido a que las luces, los dispositivos electrónicos y los termostatos se dejaron encendidos antes del apagón. Esto se llama recolección de carga eléctrica en Frío y puede causar una segunda interrupción. Los clientes que actualmente no tienen electricidad pueden ayudarnos a evitar la recolección de carga en Frío al:

- Apagando sus termostatos.
- Apagar o desenchufar cualquier accesorio o aparato.
- Dejando solo una luz para indicar cuando se vuelve a encender.

جمع الأحمال في وقت البرودة

عند استعادة تشغيل التيار الكهربائي، يمكن أن تصبح الدوائر محملة بشكل زائد بسبب المصابيح والإلكترونيات ومنظمات الحرارة التي تركت قبل الانقطاع. وهذا ما يُسمى **جمع الأحمال في وقت البرودة** ويمكن أن يتسبب في انقطاع ثانٍ. يمكن للعملاء الذين ليس لديهم طاقة حاليًا مساعدتنا في تجنب جمع الأحمال في وقت البرودة من خلال ما يلي:

- إيقاف تشغيل منظمات الحرارة الخاصة بهم.
- إيقاف أو فصل أي تركيبات أو أجهزة.
- يمكن ترك مصباح واحد فقط قيد التشغيل للإشارة إلى عودة التيار الكهربائي.

冷负荷启动

当电力恢复时，由于停电之前灯、电子设备和恒温器没有关闭，电路可能会过载。这被称为**冷负荷启动**，可能导致第二次停电。目前停电的客户可以通过以下方式帮助我们避免冷负荷启动：

- 关闭恒温器。
- 关闭所有固定装置或电器或拔掉它们的插头。
- 只留一盏灯不关上，以便电力恢复时可以及时察觉。

Don't FALL for the CALL!

Beware of winter storm scammers.

Is your neighbor's power back on, while yours is still out? Did you receive a message that your power is on, when it isn't?

You may have a nested outage.

That's when power is restored on a larger outage and some people regain power, but damage further down the line keeps power off for other customers. Maybe the transformer at the end of your block is fixed but the tree that fell on the power line by your home is preventing your power from coming back on.

Austin Energy is not aware of all nested outages, so it's important for you to let us know that your power is still out.

Report power outages by texting **OUT** to **287846**, online at outagemap.austinenergy.com, or by calling **512-322-9100**.

If you receive a text that your power is on, but it is not, text **OUT** in response.

Generator Safety Tips

Never fuel or run a generator indoors or in a garage.

AUSTIN ENERGY Customer Driven. Community Focused.™

NEVER touch a downed power line or a tree limb making contact with a downed power line.

Call **512-322-9100** to report a downed power line.

SLAM the DOOR on SCAMMERS

DO NOT LET UNKNOWN INDIVIDUALS IN YOUR HOME. IF YOU FEEL YOU ARE IN PERSONAL DANGER, CALL 911.

Reminder: Austin Energy and City of Austin crews have proper identification and are in marked vehicles.

NUNCA toque una línea eléctrica caída o una rama de árbol que haga contacto con una línea eléctrica caída.

Lláme al **512-322-9100** para reportar una línea eléctrica caída.

Consejo de seguridad para el uso de Generadores

Nunca ponga combustible ni encienda un generador en espacios cerrados o en un garaje.

AUSTIN ENERGY Customer Driven. Community Focused.™



Key Findings

1. **Timing of Customer Communications:** An initial news conference, customer emails, and proactive text messages (not the automatic text messages sent through the outage management platform alert system) should have been initiated earlier in the winter storm, providing the community with more prominent notifications of conditions. For example, the first city-wide news conference did not take place until the morning of the second day, Thursday, February 2. Austin Energy’s Public Information team began sending customer emails and proactive, status text messages on Friday, February 3.
2. **Communication and Coordination with Communications and Public Information Office:** Expectations for coordination with CPIO for a long-duration outage were not clearly defined. In a typical emergency situation, Austin Energy manages customer communications, regularly sharing updates and messaging with CPIO. At the start of this unprecedented event, the lack of initial alignment of those expectations led to inefficiencies in coordinated collaboration.
3. **Information for Elected Officials:** Elected officials have a unique need for information in response to constituent concerns. The lack of accurate ETRs provided additional challenges in providing these officials information to assist constituents. Additionally, the Local Government and Regulatory Affairs teams received many escalations and did not have a pre-identified single point of contact to obtain restoration status information.
4. **Collaboration with Restoration Operations for Accurate ETRs:** Austin Energy’s Public Information and Regulatory and Government Affairs teams require closer collaboration with Restoration Operations to ensure accurate and timely communication of system conditions and a systemwide estimated time of restoration to customers.
5. **Some Outage Alerts are Not Suitable for Long-Duration Outage Events:** Some automatic text messages sent through the outage management platform’s alert system did not fully align with the conditions of the winter storm, leaving customers dissatisfied with the experience and information.
6. **Customer Care Support on Social Media Messaging:** A follow-up action from the 2021 Winter Storm Uri AAR was to “Coordinate with Customer Care and provide a pool of trained representatives to help respond to social media messages during an emergency.” This item was marked Complete in Q2 2022, but it was not implemented during Winter Storm Mara. Due to the severity of the ice storm, there was a lack of Customer Care resources available to support this new role.

Follow-Up Actions

- AI 3.1** - Align with City leadership expectations for news conference protocols in the early stages of an emergency.
- AI 3.2** - Participate in the City’s communication plan efforts and drills to improve preparedness and collaboration with CPIO and other stakeholders involved in emergency response.
- AI 3.3** - Designate a single point of contact as part of Incident Command to focus on elected official inquiries, district-specific situational awareness, and escalations.
- AI 3.4** - Enhance coordination mechanisms with Restoration Operations so they can provide the Austin Energy Public Information team with timely and accurate information from the field and accurate systemwide estimated restoration times for communication with the public.
- AI 3.5** - Review processes and messaging for Outage Alerts sent during long-duration outages.
- AI 3.6** - Establish oversight and ownership of the outage map platform messaging tools, including administrative access, editing, broadcast, and reporting.
- AI 3.7** - Develop messaging and templates specific to long-duration outages. This will allow for quicker dissemination of information, particularly direct customer emails and text messages.
- AI 3.8** - Re-evaluate coordination with Customer Care to help respond to social media messages during an emergency.

Observation 4 - Customer Care

During extreme weather, the Customer Care team plays a critical role in ensuring customers receive support, information, and assistance. Their primary focus is on addressing customer needs, managing inquiries, and providing timely and accurate updates. During Winter Storm Mara, Austin Energy's Customer Care teams received 370,000 calls and conducted wellness checks for medically vulnerable customers to ensure their safety. While Customer Care played a key role in Austin Energy's emergency response, there were areas of improvement identified:

Key Findings

- 1. Managing Inquiries and Information Flow:** Inquiries for information came through multiple teams throughout the event: the Public Information team, utility executives, Regulatory Affairs, and the Austin/Travis County Emergency Operations Center. Without a clear path to manage these inquiries, the requests often spanned multiple groups for resolution. This led to confusion of priorities, information delays and gaps in communication.
- 2. Issues with Customer Information System Data:** In some cases, the outage map platform lacked complete customer address information, such as street identifiers like East or West, causing customers to receive text messages with missing data.
- 3. Wellness Check Expectations:** Customers expected additional support like hot meals and chargers from staff conducting wellness checks. This may be an opportunity to partner with other City departments and nonprofits to provide needed community services.
- 4. Need for Improved Shift Sharing and Essential Worker Information Among Customer Care Section:** The system used to share information between shifts and determine staffing needs for outage calls was insufficient. This led to challenges for incoming Customer Care support staff assigned to work outage calls.
- 5. Lack of Pre-Established Plans for the Outreach Bus:** A neighboring utility loaned Austin Energy a bus for use at community events. The bus provides mobile charging ports for use by those who are experiencing power outages and creates a useful space for customers to engage with the utility. However, the purpose of and locations for the bus were not established in advance, emphasizing the need for pre-event agreements and planning.
- 6. Insufficient Staff Assignment:** Following normal protocol, Utility Contact Center (UCC) staff created new escalation cases when a customer called in with a concern that would be handled by the Customer Solutions team. However, the Customer Solutions team was not working escalations during Winter Storm Mara because they shifted to support UCC by answering customer calls. This added to the backlog of cases and may have diverted some calls that would have been better handled as supervisor escalations.

Follow-Up Actions

- AI 4.1** - Enhance the inbound customer inquiry and escalation process for storm restoration. Establish a single point of contact and appropriate tracking mechanism.
- AI 4.2** - Ensure essential customer information, such as a customer's full address (including all identifiers like East, West, etc.), is not missing from the outage map platform database.
- AI 4.3** - Evaluate and improve coordination regarding the Medically Vulnerable resident pre-planning process.
- AI 4.4** - Evaluate the Medically Vulnerable Registry (MVR) wellness check process for collaboration opportunities with other City departments. For example, explore the ability to loan out charging devices to registered MVR customers that can power life-support equipment for approximately one day or a few small devices (phone, laptop, TV, fan) for several days.

- AI 4.5** - Evaluate the use of an outreach bus or similar resources for long-duration outage events. Establish agreements, locations, and deployment plans as needed.
- AI 4.6** - Conduct outage call refresher training for essential workers and improve agent support.
- AI 4.7** - Evaluate and optimize Utility Call Center escalation case creation during emergency events.
- AI 4.8** - Ensure all Customer Support Service personnel who will support Incident Command during emergency response have completed Incident Command trainings.
- AI 4.9** - Solicit customer feedback and suggestions for continuous improvement regarding long-duration outage events, and establish a plan to address concerns, as applicable.



The Customer Care team staffed community events and charging stations, helping those without power and providing financial assistance information.



EMERGENCY PREPAREDNESS

Emergency preparedness is of utmost importance for Austin Energy. Being well-prepared for emergencies is essential to safeguard public safety, maintain reliable service, and minimize the impact of emergency events. Austin Energy recognizes areas for improvement in assessing the storm impact, preparing its response and conducting preparedness drills.

Observation 5 - Incident Command Operations

Austin Energy follows the National Incident Management System when it comes to emergency preparedness and response. This provides the utility with a consistent structure and processes, including established roles, operational sections, and coordination protocols. In addition, Incident Command personnel are required to complete trainings and participate in annual exercises to prepare for emergencies. During Winter Storm Mara, Austin Energy activated more than 200 employees (not including field crews or mutual aid personnel) in support of emergency response activities. However, Austin Energy identified areas to improve its overall preparedness and response:

Key Findings

- 1. Trained Personnel in Incident Command Roles:** Some staff lacked sufficient knowledge and experience in the Incident Command role they were assigned. This affected efficiency in decision-making and operations.
- 2. Approach Did Not Match the Event:** Austin Energy was prepared for a short-duration outage event, like what the utility experiences during a severe thunderstorm with extreme winds. This event proved to have vastly different challenges. For example, ice and trees continued to affect the electric system after the weather passed through the area, and the extent of damage to individual customers and equipment created longer timelines to bring power back to customers. Having to adjust the restoration process to match these conditions while making repairs created inefficiencies in Austin Energy's response.
- 3. Training Scenarios:** Emergency preparedness drills did not simulate long-duration outage emergencies.
- 4. Role Clarity Around Essential Employee Status:** Some personnel were not aware they are considered essential employees when Incident Command is activated.
- 5. Burnout and Mental Fatigue:** Extended emergencies that require prolonged response efforts, like Winter Storm Mara, have a significant impact on staff. Working long hours under high-pressure conditions led to physical and mental exhaustion, emotional distress, and burnout. The prolonged and intense nature of the response highlighted the importance of increased staffing levels to ensure adequate rest and recovery to address the safety and well-being of personnel and to reduce errors and safety risks during such events.

Follow-Up Actions

- AI 5.1** - Re-evaluate Incident Command policy and procedures and focus on employee preparedness, emergency response procedures, and training such as conducting dry runs, drills, and exercises.
- AI 5.2** - Evaluate activation procedures for gaps and provide refresher training to ensure all Incident Command staff are well trained. This will include conducting dry runs, drills, and exercises.
- AI 5.3** - Collaborate with peer utilities to discuss best practices and implement ways to improve emergency response.
- AI 5.4** - Evaluate the essential status of all Austin Energy employees during emergency response and establish appropriate training and communication.
- AI 5.5** - Optimize shifts for each Incident Command section to ensure support, safety, and wellness.



During emergencies, Austin Energy activates its Incident Command to manage all the areas required to resolve the situation as safely and quickly as possible.



Observation 6 - Emergency Management Administration

Based on weather forecasts, Austin Energy's Emergency Management team activated Incident Command on Tuesday, January 31, in preparation for the storm. Incident Command provided a centralized hub for emergency response activities including real-time situational awareness, resource tracking, and updates every four hours for decision-making. However, Austin Energy recognizes several areas for improvement:

Key Findings

- 1. Dedicated Emergency Management Personnel:** Austin Energy had only one full-time employee dedicated to emergency management at the time of Winter Storm Mara, which is insufficient given the size of the utility and the severity of the storm.
- 2. Documentation of Emergency Operations Plan:** Portions of Austin Energy's Emergency Operations Plan (EOP) lacked updated documentation to support storm response and operational practices.

Follow-Up Actions

- AI 6.1** - Establish and hire a director-level Emergency Management position to lead the Austin Energy Emergency Management team.
- AI 6.2** - Hire additional personnel for the Emergency Management team to support utility preparedness.
- AI 6.3** - Review and update Austin Energy Operations Plans to reflect changes and current practices.



Austin Energy's Incident Command is staffed 24/7 when there is an emergency situation.

STORM RESPONSE & COORDINATION

Storm response and coordination play a vital role in Austin Energy’s restoration efforts, requiring teamwork and effective communication among multiple teams. Austin Energy acknowledges several areas in need of improvement and is fully committed to addressing the following observations. This is how Austin Energy will enhance its storm response and coordination capabilities to better support customers and the community.



Observation 7 - Damage Assessment

During the ice storm, a significant number of damaged trees and branches created hazardous conditions including fallen power lines, large debris in roadways, and weakened tree branches overhead. Austin Energy mobilized patrollers to assess the damage and prioritize the safety of crews as an initial approach.

Austin Energy identified areas of improvement in the damage assessment process:

Key Findings

1. **Incomplete Damage Assessment:** Austin Energy patrollers did not perform an effective damage assessment because of unclear expectations on what and how to report back to Incident Command and a lack of established procedures. This meant Austin Energy did not have the information needed to establish an accurate systemwide estimated time of restoration, such as severity of damage at each location.
2. **Experience with ADMS Field Client Software:** Some patrollers involved in the operation were not thoroughly experienced with the Field Client software, the ADMS module that allows field personnel to provide updated information on field conditions. This impacted their ability to efficiently carry out their tasks. For example, some sections of circuits were energized in the field but showed de-energized in the software. Once confirming this, patrollers should have made updates in ADMS Field Client to reflect the current field conditions by closing out incidents to indicate they were resolved.

Follow-Up Actions

- AI 7.1** - Establish and train on a damage assessment process for emergency response.
- AI 7.2** - Re-evaluate how Austin Energy uses patrollers during these events to maximize productivity and train them accordingly.
- AI 7.3** - Retrain patrollers on updating ADMS Field Client software properly and establish a verification procedure.

Observation 8 - Restoration Coordination

Austin Energy's Restoration Operations team mobilized additional personnel and restored a significant number of outages daily. However, Austin Energy recognizes several areas of improvement related to coordination that impacted the restoration:

Key Findings

- 1. Challenges with Repeat Outages:** The process and prioritization of restoration became complicated when Austin Energy restored areas that subsequently experienced repeat outages for various reasons. For example, branches continued to break as trees weakened over time. This created difficulties in tracking and managing the restoration efforts effectively.
- 2. Updating Tickets in the Field:** Some crews did not update and close out tickets as assignments were completed in the field. This caused dispatchers to believe these tickets were not completed and reassigned the work. This was due, in part, to a need for additional training.
- 3. Dispatching Tools and Communication:** Service dispatch and service crews used two different dispatching tools, ADMS Field Client and Mobile Workforce Management, leading to miscommunications and inefficiencies in restoration activities.
- 4. Limited Access to Electronic Records System:** Some field personnel removed meters and reinstalled them without proper tracking in the electronic records system. In some cases, the field personnel did not have access to the electronic systems, and they did not always write down the outgoing meter read so the customer could be billed properly. At other times, paper-based methods used for documentation created inconsistencies. Customer-Sided Repairs: There is no automated way of determining whether single outages are due to issues on the customer side or the utility side of the meter without dispatching field crews. As a result, creating the list of customers needing repair is a manual and ever-changing process. Further, it is not always known whether customers need to initiate repair work on their side until after the larger outages are restored. This contributes to single outages being the last to be restored.

Follow-Up Actions

- AI 8.1** - Re-evaluate storm prioritization process and optimize restoration criteria in phases to support emergency response.
- AI 8.2** - Conduct ADMS Field Client refresher training.
- AI 8.3** - Retrain field staff on updating ADMS properly, and establish a verification procedure.
- AI 8.4** - Evaluate and establish a process to ensure ADMS cross references with Mobile Workforce Management incidents.
- AI 8.5** - Establish a meter removal and installation process for mutual aid personnel and those without access to electronic record systems.
- AI 8.6** - Establish a single-ticket restoration process during emergency response events, and establish a standardized tracking mechanism.

Observation 9 - Response Planning

Austin Energy's Incident Command Planning team, specifically the Documentation unit, maintained accurate documentation of incident response activities. This included detailed incident summaries and progress reports, which provided a comprehensive record of response efforts. Accurate documentation is essential for tracking progress, planning for the next operational period, evaluating effectiveness, and facilitating post-incident analysis. Additionally, the Planning Analysis unit's data analysis enabled Incident Command to gain insights into the incident's scope and impact as more data became available. This facilitated decision-making and response planning.

While Austin Energy provided progress reporting and analysis, there were areas of opportunity identified related to response planning:

Key Findings

- 1. Shortage of Subject Matter Experts (SMEs):** Because of employee turnover and insufficient training, there were not enough transmission, substation, and distribution SMEs available during shifts to adequately monitor and analyze the evolving event. Historically, Austin Energy's Planning team included a more diverse mix of subject matter experts from the Austin Energy Engineering workgroups.
- 2. Reports Not Sent to Documentation Unit:** Section Chiefs and Branch Directors did not always email their report-out to the Documentation unit after briefings, which delayed the communication to the larger team as the Documentation unit worked to gather information following briefing calls.
- 3. Communication on Assigned Role:** Some personnel were unaware of their assignments or role within the Planning units, indicating a breakdown in pre-event planning and affecting their ability to fulfill responsibilities.

Follow-Up Actions

- AI 9.1** - Add more subject matter experts in the Planning section to support Incident Command and operations with engineering expertise.
- AI 9.2** - Establish a mechanism to communicate the documentation reporting process to all sections prior to the event.
- AI 9.3** - Update the Planning section staffing chart to reflect active/current team members and establish a review and notification mechanism.

Observation 10 - Tree Trimming/Vegetation Management Coordination

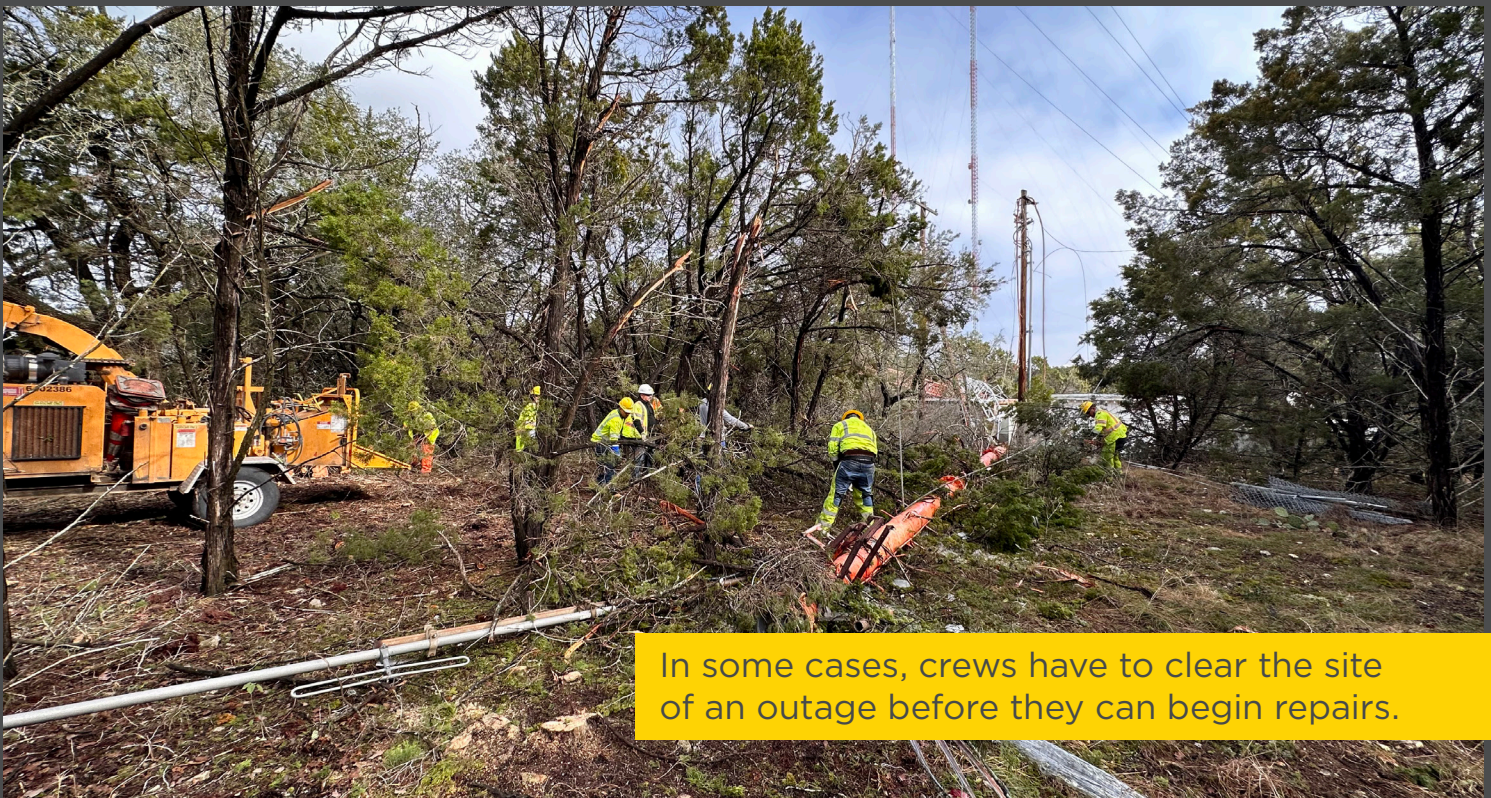
Ice accumulation adds significant weight to power lines and tree branches, bringing vegetation in contact with wires and breaking poles and cross-arms. According to Texas A&M Forest Service, Winter Storm Mara affected about 10.5 million trees. These conditions created widespread outages, service fluctuations, and hazardous conditions for Austin Energy field crews to manage both during and after the storm. Winter Storm Mara highlighted areas of improvement relating to tree trimming/vegetation management coordination:

Key Findings

- 1. Coordinating Tree Crews with Line Crews:** Austin Energy initially assigned more tree trimming crews than necessary to deploy with line crews working to repair fully de-energized circuits. This delayed repairs on circuits with only partial outages.
- 2. Tracking Tree Crews:** When tree crews were assigned to work with line crews on de-energized circuits, the line crews did not track the properties tree crews worked. This led to insufficient knowledge of which areas had been cleared.
- 3. Challenges with Tree Limb on Wire (TLOW) Tickets:** TLOW tickets normally only require tree trimming crews to resolve the issue. Some TLOW tickets during the February winter storm, though, also involved outages with wires down — particularly service drops, the wire connecting buildings with the electric system. When line crew personnel were not available to address these issues, the vegetation planner had to stay on-site until it was made safe, resulting in delays for the planner in addressing other TLOW tickets.
- 4. Tree Crews on Standby:** As more tree crews were activated to respond to storm conditions, it was a challenge to manage and coordinate their deployment throughout the service area and make full, efficient use of their expertise.
- 5. Tree Trimming Process and Outages:** Historical tree trimming clearance standards (8 feet for fast growing species and 4 feet for slow growing species) may have contributed to the number of outages and hazards experienced during Winter Storm Mara. Austin Energy returned to industry standards (15 feet for fast growing species and 10 feet for slow growing species) several years ago, but it takes time and sufficient crews to bring the entire system up to the new standards.
- 6. Outages Caused by Vegetation and Communications Lines:** Communication carriers often lease space on Austin Energy poles to attach communication lines (for example, cable and internet) under electric lines. Austin's Utility Criteria Manual makes communication carriers responsible for all tree trimming necessary for the safe and reliable installation, use, and maintenance of their attachments and to avoid stress on poles caused by contact between tree limbs and attachments. However, during Winter Storm Mara, broken branches and uprooted trees coming into contact with communications lines often added enough weight to break poles and pull down power lines.
- 7. Responsibility for Debris Removal:** Some customers expected Austin Energy Vegetation Management crews to remove debris from their yards and place it on the curb in front of their houses. These are customers' trees, and that work is the homeowner's responsibility. Once debris is placed on the curb, Austin Resource Recovery or other jurisdictional entities were responsible for removal.

Follow-Up Actions

- AI 10.1** - Improve tree trimming coordination processes with restoration operations.
- AI 10.2** - Hire more tree trimming/vegetation management personnel for regular vegetation preventative maintenance work.
- AI 10.3** - Participate in the City Auditor's evaluation of Austin Energy's tree trimming/vegetation management program.
- AI 10.4** - Describe the potential risks of vegetation near communication lines to carrier companies and communicate the need for them to trim.
- AI 10.5** - Define and communicate Austin Energy's responsibilities versus other department and entity responsibilities for debris removal from customer properties.





A mutual aid crew with Bird Electric hand-carried and manually set a new utility pole on a steep hillside. Utility poles can weigh anywhere from 800 to 4,000 pounds.

Observation 11 - Mutual Aid Efforts

Mutual aid allows utilities to collaborate and share resources, personnel, and expertise to enhance response capabilities and expedite power restoration efforts during emergencies. Austin Energy requested mutual aid support on the morning of Wednesday, February 1, the first day of the ice storm. The first round of mutual aid personnel arrived later that day. In total, 455 mutual aid crews arrived to assist with outage restoration. This coordination and deployment of additional resources greatly assisted Austin Energy Operations teams in the restoration efforts. Mutual aid crews remained until Saturday, February 11, the final day of storm outage restoration, and, notably, they performed all their work without any recordable safety incidents.

Austin Energy identified areas of opportunities within the Mutual Aid program:

Key Findings

- 1. Development and Refresh of Mutual Aid Agreements and Emergency Services Contracts:** While Austin Energy had existing mutual aid agreements through industry association group participation, many were signed several years ago and needed additional terms and conditions before being ready for use during Winter Storm Mara. Austin Energy also used the opportunity to sign contracts with emergency electric service companies to support restoration. However, Austin Energy lacks an established and recurring process for developing, executing, and updating mutual aid and emergency services contracts as part of its emergency management preparedness procedures.
- 2. Facilities for Mutual Aid Coordination:** It was challenging to provide suitable staging facilities to accommodate the overflow of mutual aid crews, vehicles and equipment that exceeded existing service center space. Historically, Austin Energy has been able to support employees and contractors through existing service centers, but it did not have direct experience setting up a large staging area for mutual aid support. In managing this issue, Austin Energy successfully worked with the Texas Division of Emergency Management, who accommodated a large number of crews at a Texas Department of Transportation facility.
- 3. Established Process for Managing Mutual Aid Agreements:** Austin Energy lacks a well-defined approach for using and managing mutual aid agreements.
- 4. Demobilizing Mutual Aid:** There was a large amount of work associated with closing out mutual aid activities after Incident Command was deactivated, but there was no clear process to establish who was responsible for closing out contracts, reviewing invoices, and drafting approval documents.
- 5. Mutual Aid/Emergency Services Agreement Terms and Conditions:** The mutual aid agreements and emergency electrical services contracts used during Winter Storm Mara had the potential to expose Austin Energy to financial risk. Appropriate terms and conditions related to working on electric infrastructure take time to establish and, ideally, agreements are executed well before an emergency event.

Follow-Up Actions

- AI 11.1** - Establish and update mutual aid agreements and Emergency Electrical Services Contracts as well as a process for maintaining them.
- AI 11.2** - Develop and maintain agreements for scalable, offsite staging areas for emergency management operations including facilities, yards, and parking lots as required.
- AI 11.3** - Establish contracts for storm contract services as well as a process for billing, communicating objectives, and standardizing close-out requirements for contracts.
- AI 11.4** - Define roles and responsibilities for mutual aid demobilization activities.

Observation 12 - Collaboration with City of Austin Departments and Other Governmental Entities

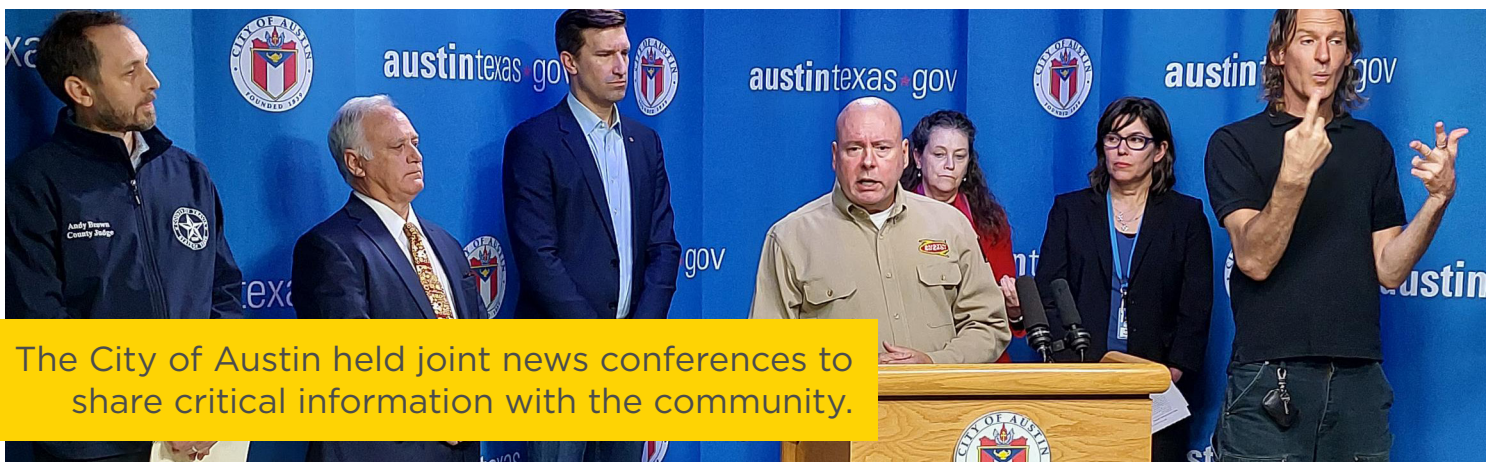
During the storm, Austin Energy’s Emergency Operations Center (EOC) Liaison Officer team coordinated and facilitated the flow of information with the Austin/Travis County Emergency Operations Center and other agencies that were involved in emergency response activities. A member of Austin Energy’s EOC Liaison Officer team is stationed at the Combined Transportation, Emergency and Communications Center (CTECC) for the duration of the City’s Incident Command activation. The AAR identified opportunities to improve coordination, communication, and response with EOC and other City departments:

Key Findings

1. **Insufficient Process and Tool for Coordinating Requests:** Austin Energy’s EOC Liaison Officer team faced challenges coordinating the high volume of requests received from other EOC representatives through the WebEOC portal. There was a need for a process or tool to manage these requests with Austin Energy Incident Command personnel and prioritize them efficiently.
2. **Insufficient Information about Traffic Signals and Backup Power Systems:** There was a lack of clear information between Austin Energy and Transportation Public Works crews regarding the equipment and power sources for traffic signals. Crews arrived at pole locations and had to conduct field research to identify power source locations, leading to delays in addressing issues.
3. **Threats and Acts of Violence:** Austin Energy crews experienced threats and acts of violence that posed a risk to crew safety and delayed outage restoration activity. Austin Energy routed these reports through Incident Command and the EOC, requesting law enforcement to dispatch officers. Due to various constraints, including resource availability and jurisdictional uncertainties, there were delays in dispatching first responders.

Follow-Up Actions

- AI 12.1 -** Develop a better process for Liaisons to obtain and share status updates with Austin Energy Incident Command personnel on EOC requests.
- AI 12.2 -** Optimize collaboration between Austin Energy and Transportation Public Works (TPW) to mitigate the impacts of power outages on traffic signal operations. TPW is identifying and mapping power source pole locations to expedite the coordination between Austin Energy and TPW, and power restoration to signal infrastructure.
- AI 12.3 -** Work with the law enforcement entities to revisit the best way to obtain support for threats and acts of violence against Austin Energy employees during restoration activities.



The City of Austin held joint news conferences to share critical information with the community.



Managing resources and equipment is important in getting through an emergency. When Austin Energy brought in mutual aid crews, the utility had to find areas to stage vehicles.



Observation 13 - Logistics Coordination & Supply Chain Management

Austin Energy's Logistics section serves an important function during Incident Command activations. This team provided meals and lodging for Austin Energy, contractor, and mutual aid personnel. Logistics also coordinated fleet services, including repairs, fueling cards, and backup vehicles. The team had materials on hand and access to inventory to support restoration operations. Despite many logistical and supply chain successes, Austin Energy identified areas of opportunities within these areas:

Key Findings

- 1. Insufficient Emergency Supplier/Vendor Agreements:** Austin Energy does not have pre-identified emergency vendors and agreements for necessary supplies such as fuel.
- 2. Challenges with Meal Logistics:** In some instances, staff did not receive meals or received meals late. The Logistics team did not always receive accurate crew counts or locations with sufficient time to coordinate with food vendors.
- 3. Challenges with Hotel Accommodations:** Austin Energy did not secure hotel rooms in time for some staff to receive room assignments by the end of their first shift. At times, Austin Energy had difficulty securing suitable accommodations for personnel.
- 4. Need for Laundry Facilities at Power Plants/Service Centers:** Austin Energy does not have washers and dryers or hookups at the power plants and service centers where personnel sequester during emergency events and long-duration outages.
- 5. Backup Generators for Austin Energy Facilities:** In some instances, backup generators at Austin Energy facilities did not start up as expected when they lost power. Ensuring key facilities have functioning backup power is crucial for continuous operations and safely restoring power.

Follow-Up Actions

- AI 13.1** - Identify suppliers/vendors capable of meeting service demands and establish agreements.
- AI 13.2** - Optimize the catering service procurement and coordination process.
- AI 13.3** - Optimize the lodging procurement and coordination process.
- AI 13.4** - Re-evaluate the identification process and tracking system requirements to manage, and coordinate logistic services during emergency response.
- AI 13.5** - Improve Incident Command sequester support during long-duration outage events.
- AI 13.6** - Implement third-party review of Austin Energy critical facility backup generators, and establish a maintenance plan for fuel testing.



From making sure crews are fed to gathering additional equipment, responding to an emergency is a team effort.





Observation 14 - Financial Management

Austin Energy's Finance and Administration section tracked and reported expenses including costs related to personnel, equipment, supplies, contracts, and other resources; provided cost estimations to aid in resource allocation and decision-making; allocated financial resources to various response priorities; sought reimbursement from federal and state sources; and provided procurement and contract oversight. Austin Energy ensured financial transactions were conducted in accordance with established policies and regulations, maintaining the integrity of the incident response efforts. Austin Energy identified improvement opportunities within these areas:

Key Findings

- 1. Challenges with ProCard Readiness:** There were Emergency ProCard holders that were not available and some Emergency ProCard holders had not picked up their renewed card. There was no established process to increase spending limits when needed. Further, some key personnel in the Technology section did not obtain Emergency ProCards after their previous counterparts departed from Austin Energy.
- 2. Lack of Documented Process:** Some Emergency ProCard holders did not follow established protocol for managing transactions, making it difficult to track lodging requirements and burn rates. Some failed to keep invoices and receipts.
- 3. Unable to Track Contractor Work Dates:** The Contractor Work Reporting (CWR) module in Maximo tracks work by service period not by a daily date entry. This required Finance and Administration personnel to separately collect and combine contractor timesheets with the CWR reports.
- 4. Emergency Work Time Coding:** City of Austin personnel activated emergency time codes after many exempt employees who worked the storm already reported their time. This resulted in extra administrative work for employees, managers, and timekeepers.

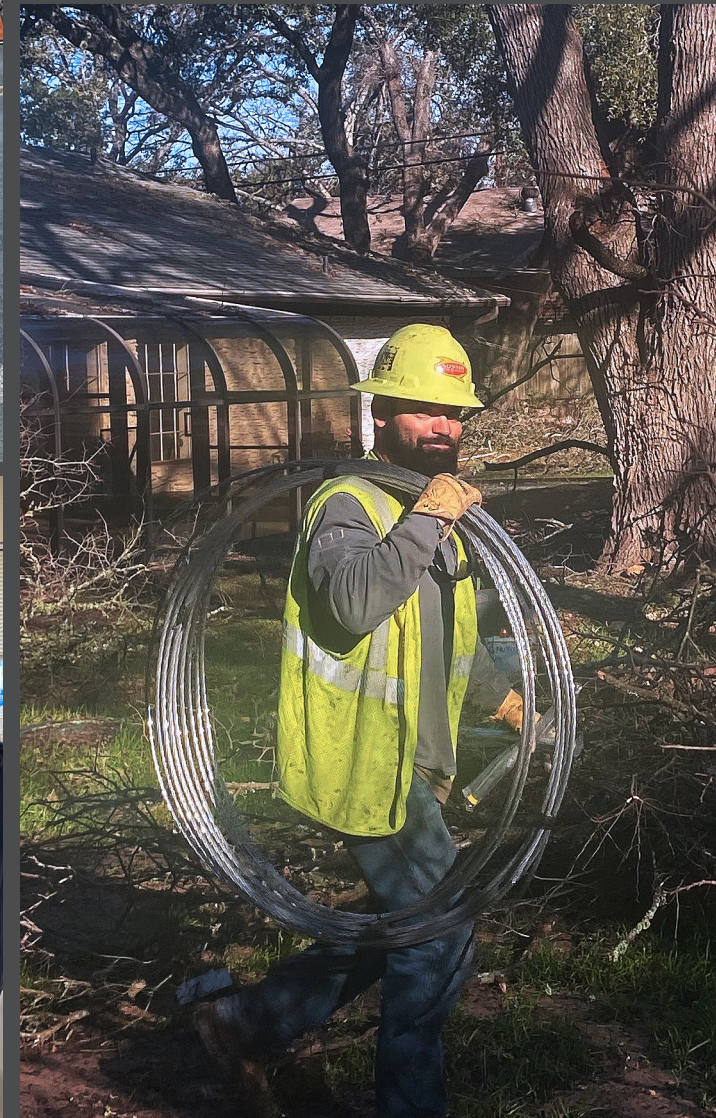
Follow-Up Actions

- AI 14.1** - Establish an Emergency ProCard Readiness Process.
- AI 14.2** - Establish an Emergency ProCard Incident Command Process.
- AI 14.3** - Establish a protocol to send out reminders about mandatory backup documentation for purchases during emergency events.
- AI 14.4** - Ensure essential and designated response personnel have Emergency ProCards.
- AI 14.5** - Evaluate and modify the Contractor Work Reporting module in Maximo to require work to be entered by date instead of service period.
- AI 14.6** - Establish event time code accountability.
- AI 14.7** - Establish an Event Accounting Codes Process.



Austin Energy and CPS Energy staff met after the February 2023 winter storm to discuss best practices and improve response.

A focus on safety, planning, and repairs was how Austin Energy restored power after Winter Storm Mara.



V. CONCLUSION

Austin Energy acknowledges the impact extended outages have on our customers and community. The utility deeply regrets the hardships and disruptions caused during this challenging time. Austin Energy failed to meet customers' expectations, and for that, the utility sincerely apologizes. The community's patience and understanding has been commendable, and Austin Energy expresses its sincerest gratitude.

With extreme weather occurring more frequently, power outages are inevitable. While Austin Energy cannot eliminate the possibility of long-duration outage events, the utility must work to minimize the impact to customers and provide better information in a more timely manner.

The comprehensive evaluation and analysis conducted for this After Action Report has provided valuable insights into the strengths and weaknesses of Austin Energy's response efforts. It identified key findings and areas for improvement, captured valuable lessons learned, and highlighted targeted strategies to ensure a more resilient and effective response in the face of future ice storms or other types of extreme events.

Throughout this AAR, Austin Energy recognizes the importance of proactive planning and preparedness. The ice storm presented unique challenges, testing the utility's infrastructure, response capabilities, and coordination efforts. Austin Energy will continue to work toward comprehensive risk assessments, refined emergency response plans, and enhanced communication strategies. These measures will enable Austin Energy to anticipate and adapt to the specific challenges posed by ice storms and other long-duration outage events, improving the overall response efficiency.

Another key takeaway from this AAR is the significance of collaboration and coordination. Austin Energy appreciates the support and partnership of other City of Austin departments, emergency management agencies, and neighboring utilities during the ice storm response. The utility will continue to foster and strengthen these relationships to facilitate swift restoration, mutual aid, and shared resources during future events.

Ultimately, the AAR serves as a roadmap for change and improvement within Austin Energy. The insights gained from this AAR are integral to Austin Energy's ongoing efforts to enhance its preparedness, response, and recovery capabilities. With this completed report, the utility now turns toward the implementation process for each action item listed in the previous sections. As Austin Energy moves forward, it will remain transparent, accountable, and focused on providing the highest level of service to our valued customers.

In addition to the immediate actions identified in Section III of this report (internal emergency management leadership, long-duration outage best practices, outage map improvements, improved communication planning, vegetation management contracts, and undergrounding feasibility study), Austin Energy will proceed as swiftly as possible on follow-up actions that prioritize improved customer experience, enhanced emergency preparedness, storm response and coordination, and mutual aid efforts that will have the greatest possible impact coming into winter of 2024. In establishing that accountability, Austin Energy will provide written, quarterly updates on all actions completed or operationalized.

All these efforts will help navigate future challenges with increased resilience and ensure that power is restored to the community as quickly as possible.

APPENDIX

METHODOLOGY

After-Action Review Process Overview

Austin Energy's Corporate Quality Services team led the coordination of a five-step After-Action Review process, which aimed to provide a comprehensive analysis of the event and identify areas for improvement.

Corporate Quality Services is an internal continuous improvement team within Austin Energy dedicated to improving processes, developing systems, mitigating risks, and increasing quality throughout the utility. Having a deep understanding of Austin Energy's operations, processes, and organizational structure and expertise in utility-related areas, Corporate Quality Services provides unbiased assessments and recommendations to identify and implement areas for improvement.

In addition to the internal process, Austin Energy worked with third-party organizations to review the method and provide oversight and feedback. One organization — NSAI, Inc. — performed an audit of the After-Action Review process. NSAI, or National Standards Authority of Ireland, specializes in standards and certifications around Quality Management Systems, giving them the ability to evaluate Austin Energy's After-Action Review. Based on their analysis, the auditor determined Austin Energy's process was effective in highlighting recommendations and areas of improvement.

The five-step process phases are:

- Plan
- Discover
- Analyze
- Improve
- Report

The Plan phase. The scope of the plan phase encompassed all relevant aspects of Austin Energy's emergency response to the Winter Storm Mara event. Gathering documentation and reports related to the event was a crucial part of this phase, as it allowed Austin Energy to have an overall understanding of the incident. Additionally, internal stakeholders such as Incident Command teams and Austin Energy leadership were engaged to ensure key individuals and teams were included in the review process. In addition, external stakeholders were identified, and their perspectives were considered. This included considering comments and questions from City Council, feedback from the Electric Utility Commission, and input from mutual aid personnel.

The Discover phase. This phase involved gathering information including General Work Processes, Emergency Operations Plans (EOP), incident logs, critical questions from key stakeholders such as City Council, and lessons learned from previous storms.

The Analyze phase. This phase involved analyzing the data gathered and identifying underlying root causes. By examining the contributing factors, the team identified patterns, systemic weaknesses, and areas where processes or procedures may have fallen short. Analyzing the incidents allowed Austin Energy to assess how well its emergency response aligned with the specific needs of customers, stakeholders, and the requirements of its utility operations. This phase also involved ensuring questions from key stakeholders like City Council were addressed through the findings of the After-Action Review. Finally, Austin Energy compared the findings from the Winter Storm Uri AAR to those of the Winter Storm Mara AAR to determine if there were any gaps in implementing the Uri AAR that need to be revisited.



The Improve phase. Austin Energy focused on using the insights gained from the previous phases to identify strategies for enhancing the utility’s emergency response. Austin Energy leveraged the findings to generate recommendations for improvement, considering both immediate corrective actions and long-term solutions.

The goal was to identify practical recommendations and effective strategies that would strengthen Austin Energy’s ability to mitigate future incidents and optimize overall emergency response capabilities. This phase emphasized customer-centric and utility perspectives to ensure that the strategies are tailored to the specific demands and challenges faced by Austin Energy’s utility operations.

The Report phase. Austin Energy summarized the findings by defining major observation topics (each, an aggregated observation) then listing associated recommendations for improvement. This comprehensive After-Action Review report serves as a valuable resource for Austin Energy, providing a detailed account of the Winter Storm event and the proposed strategies for improvement. In addition, by compiling this information, Austin Energy ensures that its insights and recommendations are effectively communicated and can be easily referenced by key stakeholders and decision-makers within the organization.

While the Report Phase concludes the After-Action Review, the work continues as Austin Energy focuses on implementing the recommendations derived from the AAR.

The implementation process involves a series of activities to enact the recommended changes. Austin Energy will record each recommendation’s actions and provide a completion status to key stakeholders to ensure accountability and transparency.

Leveraging Incident Command

Austin Energy’s internal review team leveraged its Incident Command structure to systematically capture strengths and weaknesses related to the utility’s emergency response to the storm. Based on the National Incident Management System (NIMS), the Incident Command structure provides a framework for effective coordination and communication among various sections responsible for different aspects of emergency management.

By using this structure, Austin Energy was able to identify and address specific areas of improvement within each section, with the objective of leading to the improvement of the collective whole.

For Winter Storm Mara, Austin Energy’s Incident Command structure consisted of the following primary areas. Each section is staffed by an individual or teams who worked 24/7 on a rotating basis through the entirety of the event:

1. **Incident Commander:** The Incident Commander is responsible for the overall management of the incident. This role provided strategic direction and coordinated the efforts of all other sections within the Incident Command structure.
2. **Emergency Management:** The Emergency Management section coordinated resources, conducted briefings every four hours throughout Incident Command activation, and ensured the response efforts aligned with established emergency management protocols and procedures.
3. **Public Information:** The Public Information section was responsible for managing public communications and ensuring timely and accurate dissemination of information related to the storm and Austin Energy’s response efforts. Public Information facilitates communication with the media, customers, and other stakeholders to keep them informed about restoration progress, safety guidelines, and other relevant storm-related updates.
4. **Liaisons:** This section served as the point of contact between Austin/Travis County Emergency Operations and Austin Energy’s Incident Command activation. Liaisons are stationed at the Combined Transportation, Emergency and Communications Center (CTECC) and work alongside other City of Austin department representatives. This role facilitates coordination, collaboration, and information exchange between Austin Energy and stakeholders.



5. **Safety:** This section focused on ensuring the safety of personnel and the public during the emergency response. The team developed and enforced safety protocols, conducted risk assessments, and provided training and guidance to mitigate potential hazards and accidents.
6. **Restoration Operations:** This section was responsible for the actual restoration of utility services, including power restoration, line clearance (tree trimming/vegetation management), and any necessary repairs or replacements.
7. **Customer Care:** This section addressed customer concerns and inquiries related to the storm and utility service disruptions. They provided support, information, and assistance to customers.
8. **Mutual Aid:** This section facilitated coordinating and using resources from neighboring utilities and emergency electrical services companies, who served as mutual aid partners during the event. This role established and maintained effective partnerships with other entities to leverage additional personnel and equipment for the emergency response.
9. **Technology:** This section managed and supported technological systems and tools used during the emergency response. They ensured the availability and functionality of communication systems, data management tools, and other technology-driven resources necessary for Austin Energy's response.
10. **Planning:** This section was responsible for gathering and analyzing information, developing situational assessments, and creating response plans. They worked closely with other sections to ensure that the response efforts were coordinated and adaptive to the various phases of outage restoration.
11. **Logistics:** This section managed the procurement, deployment, and distribution of resources and supplies needed for the emergency response. They ensured personnel, equipment, materials, and other necessary resources were available and distributed throughout the response effort.
12. **Finance & Administration:** This section handled the financial and administrative aspects of the emergency response. They managed emergency ProCard issuance, maintained records, and provided support services to other sections within the Incident Command structure.



**Customer Driven.
Community Focused.SM**



A lineworker replaces a blown fuse in the wake of Winter Storm Mara.



While lineworkers are out in the field making repairs, staff at the Energy Control Center monitor the system and send crews to outages.

Lineworkers take to the air to install equipment on a new pole and move lines over from a broken one.





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