# Public Utility Infrastructure Review Report

Creating more resilient infrastructure for Mississippi communities

**PRESENTED TO**
Mississippi Public Service Commission

**SUBMITTED BY**
Del Sol Consulting, Inc.

**DATE**
February 2022

Del Sol Consulting

ROYAL engineeringpossibilites.

The report was prepared on behalf of the Public Service Commission of the State of Mississippi by staff members of Del Sol Consulting, Inc. (Del Sol), a disaster recovery consulting firm specializing in providing expert consultation and staff augmentation to clients facing the daunting tasks of pre-planning for potential natural disasters, responding to disasters, and effectively implementing long-term recovery strategies. Del Sol was supported by Royal Engineers and Consultants, LLC (Royal), a full-service engineering and consulting firm with significant experience in the management of disaster recovery programs. Del Sol and Royal assisted the Commission in reviewing and analyzing the Public Utility Infrastructure Review responses received from Mississippi's electric, natural gas, water, and telecommunication public utilities and developing the summarized findings and recommendations included herein. This report was prepared by an interdisciplinary group comprised of Del Sol and Royal team members, including Michael Dorris, Joanna Ragas, Lisa Goodgion, Thad Thomas, Kirk Rhinehart, and Leanne Guidry.

# Mississippi Public Service Commission



## A Letter from Your Mississippi Public Service Commissioners

Ensuring that utilities provide reliable services across a resilient infrastructure network is a top priority for the Mississippi Public Service Commission (Commission). To reflect that commitment, last year the Commission announced that it would launch a comprehensive review of the condition and resiliency of the state's public utility infrastructure. This action was taken in response to the impacts of February 2021's winter storms, which caused utility service failures in many U.S. states, including Mississippi, and in hopes of avoiding future large-area outages of essential utility services due to extreme weather, natural disasters, and other disruptions.

From Monday, February 15 to Wednesday, February 17, 2021, the south-central region of the U.S. experienced frigid temperatures and extreme winter weather conditions that resulted in an increased demand for utility services, requests to conserve energy, and ultimately, unplanned generation and transmission outages, and forced load shed power outages. The winter storms also fueled a dramatic increase in demand for and price of natural gas resources. Moreover, the impact of the winter storm caused a multitude of water systems to fail across the state due to prolonged freezing temperatures. This course of events made it clear that the condition and maintenance of the state's electric, gas, water, telecommunication, and overall infrastructure was in dire need of review and assessment for the welfare of the state's citizens and for purposes of future economic growth.

As part of this review, the Commission has sought information regarding the actions being taken to ensure reliable operations of the electric, gas, water, and telecommunication utilities in anticipation of other future extreme weather events and conditions. We invite you to review our assessment as it seeks to inform stakeholders of the overall condition of utility infrastructure as it pertains to resiliency and reliability. With a better understanding of the state of our state's utility infrastructure, we can properly prepare for extreme situations and prevent utility service failures in Mississippi.

Chairman Dane Maxwell | Commissioner Brandon Presley | Commissioner Brent Bailey

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# Executive Summary

1.

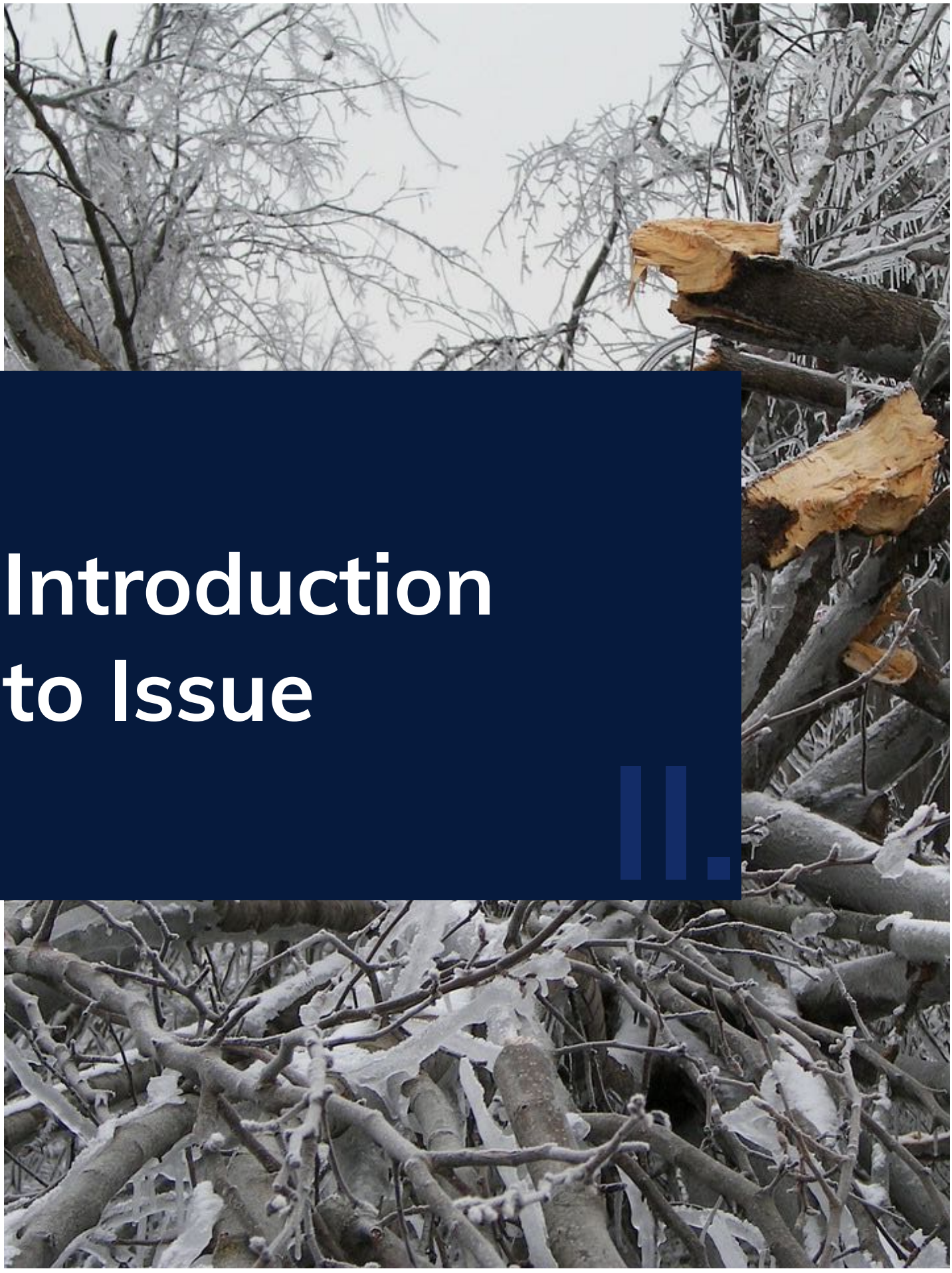
In February 2021, the Mississippi Public Service Commission (MPSC) announced it was launching a comprehensive review of the state's public utility infrastructure disaster preparedness and how utilities respond to events capable of disrupting critical, essential services. This was done in response to the impacts to utilities from disaster events across the country and the February 2021 winter storm impacting MPSC's jurisdiction. The purpose of the review was to assess the existing management and emergency practices of utilities, their responses to recent disasters, and recommend best practices to reduce future impacts.

Starting in April 2021, the MPSC circulated emergency preparedness and disaster response/impact surveys to public utilities across the state, including electric, natural gas, telecommunications, water and sewer. Follow-up emails, calls, and virtual meetings were completed with select utilities to obtain additional information on management of systems, emergency response, and damage from previous weather events. Utilities were also contacted to discuss best management practices and emergency communications protocols. There were a total of 87 surveys issued, with a 90% response rate.

The responses received from the utilities were compiled and analyzed by resiliency specialists to determine the strengths and weaknesses of each sector and to provide recommendations on improvements. Those findings and recommendations are outlined in detail in the following report.

While Mississippi and other Southern States experienced costly impacts to their infrastructure, the February Winter Storm, often referred to as Winter Storm Uri, had an overall impact of approximately $196.5 billion to the U.S. While Mississippi utilities seemed to follow their respective Emergency Plans, there were still challenges throughout the state. Those challenges included frozen regulators, loss of power and telecommunication connection, and outdated, unprotected water infrastructure that failed. The electric utilities expressed that vegetation management is a critical routine maintenance practice. Having an effective vegetation management plan reduces day-to-day outages and outages due to an extreme event. This investigation also found that not all utilities have emergency response or communications plans. In addition, cybersecurity and cyber threats are also becoming a more prominent concern to public utilities throughout the country.

It is recommended that the public utilities continue to communicate with each other and the MPSC to improve the planning and preparedness of their systems to increase their resilience in future weather related events. Utilities should also strengthen their cybersecurity defense, establish and maintain emergency response and communications plans, and create fuel supply redundancy and diversification. Training, pursuing available funding sources, completing pre-positioned contracts and mutual aid agreements, implementing hardening measures, and critical supplies tracking are just a few measures utilities can take to increase their resiliency to future storms.



# Introduction to Issue

II.

## A. PURPOSE OF INVESTIGATION

On February 24, 2021, the Mississippi Public Service Commission (MPSC) announced it was launching a comprehensive review of the state's public utility infrastructure. This review aims to identify the negative effects of disaster events across the country and the lingering aftermath of the February 2021 winter storm, assess the existing management and emergency practices of utilities, and recommend best practices to reduce future damage. To achieve this, the following report will identify strengths and weaknesses in Mississippi's utility management and emergency response, analyze the communication among utilities and their key stakeholders, and recommend actions for regulators and policy makers to take to ensure reliable and robust utility infrastructure in Mississippi. The goal of this investigation is to ensure that the necessary steps are being taken by utility companies to protect and enhance the reliability of electric, gas, water, sewer, and telecommunications services in the state of Mississippi. This report addresses the effects of recent weather events, utilities' system resiliency protocols, and recommendations to improve planning, preparation, and response for future extreme events. This report also speaks to the increasing threats posed by malicious cyber activity.

Infrastructure resilience is a top priority for all three Commissioners of the Public Service Commission. At the time this public utility infrastructure review was announced, the Commissioners provided the following statements:

*"Grid resiliency and reliability is an incredibly important issue, and we must maintain a proactive approach to protect our systems and infrastructure,"* Chairman Dane Maxwell said. *"The extreme winter weather last week brought to light many issues throughout the region that must be addressed to ensure forced outages on a massive scale do not happen here in Mississippi like we saw in other parts on the country."*

*"Although the majority of utilities performed well during the recent extreme weather event, the events have raised the bar of preparation and preventive actions utilities take to minimize outages,"* Commissioner Brent Bailey said. *"Our emphasis remains on providing Mississippi residents with effective communication, ensuring reliability, and preventing the loss of vital utility services during any inclement weather conditions, particularly for the most vulnerable of customers. "*

*"It is our highest duty as Commissioners to make sure that we not only solve problems but anticipate them ahead of time,"* Commissioner Brandon Presley said. *"This latest winter storm has presented challenges that must be addressed in a formal and thorough manner. Mississippians deserve to have every assurance that the public and private power grid, water, and other utility services will be there at all times. After all, the customers are the ones paying for it. Working families and small businesses are already financially struggling because of the pandemic, we must protect their pocketbooks along the way. "*

### B. METHOD OF DATA COLLECTION

Throughout the month of April 2021, the Mississippi Public Service Commission circulated data requests to many public utility entities across the state. These entities include investor-owned and cooperative electric utilities, investor-owned and municipal/district natural gas utilities, and private/local and incumbent telecommunications. This request for information aimed at getting responses regarding the effects of recent weather events on utilities (including the February 2021 winter storm), the management of resiliency and reliability for utility infrastructure, planning and response, and communication to key stakeholders. The Mississippi State Department of Health (MSDH) Bureau of Public Water Supply and the Mississippi Rural Water Association (MWRA) agreed to assist the MPSC in the collection and reporting of similar data for rural, municipal, and district water and sewer utilities.

In addition to the initial responses received, the utilities were contacted via email for additional information on the management of their systems, emergency response, and damage from previous weather events. Virtual meetings were also conducted with some utilities to further discuss best management practices and emergency communication protocols. The responses received from the utilities were then compiled and analyzed by resiliency specialists to determine the strengths and weaknesses of each sector and where improvements can be made.

**By The Numbers**

**87**

**SURVEYS ISSUED**

Topics addressed include policy, regulatory, system management, emergency response, communication, and cybersecurity.

**90%**

**RESPONSE RATE**

78 utility entities responded to the survey.

**SERVICE SECTORS INCLUDED**

Cooperatives

Electric

Communications

Natural Gas

Water

Municipalities

# Recent Extreme Weather Events

III.

## A. FEBRUARY 2021 WINTER STORMS

During the week of February 14, 2021, utility providers across the nation experienced unprecedented effects from freezing temperatures and winter storms Uri and Viola. This event marked the fourth time in the past decade in which the bulk-power system was jeopardized due to unforeseen cold weather outages. Electric companies experienced generation outages, and Balancing Authorities ordered load shed within their footprints ranging from two hours to three days. The natural gas system also experienced the largest monthly decline of production nationally on record.[1]

According to analysis from the *NERC February 2021 Cold Weather Grid Operations: Preliminary Findings and Recommendations*, the largest cause in the outages experienced during the winter storms was freezing issues. Forty-four percent of unplanned generation outages were caused by freezing issues. Generation facilities in the southern region of the United States are typically not constructed within enclosed structures. This lack of shelter leaves the equipment and power systems open to freezing temperatures.[1]

The second largest cause was natural gas fuel supply issues which led to 87% of fuel related outages. The south-central United States' electric generation to meet capacity and need is mainly reliant on the natural gas fuel supply. According to the US Energy Information Administration, natural gas comprised about 40% of electricity generation in 2020 in the United States.[2] These problems in natural gas supply were directly related to freezing issues. The decline in natural gas wellhead production was primarily due to shut-ins to reduce freeze-related issues at production and processing facilities, frozen equipment, loss of power supply, and poor road conditions which halted movement of supply from production sites and repair to facilities.[1] These facts display that the natural gas and electric infrastructure affected by the winter storm are interdependent and rely on each other heavily. Natural gas supply is affected by loss of power supply while electric generation is dependent on that same natural gas supply.

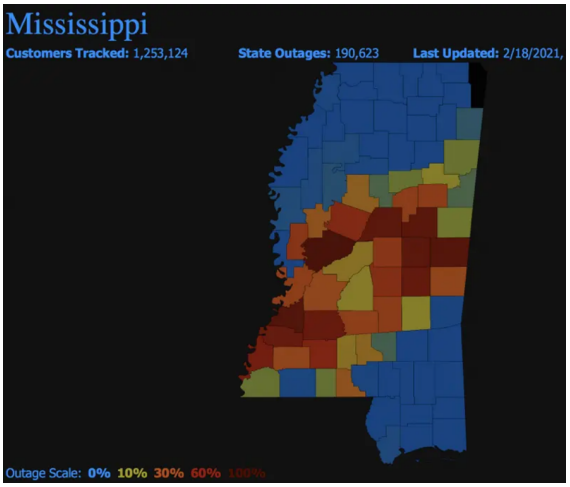



Figure 1: County Outage Percentages (3)

Entergy Mississippi, LLC (EML) and Cooperative Energy were required to shed load for approximately 2 hours and 20 minutes under the order of the Midcontinent Independent System Operator (MISO). MISO is a member-based Regional Transmission Organization (RTO) that is responsible for operating and regulating the power grid of its member utilities. Load shedding is a way to reduce the consumption of electricity and stabilize the grid to avoid failures across the system by cutting off supply to certain customers. It is done to avoid damage to critical facilities. EML had 18,901 customers affected across the state in cities including Southaven, Greenville, Clinton, Natchez, Byram, Brookhaven, Jackson, Richland, Ridgeland, Carthage, and Vicksburg. Most of those cities had circuits that included customers that are in the city limits as well as customers that are in the county. The map shown in Figure 1 displays the percentages of outages per county as of February 18, 2021 at 9:25 AM.[3] At this time the winter storm was at its most severe point. The states total outages at that time were near 200,000.[3] These power outages had consequences for the state's communications utilities when the electricity to their equipment was disrupted. AT&T, Bay Springs, and Fulton Telephone reported in their responses the need for backup generation to power equipment after power outages caused by the winter storm.

Effects to natural gas facilities were reported by Sebastopol Natural Gas Utility. Regulators on customers' meters that had not been used recently froze due to the winter conditions. Atmos Energy reported minimal disruption also occurred from frozen regulators. Less than 50 customers were affected, and service was restored quickly.

Water distribution utilities across the state experienced significant impacts. Mississippi State Department of Health (MSDH) reported that eighty-eight (88) facilities in forty (40) counties that span from North to South Mississippi reported issues due to the inclement weather of Uri and Viola. These issues included electrical malfunctions, line breaks, well malfunctions, power outages, tank malfunctions, and system malfunctions which led to pressure losses. Seventy-nine, or 90%, of these water distribution utilities issued Boil Water Notices (BWNs). Water systems self-impose notices when there are pressure losses or there is a reason to believe the system is compromised. MSDH will also issue a "state-imposed" notice if a system tests positive for E. Coli or after a catastrophic event or natural disaster. Sunrise Utility and the Town of Georgetown were the first to lift the BWN on February 13, 2021. The City of Jackson, however, did not lift its BWN until March 17, 2021. In a log of damages and effects of Uri and Viola, MWRA reported that ten (10) of their member water utilities had no power in the winter storm, and twenty-five (25) had to use generator power as of March 4, 2021.

## B. RECENT HURRICANE EVENTS AND THUNDERSTORMS

Since 2017, five (5) hurricanes of Categories Four or Five have landed along the coast from Texas to Florida. As seen in Figure 2, the most recent, Hurricane Ida, made landfall near Port Fourchon, Louisiana, on August 29, 2021.

Following Hurricane Ida, MSDH reported pressure losses in water systems across the state due to power outages, line breaks, and lightning strikes to a well. These impacts were reported by Sunrise Mobile Home Park, Willow Grove Water Association, Oak Harbor, Wilk-Amite Water Association, Sunnyhill Water Association, Homestead Water Association, the Village of Glendora, Hide-a-Way Hills Water Company, Coles Water Association, Wright's Camp Ground, and the Town of Eden. Each of these water utilities placed Boil Water Notices (BWNs) after the pressure losses. Some lasted until September 7, 2021, nine days after landfall, while others, like Coles Water Association, had BWNs in place until September 27, 2021.

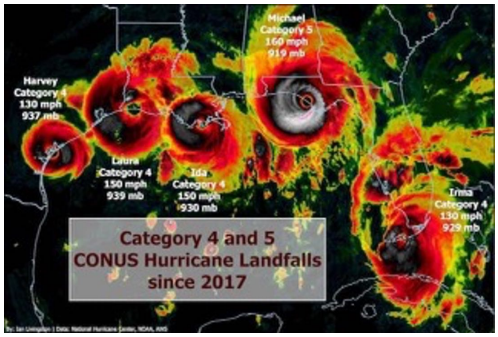



Figure 2: Category 4 and 5 CONIS Hurricane Landfalls since 2017

EML reported damage to its electric grid of more than 163 poles, 752 spans of wire, 59 crossarms and 45 transformers as result of high winds and heavy rains caused by Hurricane Ida. The rural electric cooperatives of South Mississippi also suffered damage to distribution systems due to Hurricane Ida. Coast Electric reported 75 poles broken, 28 leaning poles, 35 transformers damaged, 213 downed spans of wire, 71 low lines, 27 lines damaged, 518 equipment repair locations, and 192 trees to cut. Delta Electric had 3 poles damaged, 1 transformer damaged, and 8 spans of wire damaged. Over 40 states sent crews to the Southeast to assist in restoration.

Just 100 miles away from the coast of Mississippi in Houma, Louisiana, the high winds of the hurricane eye wall caused catastrophic damage to the power delivery systems of electric cooperatives and energy companies in the area, such as South Louisiana Electric Cooperative Association (SLECA). SLECA received damage to approximately 3670 poles, 2985 spans of wire, 736 transformers, and 1639 crossarms. If Hurricane Ida had made direct landfall in Mississippi it would have caused a similar magnitude of damage.

On October 28, 2020, Hurricane Zeta, a Category 3 storm, made landfall in east Louisiana and quickly travelled along the coast into Mississippi, affecting utilities across the state and the Gulf Coast. Damage to powerlines from hurricane-strengths winds left over 220,000 residents in the state without power,[4] and by that Sunday October 31, outages were still numbered at 56,586.[5] Mississippi Power Company reported 94,039 (49%) customers out of power, 18 transmission structures replaced, 1,270 distribution outage events, 528 distribution poles replaced, 1,600 spans of distribution wire replaced/repaired, and 300 distribution transformers replaced.

Figure 3: Damaged Powerlines after Hurricane Zeta (5)

Outages of this nature can also have great effects on water supply due to lack of power to pump, treat, and distribute water.

The FCC also reported on October 30, 2020, that almost 8.6% of cell sites were out of service in the affected area, and 149,863 cable and wireline customers were out of service. This includes severance of telephone, television, and/or internet services.[6]

The adjacent National Climate Data Center map in Figure 4 displays the annual average number of thunderstorms throughout the United States. Most of Mississippi ranges from seventy (70) to one hundred (100) storms per year. The coastal region of the state has a higher average of one hundred (100) to one hundred ten (110) thunderstorms annually.[7] Thunderstorms with high winds can cause similar damage to that of hurricanes. For example, on September 1, 2021, storms with straight line winds rolled through the state causing damages that included 44 broken poles, 168 spans of wire down, 16 broken cross arms, and 16 damaged transformers with the heavier damage being in rural Hinds, Attala, and Holmes counties and the Vicksburg area, as reported by EML.


Figure 4: Average Annual Number of Thunderstorms

**C. TORNADO OUTBREAKS**

Mississippi is located in a region known for its tornado activity, and the state ranks eighth in the nation in number of tornadoes normalized by square miles. According to the National Weather Service, seventy-six (76) tornadoes formed in Mississippi in 2021. The majority of these occurred between March and August, with twenty-seven (27) in May. This is the highest tornado count in May since 1950.[8] From data collected between 2000 and 2007, there was an average of fifty-seven (57) tornadoes a year in Mississippi. This is an increase from the yearly average of twenty-seven (27) from 1950-2006.[9]

On Sunday May 2, 2021, a tornado caused significant damage to the city of Tupelo, Mississippi, destroying homes, downing trees, and breaking power lines.[10] The Mississippi Emergency Management Agency (MEMA) reported that 12 tornadoes, ranging from 75-115 mph winds, occurred across the state on that day.[11] The impact of tornado damage can be similar to that of hurricanes. High wind speeds can lead to potential loss of power and communications due to damaged electric systems and telecom towers and disruption to water, wastewater, and natural gas services from debris and power shortages.

## D. OTHER THREATS

### *i. Earthquakes*

The Mississippi Department of Environmental Quality (MDEQ) reported in January 2021 that there have been sixty (60) earthquake occurrences in Mississippi since the year 1923, with twenty-eight (28) being felt at the surface.[12] Earthquakes can have devastating effects on utility systems due to underground seismic activity. Earthquakes can cause fractures in water lines and can damage storage and processing tanks at water facilities. Breaks in sewer collection systems are also common damages after earthquakes.[13] The electric power grid and its generation facilities, substations, transmission towers and lines, and distribution subsystems can experience equipment failures as a result of ground disturbance in an earthquake event.[14]

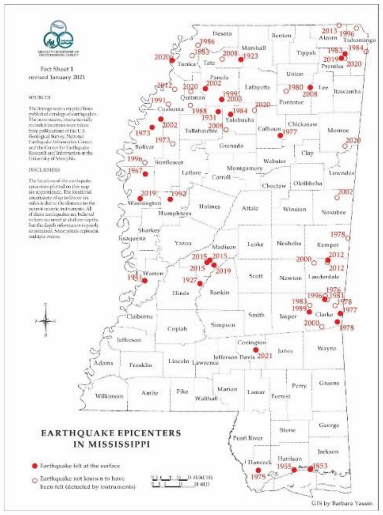



Figure 5: Locations of Earthquake Epicenters in Mississippi (9)

### *ii. Cyber Attacks*

In the recent years, cyber attacks have shifted away from data breaches, and attackers are now focusing on critical infrastructure systems, such as the energy and water/wastewater sectors. Touro College Illinois reports that in the year 2021 alone, six (6) ransomware groups attacked the cybersecurity of two hundred ninety-two (292) organizations, taking over $45 million dollars. The most notorious of these attacks was on the Colonial Pipeline, disrupting much of the gasoline supply along the east coast. This attack affected Americans with gasoline shortages, and Colonial Pipeline paid the cyberattackers $4.4 million to regain control of its systems.[15]

In the current age of technology and interconnectivity, threats to cybersecurity must be a top priority to critical infrastructure systems. Utility facilities need to consider what aspects of their systems are susceptible to cyberattacks and what mechanisms they have in place to detect and avoid threats.

### *iii. Physical Attacks*

Physical attacks also pose a threat to the utility infrastructure system, particularly the electric grid. Most recently, in December 2020, investigations began into the motivations and potential actions of a plot to attack a power station in the southeast United States. It was discovered that the individual of concern planned to cause a power outage by shooting rifle rounds into a substation. This plan was luckily thwarted before any actions could be made.

However, authorities do not always discover physical threats to infrastructure before they occur. The US power grid experienced two physical attacks in 2013, one to a Pacific Gas and Electric substation in California and another to the Arkansas electric grid.[16] These attacks bring to light the need to advance discussions on the physical security of utilities nationwide. Important information to consider would be what vulnerabilities the physical utility infrastructure of Mississippi has, the accessibility the public has to utility facilities, and what options there are to secure these locations.

# Managing Utility Infrastructure for Resiliency & Reliability

IV.

## A. ELECTRIC

### *i. Investor-Owned Utilities*

Entergy Mississippi, LLC (EML) and Mississippi Power Company (MPC) represent the two investor-owned electric utilities subject to the jurisdiction of the Mississippi Public Service Commission. Routine maintenance is a key component of resiliency and reliability planning for both companies.

#### *Vegetation Management*

Both EML and MPC stated that the most common issue in routine maintenance is vegetation management (VM), as most outages are caused by tree and limb damage to poles and lines. Both companies have implemented vegetation management programs for their transmission and distribution lines to greatly reduce outages.

In communication with MPC, its personnel stated that the Mississippi Public Service Commission has stressed the importance of VM to the electric grid and encouraged companies not to cut these programs during budgeting. MPC stated that "proper vegetation management has a direct impact on reliability for our customers during both large-scale weather events and for day-to-day reliability." MPC has clearing schedules outlined for both transmission and distribution systems. For line of 200kV and below, side trimming is performed on an as-needed basis, and ground floor clearing happens in a 6-year cycle of brush clearing and herbicide. MPC's distribution clearing is performed in 2 or 4 year cycles depending on the amount and rate of growth in the area. Typically south Mississippi experiences quicker vegetation growth, and lines in this area are trimmed on the 2 year cycle. The northern region does not have as much growth and is trimmed every 4 years. The graph in Figure 6 provided by MPC shows that the average CMIs (Customer Minutes Interrupted) is reduced by 50% when vegetation maintenance occurs more frequently.

In its responses, EML stated that its VM program "involves tree pruning and tree removal, transmission line mechanical side pruning, chemical herbicide application, mechanical re-clearing/mowing, vegetation maintenance interval guidelines, and a transmission vegetation removal notification process." A common issue seen by EML in VM is limbs and trees that are present outside of their right-of-way (ROW). These pose a danger of falling on and damaging electric lines, and electric companies do not have the ability to remove the threat as they do not have ROW access. Resolving this issue involves communication with landowners and/or right-of-way acquisition.

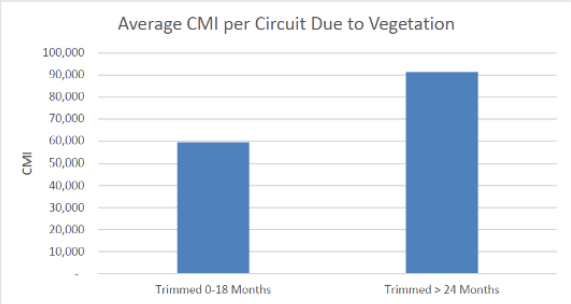



Figure 6: MPC Average CMI per Circuit Due to Vegetation

#### *Fuel Supply*

Access to fuel supply is also a necessity in maintaining a reliable electric grid. Both EML and MPC have firm supply contracts in place for natural gas. These contracts ensure that power suppliers have agreed upon natural gas quantities delivered when requested. MPC maintains natural gas storage at the equivalent of 13 days of its firm contract supply. This means that MPC can power its facilities with natural gas for 13 days in the incident of a natural gas shortage or lack of supply.

### *Continuing Maintenance*

After 2018 winter storms, the North American Electric Reliability Corporation (NERC) and the Federal Energy Regulatory Commission (FERC) made recommendations for creating more reliable systems during inclement weather conditions.[17] EML used these recommendations to modify their continuing maintenance plans. EML has plant-specific winterization procedures that are updated annually to incorporate new technologies and lessons learned from previous events. Their preventative maintenance program includes freeze protection procedures. These preventative procedures include inspections and maintenance to make sure systems are functional and reliable. In addition to these recommendations, EML conducts reliability planning to identify what systems don't meet or need to be constructed to meet NERC Reliability Standards. These standards include physical security, facility interconnection requirements, and transmission maintenance. Some of these programs and procedures are listed below:

- EML's Focus Program looks at the number of outages in specific areas of the electric system over a period of time. If a significant number of outages occur within that time period (usually two years) a reliability assessment will be triggered.
- Backbone feeder inspections occur on a three-year cycle, and any issues are responded to and fixed. These inspections are both visual and infrared.
- EML keeps a list of upgrade projects, such as substation repair and increasing line capacity, to address reliability issues found in their systems. Keeping this list updated helps EML identify priorities for funding of projects to make its system more resilient.
- EML has focused in recent years on implementation of self healing technology and automating their system. A limitation of the self-healing system is that it can only be used with available capacity and circuit ties.
- In 2018, EML changed their construction standards. All newly built infrastructure and repair/replacement of poles for transmission and distribution lines are required to be a class one or three pole. Older systems typically contain class 5 poles that are not as resilient as higher class poles.

A recognized area of concern in EML's system is the radial lines and lack of redundancy, especially in rural areas. Some larger communities may have redundancy issues, however it is easier to install new circuits to increase capacity. EML is currently pursuing solutions to this issue. This could include installing sensors on radial lines tying into the outage management system and communications to capacitor banks, building strategically placed substations, distributed batteries, and distributed generation.

Being a member of MISO, EML benefits from routine assessments of their system, and MISO acts as their Reliability Coordinator. MISO conducts real-time voltage stability analysis in critical areas under its jurisdiction. MISO assists across multiple processes such as real-time operations, day-ahead operations, transmission security planning, outage coordination, seams coordination, and network modeling.

MPC also reviewed the recommendations published by FERC and NERC after the 2018 winter storms. Since 2014, MPC has had a Standard of Excellence plan implemented through Southern Company Generation. This standard requires a freeze protection program that outlines compliance responsibility, internal communication processes, new hire and training programs, assessments of freeze protection systems, plans for protection of critical equipment, and to assist in protection and reliability. MPC also has maintenance programs listed below:

- Ground Line Maintenance Program - replacement and repair of wood poles with a ten-year cycle
- Hardware replacement - visual and infrared inspections to identify broken hardware on a five-year cycle

Common issues found in these inspections include rotting poles and rusty, deteriorating hardware. Low performing feeders are identified during inspections, and necessary improvement projects are created.

MPC also utilizes different design elements to strengthen their system. Redundancy and multiple feeders are present to be able to isolate certain areas during damage events and increase reliability. Automation systems at meter points have also been installed to detect outages and automatically make switches in the system.

Southern Company is a gas and electric utility holding company operating in the southern United States. As a subsidiary of Southern Power and part of its shared services division, MPC has access to additional resources. MPC participates in annual capacity and energy restoration drills, and Southern Company conducts real-time voltage stability analysis for MPC to alert any potential stability risks. MPC also benefits from operation modeling provided by Southern Company. This involves simulating different utilization levels of transfer points in the system and provides awareness of possible operational issues. Modeling also assists in creating next-day case analysis. During the 2018 winter storm, Southern Company monitored MPC's system in anticipation of peak usage. Southern Company's power flow models of MPC's transmission system foresaw that it would exceed the operating limit at a MISO transfer location and have transmission loading problems in the system. MPC was able to use this information to better prepare for the event.

### *ii. Co-ops*

Like the investor-owned companies, electric cooperatives (co-ops) in Mississippi also have outlined plans for continued system maintenance. Some co-ops such as North East Mississippi Electric Power Association hold a weekly maintenance meeting to "discuss any and all issues with system operations" to ensure their electric grid is efficient and reliable. In its responses, East Mississippi Electric Power Association (EMEPA) outlined multiple tools to address vulnerabilities in their system. These include:

- A Long Range Construction (LRC) Work Plan
- Two-year construction work plans as part of the LRC
- Distribution system review and evaluation programs
- Line and System Maintenance Programs
- Mobile substation and distribution equipment for rapid response
- Five-year right-of-way clearing programs

A common vulnerability listed by co-ops is outages caused by excess vegetation growth surrounding lines. All co-ops reported clearing and spraying cycles ranging from two to seven years, with some co-ops also implementing removal of dead, dying, and live trees outside the right-of-way that are identified as hazardous to the system. For example, 4-County Electric Power Association has seen its average outage time per member decrease from 200 minutes to 126 minutes since 2005. 4-County attributes this reduction in outage minutes to improved vegetation management and investments in system maintenance and improvements. Northcentral Electric Cooperative also attributes the reduction in outages in their system over the past few years to hiring a certified arborist as a ROW Coordinator and creating a "sustainable tree trimming cycle."

In its responses, Northcentral also described other processes in place to assess its infrastructure. They continually monitor system loads, growth, and reliability to bring the best service to their members. Continued load growth has required Northcentral to upgrade its system by converting voltage, acquiring right-of-way, replacing substations, and distribution equipment. Their system also has switching plans to back feed any vulnerable substation loads by surrounding substations. Poles in Northcentral's system are inspected on a 10-year cycle and replaced when necessary.

## B. NATURAL GAS

### *i. Investor-Owned Utilities*

Atmos Energy and CenterPoint Energy are the major investor-owned natural gas utilities in Mississippi. In their survey responses, Atmos and CenterPoint both attributed the minimal effects from the February 2021 Winter Storm to their resiliency and reliability protocol of system modeling and continually monitoring and addressing operational issues. In discussions with CenterPoint, its personnel stated that the most common problems seen in natural gas infrastructure are corrosion and pipe leaks. Older steel piping is of most concern. After assessment, CenterPoint replaces weak, aging infrastructure in its system. Atmos Energy also states that areas of low pressure are also a concern in natural gas systems as it can negatively affect delivery capacity.

Atmos listed the annual system assessment as the most important aspect of their best management practices. It is vital that operators understand system performance under peak demand. In communication with Atmos Energy, they listed best practices for system management including:

- Reinforcing system low pressure points regularly to ensure delivery capacity
- Having a broad view on overall system pressures and low points to assess performance and vulnerability points
- Instituting system modeling and validation to understand system capabilities based on actual flows and low-pressure point readings
- Possessing two-way feeds for redundancy
- Having a trained staff to respond to any weather-related issues

Atmos has implemented reinforcement projects in the past that hardened their system to better perform during extreme weather events. Atmos Energy manages its infrastructure for reliability by setting standards to meet the needs of its customers. Continually assessing its system for opportunities for redundancy is a part of these standards. An example of this redundancy is looped lines that create a two-way feed which allow customers to avoid losing service if a line is hit. Atmos has established firm natural gas transportation and uses its contracts with suppliers to maintain first-of-the-month, index-based pricing. In the event of transportation shortages, third-party storage contracts and company-owned storage are utilized to offset need. Atmos Energy Gas Control also manages gas pipeline flows and pressures at delivery metering points to “ensure adequate delivery capability to meet system demand.” CenterPoint also utilizes similar practices for gas supply and storage. To ensure gas supplies are available during peak demand, CenterPoint has storage at predetermined prices rather than relying on market prices.

Atmos intends to incentivize its customers to install enabling technologies that work in concert with the natural gas system. These technologies include combined heat and power (CHP) systems, natural gas-powered fuel cell technology (Fuel Cell), and natural gas-powered backup generators (Backup Generation). CHP systems produce power and thermal energy from one source and can support the grid by providing a steady electric and thermal energy supply. This allows critical facilities to operate in emergency situations by withstanding long-lasting outages. Fuel Cells chemically convert energy from natural gas methane into electricity. They are useful for major industrial facilities, commercial businesses, and critical public safety facilities as backup energy sources as they can ensure reliable backup power during grid outages. Atmos may offer incentives to customers utilizing Backup Generation to ensure emergency access to electrical power.

CenterPoint Energy attributes the resiliency of its systems to multiple maintenance and reliability programs. Inspections of equipment occur annually from the months of May to October. Personnel visit each site to verify proper operation and capacity. If any issues are found in these inspections, updates are made to remedy the problem and strengthen the system. CenterPoint also employs routine system maintenance. Leak surveys are conducted to find weaknesses in lines, and the weak, aging infrastructure is replaced.

#### *ii. Municipality/Districts*

Municipalities and districts are also essential natural gas suppliers in the state of Mississippi. Like their investor-owned counterparts, they have firm natural gas contracts and storage to maintain a reliable supply. Caledonia Natural Gas District reported in their responses that they conduct monthly reviews to manage storage.

The management of the physical infrastructure is also a priority for municipal natural gas suppliers. Natural gas districts maintain and monitor pressure regulators to retain service during critical conditions. Sebastopol Natural Gas District has double fed lines, where applicable, to ensure consistency in pressure. It also maintains a stock of regulators and parts for expedited repair and outage restoration. The City of Ripley Gas Department stated that continuous system surveys, inspections, repairs, maintenance, and upgrades keep their gas system reliable during peak season. Municipal natural gas utilities also utilize feeds from other companies. Bay Springs Natural Gas stated they have multiple feeds from different sources.

### C. WATER/SEWER

#### *i. Rural Water Associations/Municipalities/Districts*

On December 6, 2021, the Mississippi Municipal League (MML) and the Mississippi Rural Water Association (MWRA) gave presentations to the Mississippi Senate American Rescue Plan Act (ARPA) Committee on the need for improvements to the state's water/sewer infrastructure. The MML is a private non-profit organization that advocates for the interests of member cities and towns. The MWRA is a member organization that provides technical and educational support to water and wastewater utilities across the state of Mississippi.

In their presentation, the MML explained that they asked their member water and sewer utility systems to conduct a review of their infrastructure. An engineer was required to assess their system and list any improvements and repairs necessary. From the assessments received, the following needs were identified:

- New PVC sewer main piping
- New pump stations
- Repair of lift stations and new lift station piping
- Maintenance/cleaning of sewer mains
- New manholes
- New steel casings
- Elevating storage tanks and water supply wells
- Regulatory violations were discovered

The MWRA also presented statistics on the issues facing its 1,180 member utilities. Seventy percent (70%) of these water and sewer systems serve rural communities of 3,300 or less, and most were built in the late 1960's and early 1970's. The MWRA requested an overview assessment of their members and received responses back from 346 utilities, about one-third of their membership. These assessments revealed that the major failures of infrastructure are undersized and deteriorating water lines, worn out treatment plants, aging or depleting wells, and old, outdated meters. These failures can lead to ruptures, breaks, and leaks in systems. The national average of system water loss is 18%. The average water system loss in Mississippi is over 35%.

The MWRA's review also found that, of its member water systems, 96 have significant deficiencies; 11 are out of compliance because it is difficult for rural systems to keep up with new regulations; 5 are under administrative orders from the Environmental Protection Agency (EPA), Mississippi Department of Environmental Quality (MDEQ), or the Mississippi State Department of Health (MSDH); and numerous systems cannot meet the total maximum daily allowance of pollutants in their water systems.

The MWRA's presentation highlighted some of the management practices its members have in place. Many systems conduct rate studies and raise rates accordingly. Mississippi is also one of only three states that requires board training for water utility board members. The MWRA also established a US Department of Labor approved Apprenticeship Program in 2020.[18] This program aims to address the potential issue of up to 50% of the certified utility operators reaching retirement in the next decade. It will assist in passing on institutional knowledge of long-time workers to new hires and the younger workforce.

Another issue present in the state is the lack of access to public water systems in certain areas and the use of private wells. Twenty-seven (27) water utilities in the state cannot provide new connections due to lack of capacity. According to 2018 US Consensus data, 382,398 Mississippi residents, about 13% of the population, receive water from a private well. Portions of 58 counties in the state are not serviced by a public water system. This poses health issues because 1 in 3 private wells are shown to contain Total Coliform Bacteria. Asbestos piping still exists in 189 utilities, and 63 water systems in the state still have some level of lead pipe infrastructure.[19]

In response to the Public Service Commission's survey questions, the MSDH stated that water systems in Mississippi are "somewhat autonomous in and of themselves." There are some requirements of the Certified Operators for maintaining reliability during emergency operations. These requirements include obtaining continuing education units (CEUs) as a condition of maintaining their certification. These trainings foster communications with other districts in addition to educating on managing the utility infrastructure. Some water utilities may actively run generators periodically to test functionality. Water systems in the state have the option to join the Rural Water Emergency Assistance Cooperative (RWEAC) which gives assistance during emergency response. This membership is voluntary and not required.

Water systems in Mississippi are also required to maintain a Security Vulnerability Analysis and Emergency Response Plan. The MSDH provides a guide to water systems on how to conduct a Security Vulnerability Analysis which includes questions, checklists, and necessary information. Water utilities are encouraged to use the results of the analysis to make any necessary security improvements to their systems and create their Emergency Response Plan. Once completed, the utility must send the Certificate of Completion to their state drinking water primary agency. The full analysis document is kept by the utility and is not required to be sent to the primary agency.

The MSDH also implements a Capacity Development Program (CDP) to foster improvements in the capacity of Mississippi's public water systems, both new and existing. This program highlights capacity in the technical, managerial, and financial sectors. The CDP is a requirement of the Federal Safe Drinking Act Amendment of 1996 (SDWA) and is reported to the Environmental Protection Agency (EPA) annually.[20] Prior to the start of construction of a new water system, the MSDH must approve its technical and operational capacity. In existing systems, the MSDH enforces laws and regulations in relation to water quality standards, operator certification, corrosion control, and board member training which will help strengthen these systems. The MSDH also conducts a Capacity Assessment Rating Program to determine capacity of existing systems yearly. When low-capacity systems are recognized, the MSDH offers assistance to those facilities such as new management procedures, budgeting help, or operational improvements.[20] Refusal of this assistance could affect the compliance of the system in the future. The MSDH also implements the EPA's required Ground Water Rule. This rule applies to all systems utilizing ground water as a drinking water source. All systems that are at risk of fecal contamination are required to take measures to correct and reduce exposure to microbial pathogens.[21]

### D. TELECOMMUNICATIONS

Mississippi has a range of private/local and incumbent telecommunications providers. A key vulnerability in telecommunication systems is the reliance on power supply for operation. When power outages occur, interruptions in service are likely as well. After the February 2021 Winter Storm, AT&T purchased additional portable generators, wireless Cells On Wheels (COWS) and Cells On Light Truck (COLTS), and fiber optic facilities. Portable generators were a key component to AT&T restoring wireline service to customers after the winter storm. COWS and COLTS are two forms of mobile cell sites that are mounted on vehicles like vans or trucks. This emergency equipment is useful for all telecommunications facilities to possess in the event of extreme weather and outages. In the responses, Natchez Trace EPA Telecommunications and TEC of Jackson listed all-terrain vehicles to safely reach outages areas as key equipment in emergency response. TEC of Jackson does not currently own any all-terrain vehicles.

Some systems, like Georgetown Telephone and Sledge Telephone, have completely buried lines, which helps their reliability and resiliency. Most communications utility providers in the state have back-up generation power, bi-directional network rings, and hot back-ups with auto failover to keep their infrastructure operational in the face of multiple threats. Other utilities are also adding more fiber ring paths, diverse connections, and equipment to upgrade their systems. Many telecommunication facilities also have fiber optic systems, multiple injection points, redundant access connections, and middle mile connections to other states. Middle mile connections refer to the part of broadband networks that connect larger metropolitan networks to smaller rural municipal networks. Middle mile connections help lower costs and increase connectivity. Prentiss Electric Broadband has two middle mile connections to Chicago and two connections to Atlanta. After the winter storms of 2021, 4-County Telecommunications intends to install a second injection point to ensure redundancy. DE Fastlink is currently building fiber optic systems and ring switching. They also have optical line terminals and secondary tertiary backup power in their system. Delta Fiber also uses a fiber optic system and is currently building a redundant ring throughout the fiber optic network.

With all of these practices, there are still issues with access and connectivity present in the telecommunications infrastructure of Mississippi. Mississippi ranks 42nd in the nation in broadband access, and 41.3% of Mississippi households do not have access to high-speed broadband that is a fixed service.[19]

## E. CYBERSECURITY

### *i. Threats Posed to Utility Operations*

Cybersecurity threats have become an increased problem for utility infrastructure. Some types of cyber attacks are denial of service, spyware, virus, sniffer, and phishing. The impacts of some of these attacks can be interference with the operation of the water treatment equipment, unauthorized changes to programmed instructions which allows individuals to take control of drinking water distribution or wastewater collection systems, and changing or disabling alarm thresholds. Mississippi State Department of Health (MSDH) expressed concerns that many of the state's water systems possess electronic control systems for treatment and other processes that could be vulnerable to cyber-attacks. Billing systems with customer information could also be a target for such threats. Older utility infrastructure is especially at higher risk of cyber hacking due to lack of technology protections and newer equipment.

Distribution facilities tend to operate outside the FERC jurisdiction, which could make them more vulnerable to cyber-attacks. If an attack happened at the distribution level, it could impact the larger grid. Therefore, it is important to have robust cyber security practices at all levels of utility input and output.

As utilities move into more technology-based systems, such as smart grid systems, they also increase their cybersecurity concerns. Some of these concerns are availability of critical infrastructure, reliability and resilience, and data privacy. Attackers can interrupt communications pathways and manipulate data. As the digital exchange of customer-specific data increases, so does the importance of securing devices, systems, networks, and data that comprises these smart grids.

### *ii. Utility Preparedness and Risk Management*

Utilities across the state of Mississippi possess some level of cyber security programming. Most have dedicated enterprise security programs. Employees and contractors receive training to understand cyber security processes. Many of the utilities also utilize firewalls, anti-viral scanning software, and threat detection software. These threat intelligence programs are typically run through security vendors such as SecureWorks, Fortinet, Carbon Black, for example. Even though most facilities have a standard for cybersecurity, some older, smaller infrastructure is still vulnerable, which can leave the entire system vulnerable.

Some key practices to prevent cyber-attacks are limiting authorized user access, updating software on a regular basis, strong password criteria, anti-virus software, and ensure you have systems in place to detect this type of activity.

There are currently federally mandated reliability standards for power systems that also include some cybersecurity protections. According to the February 2014 Bipartisan Policy Center Cybersecurity report, "critical infrastructure protection (CIP) standards are developed by the North American Electric Reliability Corporation (NERC) and approved by the Federal Energy Regulatory Commission (FERC). These standards cover critical cyber asset identification, security management controls, personnel, training, electronic security, physical security, systems security, incident reporting, response planning, and recovery plans".[22] These standards provide a baseline for cybersecurity practices, but they do not provide motivation for continual improvement and adaptation needed to effectively respond to changing cyber threats.

Information sharing also plays a vital role in cyber security practices. It is important to have timely information on potential threats and imminent attacks in order for any cybersecurity strategy to be effective. Collaboration between industry and government, within industry and across infrastructure sectors, and among different levels of government is key in having the best cyber security practices. Information sharing is also a way to identify, assess, and respond to threats real time.

Utility-led collection and information sharing on threats and vulnerabilities should complement the information sharing between the industry and the government. The utilities in Mississippi currently monitor and share information through platforms such as the United States Computer Emergency Readiness Team (US-CERT) and Information Sharing & Analysis Center (ISAC) feeds. They also have partnerships with law enforcement, security vendors, and the Department of Defense. Per the Presidential Executive Order on Improving the Nation's Cybersecurity, barriers to sharing threat information will be evaluated and adjusted as necessary to improve the sharing of threat information among various agencies and governments.

The Water Information Sharing and Analysis Center (Water ISAC) was created by and for the water and wastewater sector to enhance the security of these utilities by providing information and tools for preventing, detecting, responding to, and recovering from all hazards. Water ISAC is the only all-threats security information source for the water and wastewater sector, and is a single point source for data, facts, and analysis on water security and threats. They also provide analysis and resources to support response, mitigation, and resilience initiatives.[23]

Safe and clean water is essential for public health, ecosystem protection, and economic strength. Secure information and operational technology help support these functions. If these technologies are compromised, it can have a significant impact on the utility. Some impacts are loss of staff productivity, costs to fix the issues, potential damage to reputations due to loss of personal data, and potential operational disruptions.

Water ISAC has provided some fundamentals for water utilities to ensure the utilities have minimal disruptions from attacks and to also help prevent these attacks from happening. Some of these fundamentals are to report incidents and suspicious activity to Water ISAC, perform asset inventories, assess risks, minimize control system exposure, enforce user access controls, limit physical access, install independent cyber-physical safety systems, and create a cyber security culture just to name a few. It is also very important for water utilities to enforce their cyber security policies and procedures. Few utilities have cybersecurity experts on hand, but the staff and consultants who understand the systems can collaborate to identify ways that physical damage or hazardous situations can be created either intentionally or accidentally.[23]

Cybersecurity is the responsibility of all staff and stakeholders of that utility. If employees are not involved in cybersecurity, vulnerabilities and threats can go unnoticed and those employees can become unintentional insider threats. Effective cybersecurity starts with leadership. Understanding, commitment, participation, and empowerment from top leadership is required for an effective cybersecurity culture.

As mentioned above, the utilities in Mississippi use threat detection and monitoring software, as well as maintain incident response plans that include cybersecurity incidents. They also participate in information sharing and collaboration communities.

# Event Management

Planning, Preparation, & Response for Electric, Water/Sewer, Natural Gas, & Telecommunications

V.

Managing an extreme weather event has many facets for utilities across the state to consider. The survey distributed by the Mississippi Public Service Commission and subsequent conversations with utilities focused on continuous actions, imminent event actions, response management, and post-event evaluation.

## A. CONTINUOUS ACTION

Actions taken outside of peak storm seasons and weather events are critical to plan and prepare for disasters. Weather monitoring is a key component of these actions. Atmos Energy's Dispatch, Gas Supply, Technical Services, and Operations teams survey weather forecasts for potential impacts in its service areas. Northcentral Electric Cooperative stated that its staff monitors conditions daily for all emergencies and has personnel and facilities available 24/7 to respond to issues. System modeling and studies are also important continual actions that utilities can institute to prepare for disaster events. As a continual standard of preparation, EML conducts yearly assessments to prepare for extreme weather conditions. If problems are seen, EML prioritizes projects to resolve forecasted overloads or voltage issues during peak seasons (summer and winter months). Atmos stated that, after the 2021 winter storms, its systems were modeled in terms of the weather event to validate theoretical models and modify the system based on actual performance. Atmos regularly assesses system capacity with new customers to ensure supply will meet peak demand during weather extremes.

Most utility companies in Mississippi have detailed emergency response plans in place for disasters and major weather events including tornadoes, thunderstorms, ice storms, and tropical events. MPC updates its disaster response plan annually prior to hurricane season. This annual planning process for MPC includes assigning specific disaster responsibilities to each employee, maintaining contracts with key vendors, and verifying stock of storm inventory. MPC attributes its success in restoring service post-event to its annual planning and preparation. More specific details on information within these reports are listed in the following Imminent Event Actions and Managing the Response sections. However, some smaller districts, like Belmont Municipal Gas, do not have any official pre-event and disaster response policies. In its responses to the survey, Belmont Municipal Gas stated that it is open to guidance in preparing a more detailed disaster response plan.

In addition to maintaining emergency response plans, some utilities have annual drills/exercises to help form their plans. EML employees participate in annual storm drills to evaluate storm processes and staff readiness. CenterPoint Energy credits its efficient disaster response to trained and well-equipped employees. CenterPoint's employees are cross-trained and field-trained to prepare for disaster events. Northcentral Electric Cooperative holds monthly safety meetings that review the Emergency Radio Communication Plan, Fire Safety and Evacuation Plan, Building Emergency Plan, and Severe Weather Emergency Plan. Atmos Energy holds a preparation meeting each fall to review past winter performance, any system changes in the year, active projects, system flow in peak demand, and winterization activities. Winterization practices include: inspecting and replacing equipment parts, procuring winter safety equipment, and reviewing and installing pressure monitoring devices at expected low pressure points.

Most investor-owned and cooperative electric utilities maintain a list of critical infrastructure facilities to be prioritized for protection or expedited restoration in the case of a scheduled load shed or a service outage. EML lists facilities that are heavily protected during load sheds, such as major hospitals, major airports, fire and police stations, water systems, major broadcasters, and major industrial plants. MPC also has a program called L.I.V.E. (Lines Into Vital Equipment). This program flags electric service accounts for customers who are reliant on special medical equipment, such as dialysis machines and respiratory equipment.

In disaster response situations, natural gas suppliers can experience strain on their supply due to additional need and shortages due to lack of power supply. Because of this, they may place curtailments on certain customers to limit their supply. Natural gas suppliers, such as Atmos Energy and Bay Springs Natural Gas, keep a continuous list of customers that are subject to curtailment as well. All the companies surveyed keep open communication with their users regarding possible interruptions. CenterPoint Energy states that curtailment focuses on non-human needs customers first.

### B. IMMINENT EVENT ACTIONS

Emergency response begins when an extreme weather event is detected in a utility service area. The emergency response plans created by utilities detail preparations for an imminent threat. These preparations include protocols on availability of personnel, securing lodging and meals, and additional personnel needed. In correspondence, both Atmos Energy and EML stated that personnel availability is always an issue during disaster response, and mutual aid agreements are critical. Atmos Energy utilizes the Incident Command System (ICS) for a "cooperative emergency response by multiple external agencies, company employees across multiple states, and mutual aid partners." EML has extra staffing especially during MISO directed load shed events. MPC's first step in response is determining if outside resources will be necessary. Most utilities in the state have pre-event mutual aid contracts. North East Mississippi EPA and Fiber utilize mutual aid assistance from Electric Cooperatives of Mississippi (ECM) and National Rural Electric Cooperative Association (NRECA). Sebastopol Natural Gas has mutual aid agreements with the Town of Walnut Grove Natural Gas System for assistance and resources during extreme events. Water systems have the ability to join the Rural Water Emergency Assistance Cooperative (RWEAC) to acquire backup support in the event of an emergency. Some smaller co-ops and districts do not have formal mutual aid established and reach out to neighboring utilities when a weather event is imminent.

The next common step for most utilities for an upcoming event is conducting pre-event meetings. CenterPoint stated that in these meetings its management teams establish strategies, communications, and action items to implement prior to the event. CenterPoint listed established lines of communication within the company as an important aspect of its recovery effort. MPC also attributed success in recovery to internal communication between company Disaster Directors to ensure situational awareness. Belmont Natural Gas held a meeting with the mayor, board of aldermen and all department heads to discuss any areas of concern leading up to the February 2021 winter storms.

Preparing resources and customers is another important aspect of imminent event actions. CenterPoint Energy identifies any potential constraints on the gas supply and contacts customers who can be curtailed prior to a weather disturbance. Many electric co-cops will notify critical facilities, if a list is kept, of possible outages. In preparation for extreme weather events, EML reviews expected natural gas requirements and procures necessary volumes in advance of the peak demand. Electric co-ops like Coahoma Electric Power Association identify materials and equipment necessary for disaster response and restoration as an event is approaching. In its responses, Sebastopol Natural Gas listed some its pre-event preparation steps and resource checks. They include:

- Emergency lights and communications systems
- Battery operated weather, AM/FM radio, and television
- Rain clothing and winter clothing
- Marking flags, paint, and barricades
- Trucks and digging equipment

### C. MANAGING THE RESPONSE

Emergency Response Plans also list actions taken by utilities in managing response immediately after a major weather event occurs. 4-County Electric has response protocol specific to small, intermediate, and major storms. 4-County's plan details best management practices for any type of event, including:

- Dividing its systems into work areas
- Utilizing personnel in an efficient and safe manner (assigning restoration work tasks, no crews deployed after dark, no work past 9pm, communication of work completed during shift changes)
- Central Command room for management team
- Divided assessment (outage assessment and damage assessment)
- Staged assessment (major feeders, then known damage areas, then detailed assessment)

CenterPoint listed two important aspects of managing response as continuing communication amongst managers and employees and line locating. Line locating is critical for natural gas supplies to ensure that supply does not get interrupted due to underground activities of the recovery efforts of other utilities, like digging. Natural gas suppliers have engineers monitoring infrastructure throughout the event to adapt to any changes from initial line assessment. North East Mississippi EPA and Fiber also stated that communication between the CEO and all members of the company's management team is an important aspect of response. Supervisors then communicate with their specific departments to keep communication lines succinct. EML stated that all utilities' damage assessments are critical for efficient restoration after an event. EML's damage assessors are trained annually on how to safely, efficiently, and accurately identify damage.

### D. POST-EVENT EVALUATION (LESSONS LEARNED)

Lessons learned from disaster events are a key component to enacting best management practices in disaster response. Most utilities in the state of Mississippi have some level of post-event evaluation established and incorporate lessons learned into future event response.

Investor-owned electric companies can have access to post-event evaluation if they are members of the Southeast Electric Exchange (SEE) Mutual Assistance Group. In Mississippi, MPC is a member of this organization. After a major event, SEE meets to discuss lessons learned, best practices, and aid areas affected. EML conducts internal meetings for lessons learned and validation that issues identified are being addressed. CenterPoint Energy conducts an "After Action Review" in response to major weather events. This review identifies potential solutions to enact permanent remediation plans to avoid future problems. These solutions are then documented in CenterPoint's Emergency Response Plan.

Some utilities do not have structured post-event response reviews, especially gas and water districts. Belmont Natural gas stated in its response to the questionnaire that it does not have a structured post-event evaluation plan and is open to any suggestions on setting up this structure. MSDH was unaware of any post event activities that water utilities have taken to determine what needs are for the next event. Electrical cooperatives in Mississippi have the opportunity to utilize lessons learned from the Electric Cooperatives of Mississippi (ECM). North East Mississippi EPA and Fiber stated in their correspondence that they participate in ECM's Emergency Workplan Workshop to discuss any problems or necessary edits to the cooperative-wide plan. Northcentral Electric Cooperative detailed that its staff meets after an event to discuss problem areas and improvements.

Atmos Energy and CenterPoint Energy detailed some lessons learned from recent disasters like the 2021 winter storms in their responses. Atmos stated that refining communication to customers to deliver key information is a top priority. Atmos has enhanced its customer communication practices since the 2021 winter storms. An element of this change has been boosted communication campaigns to customers and communities on awareness of winter weather preparedness actions and ways to manage increased energy bills. Atmos has also amended contact listings for large volume, interruptible customers to include information that is effective outside of business hours. In post-event evaluation, CenterPoint Energy pinpointed common issues in certain weather situations. Frozen regulators are typical in winter storms. Common issues during hurricanes are debris on regulatory stations and meters and damage in storm surge areas.

# Communications to Key Stakeholders

(Protocols & Process, Platforms & Mediums, Timing & Alert Triggers)

VI.

Communication is a vital part of emergency response to allow utilities, customers and other stakeholders proper time and resources to prepare and respond to an event. Key stakeholders include the Mississippi Emergency Management Agency (MEMA), the Public Service Commission, local officials, law enforcement, first responders, and the general public. Utilities across the state of Mississippi have communication protocols established before, during, and after an event to distribute critical information related to the disaster. These communications responses are outlined in Emergency Response Plans for many of the companies.

Since most utilities monitor the weather several days in advance, they can put emergency communications into effect before a major event occurs. For example, in response to the February 2021 winter storm, EML started communications with its customers six days before it was required to shed load. EML begins email correspondence on weather guidance and general preparations to the Public Service Commission, MEMA, and customers prior to an event. Atmos Energy's Public Affairs team also communicates with the Public Service Commission, customers, media, and elected officials immediately after an event is identified. This pre-event communication pertains to preparations that can made to better equip the public for potential damage. Atmos also continually updates its curtailment customer contact list and keeps clear, concise communication with curtailment customers prior to a potential supply shortage. CenterPoint Energy's Manager of Regulatory Relations contacts the Public Service Commission, the Mississippi Public Utilities Staff, and the Division of Pipeline Safety when its Emergency Operations Plan is implemented. Information shared includes pre-storm staging plans and areas of potential service/operations interruption. For utilities under the authority of federal regulators, staff communicates with those regulators to give updates on system preparedness and status. For example, Northcentral Electric Cooperative communicates with the Tennessee Valley Authority prior to major expected events.

Communication between utilities and key stakeholders continues as an extreme weather event progresses. Atmos Energy detailed that its Public Affairs team provides information to the Public Service Commission on significant customer outages of more than fifty customers due to supply curtailment, low pressure, equipment malfunction, or damage to facilities. In certain cases for extreme storms like Winter Storm Uri, the Governor, Lieutenant Governor, and other necessary legislators are also updated on system performance during and after an event. The Public Affairs team communicates on a local level with mayors of affected areas to discuss service status and specific needs. Smaller co-ops and municipal districts also keep close contact with the mayor during disaster response to relay up-to-date information. Northcentral Electric Cooperative engages with emergency management organizations during major events to share restoration progress and to ensure the methodology data is maintained to facilitate reimbursement. In its responses, EML stated that it initiates email correspondence with MPSC and MEMA throughout an event to relay information, such as outage statistics, current weather forecasts in the service areas, and adjustments to the restoration plan.

Utility companies use a variety of different media to communicate with customers and the public. However, some water utilities do not have crisis communications and protocols in place. CenterPoint Energy listed its main forms of communication as social media (Facebook and Twitter), email, news releases, and media interviews. Many companies, like Northeast Mississippi EPA and Fiber use social media as a primary way to reach customers before, during, and after an event. AT&T uses social media to identify customer issues and give updates during an event. Electric companies also rely on their websites to deliver updates to customers. EML and MPC both referenced outage maps displayed online that can assist customers in obtaining information of affected areas post-event. To handle the influx of calls and correspondence post-disaster, some utilities acquire additional personnel resources. EML expands its social media team before, during, and after major weather events to post updates and respond to questions. Natural gas utilities, like Belmont Natural Gas, and co-ops, like Northcentral Electric Cooperative, have employees on call 24/7 to address customer needs during an event.

# Recommendations for Each Utility Sector & Cross-Cutting Actions

VII.

## INTRODUCTION

The recommendations included below outline high-level, near-term actions and long-term measures that should be considered to build upon both the lessons learned and the successes of Mississippi's overall response to the 2021 winter storms and other recent extreme weather events. The recommendations also address actions that could increase overall system resilience and reliability.

## OVERARCHING RECOMMENDATIONS

### *Formalize a Forum for Ongoing Preparedness Planning and Information Sharing*

It is recommended that the MPSC establish a formal, semiannual forum to bring utility general managers and other key personnel, legislators, statewide groups and associations, and community leaders together to discuss severe weather and cybersecurity preparedness best practices and facilitate information sharing across utilities. This forum will allow for statewide collaboration between the utility sectors. Additionally, it will allow leaders and elected officials to see the effects of proactive investment. Recent reports have suggested that every dollar invested in mitigation saves up to $13. Finally, this forum will allow utilities to share first-hand experiences and new ways to mitigate future losses.

### *Strengthen Cybersecurity Defenses*

Utilities are facing cybersecurity threats that are increasing in frequency, severity, and sophistication. While utilities across the state of Mississippi possess some level of cyber security programming, threats of this nature can quickly render technology and other solutions outdated. MPSC should partner with the cybersecurity industry, state and national security organizations, and utility associations to provide ongoing education on new and emerging threats and threat actors, develop tools and resources for improving cybersecurity capabilities, and facilitate training opportunities, including simulated grid attack exercises.

### *Establish and Maintain Emergency Response Plans*

Each utility should establish and actively maintain an emergency response plan. This plan should be considered a living document that is continuously updated. Staff members should be familiar with the document and take an active role in updating it. As severe weather events increase in frequency and severity, utilities should frequently reevaluate response plans to understand which risks are increasing and construct dedicated sections to address challenges and considerations unique to the type of event (winter storms, hurricanes, tornadoes, etc.). In addition, utilities should conduct post-event action evaluations and update emergency operating procedures with additional details and lessons learned after each event.

### *Create Fuel Supply Redundancy and Diversification*

Mississippi utilities are heavily dependent on natural gas, a fuel source that experienced procurement challenges in the aftermath of a severe weather event. To build fuel redundancy and diversify the fuel supply to further protect Mississippi from shortages and potential price spikes, it is recommended that the MPSC 1) identify opportunities to implement multiple supply sources for utilities currently relying on laterals from a single pipeline, 2) explore options for increasing natural gas storage, 3) implement actions to evaluate feasibility of alternative fuel sources, and 4) review performance and capacity factors of the generation fleet across the state and the fuel contracts with its private sector partners.

## PREPAREDNESS RECOMMENDATIONS BY SECTOR

### *Electric Utilities*

According to the Federal Energy Regulatory Commission (FERC), trees are the leading cause of electric service interruptions, especially during major weather events (e.g., ice storms, hurricanes). Anecdotal reports from utilities across the region underscore the importance of routine vegetation management as a means of lessening and avoiding service disruptions.

***Technology and Data Capture***

Incorporating drone or satellite technology can improve the efficiency in which utilities can identify and prioritize areas and utility equipment at risk due to troublesome vegetation such as overgrown trees and bushes along electric corridors. As data is captured and stored, it can be used to build predictive models to detect problem areas and potential hazards, reducing costs and helping to optimize trim cycles.

***Customer Education Programs***

According to an article published by POWER, "utilities are already pushing 'right-tree-for-the-right-place' initiatives to ensure that there is a balance between the decorative trees customers are planting and the clearances needed to ensure the safe operation of their distribution system." Other utilities have reported similar programs and outreach initiatives designed to help homeowners plant trees in strategic locations that will not present a risk in the future.

**RECOMMENDATION:** Updating vegetation management processes to leverage technology and data capture and educating customers are two important actions that can help mitigate impacts on the distribution system.

### *Water/Sewer Utilities*

Water distribution utilities across the state reported electrical malfunctions, line breaks, well malfunctions, power outages, tank malfunctions, and system malfunctions which led to pressure losses. Heat trace systems, insulation, weatherproof cladding of critical components subject to freeze, and building enclosures are potential solutions to help address this problem.

The EPA's Power Resilience: Guide for Water and Wastewater Utilities includes information from water industry professionals on how to increase power resilience at drinking water and wastewater utilities using generators, fuel supply planning, on-site power, microgrids, and other methods. The guide provides step-by-step instructions to water and wastewater utilities on conducting a facility-specific generator needs assessment. This can significantly reduce response time during an emergency.

**RECOMMENDATION:** MSDH, MDEQ, MPSC, and/or other agencies of jurisdiction should create minimum standards for weatherization for distribution-side of systems and water/wastewater emergency plans. Drinking water and wastewater utilities should include these plans in their annual reports.

### *Natural Gas Utilities*

As stated earlier, facilities in the southern United States are typically not constructed within enclosed structures, leaving important equipment and systems vulnerable to freezing temperatures and other weather extremes. Catalytic heaters are often used to keep the body regulators warm to avoid freeze offs from pressure differentials. Pressure differentials within the regulator can cause liquid to build up, and when that liquid freezes within the orifices of the regulators, it causes failures.

**RECOMMENDATION:** It is recommended that gas utilities use catalytic heaters to protect critical regulators from cold temperatures.

### *Telecommunications Utilities*

A key vulnerability in telecommunication systems is the reliance on the power supply for operation. Utilities in general also cited challenges reaching and communicating with outage areas in the immediate aftermath of a severe weather event.

**RECOMMENDATION:** It is recommended that utilities explore the use of portable telecom infrastructure, including wireless cell on wheels (COWS) and cell on light truck (COLTS), and telecom utilities should utilize all-terrain vehicles to speed post-event response. Load growth and power distribution challenges should be factored into the needs and plans for emergency generation, including but not limited to fuel sources, pre-staging resources, and emergency access routes.

## ITEMS FOR ADDITIONAL CONSIDERATION

Based on responses and comments received from participants during the review process, additional suggestions and best practices are included below for further consideration by the MPSC.

**Critical Supplies Tracking:** During severe weather events, it is important for utilities across the area of impact to have visibility on available resources. The MPSC should assist with finding materials and keeping inventory of critical supplies to facilitate resource sharing. Post-disaster events, unused materials and supplies should be offered to neighboring states when Mississippi is not within the area of impact.

**Emergency Communications to Customers:** The MPSC should consider developing an emergency communications checklist that outlines critical steps utilities should take to ensure pertinent information reaches customers in a timely manner. The checklist should be supported by a series of event-specific, templated scripts and social media graphics that utilities can build upon and tailor these materials to fit their own systems and customers.

**Physical Security:** The MPSC should perform a statewide risk assessment to identify types of physical threats, determine the most vulnerable portions of the grid, and determine the most appropriate solutions to reduce risks.

**Implementing Hardening Measures:** Hurricane-force winds and significant ice-accumulations are the primary causes of damage to electric utility transmission and distribution infrastructure. Hardening of transmission systems, including upgrading wooden poles to other types of materials, should be considered for areas of historical high impact. The MPSC should work with electric utilities to review the entire transmission system to identify high impact areas and prioritize pole upgrades and other appropriate hardening activities.

**Pursuing Available Funding Sources:** The MPSC should consider developing informational materials to help utilities stay aware of potential funding opportunities and associated eligibility or application requirements. Further, all utilities should have a hazard mitigation plan so that Mississippi is well positioned to take advantage of statewide mitigation funding that becomes available with any declared event within the state, including hazard mitigation program funds associated with the COVID-19 pandemic.

**Mutual Aid Agreements and Pre-Position Contracts:** Prior to a severe weather event, it is recommended that utilities reach out to state agencies and associations, local mutual aid resources, and

co-ops that are not projected to be affected or will have minimal exposure to the impending event to inform them of the situation and alert them that additional resources may be needed. It may be appropriate to prepare to house staff and provide meals pending the severity of the situation and whether it falls within their mutual aid contracts and FEMA per diem rates. Similar requests may also be made regarding fuel, snacks, ice, toiletries, or other essential needs.

It is also recommended that utilities contact current vetted contract resources to 1) confirm rates, 2) collect digital documentation to support current rates, and 3) review contracts for any necessary amendments. A post-event assessment of contracts that were or were not utilized and additional needs that were not covered by pre-positioned contracts is also important to capture as emergency response planning procedures are revised and adapted to incorporate lessons learned.

**Ongoing Training:** Utilities should maximize the use of available training resources offered through MEMA and state and national associations for new hires, employees who are promoted into new roles or transferred across departments, and, periodically, as a refresher for seasoned employees.

# Endnotes

VIII.

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