




BLACK & VEATCH

An aerial photograph of a city street completely inundated with floodwater. The water is murky and filled with debris, including twisted metal, wood, and other wreckage. Buildings on either side of the street show significant damage, with some roofs missing and structures partially submerged. The scene is lit with a warm, golden light, suggesting a sunset or sunrise, which adds a somber and dramatic atmosphere to the image.

**Four Steps** to Natural Disaster Resiliency and Response  
for Power, Water, and Telecommunications Providers

# Introduction

In 2022, natural disasters cost the U.S. [\\$175.2 billion in damages](#). Floods, hurricanes, tornadoes, earthquakes and wildfires pose dangerous threats to critical energy, water and communications infrastructure such as power lines, dams, and cell phone towers. In the wake of these natural disasters, the essential nature of the services that power, water and telecommunication providers deliver becomes even more obvious. Service outages during extreme weather events threaten public health and safety and disrupt the economy. Without power, families can't heat their homes amid sub-freezing temperatures. Without running water, community members become dehydrated or very sick. Without communications networks, the public can't receive life-saving evacuation warnings. Interruption of these services pose a significant threat beyond just financial loss and damage to reputation; the operational integrity of this critical infrastructure is vital to the community, and any disruption could endanger lives.

Disaster resiliency and response are top of mind for virtually every industry. It keeps energy, water, and communications providers up at night: a major storm has rolled through, and customers are without service. Systems need to be back up and running again as soon as possible. By adopting a proactive approach, it becomes possible to mitigate the risk of service disruptions altogether. Essential services providers should consider the following four steps on the resiliency-bolstering journey: ***Plan, Prepare, Respond and Recover.***



# Step 1: Plan

Natural disasters are cyclical. The main goal of resiliency is to break the cycle so that the impacts of the next disaster are less severe for people and property. Planning and preparation may seem synonymous, but in this context, planning refers to actions taken years if not decades ahead of time. Consider the way we plan for our personal health and well-being; making preventative care visits before there's an issue and talking with your doctor about long-term diet and exercise habits lowers the risk of unforeseen health crises in the future. Similarly, safeguarding our critical infrastructure requires a proactive approach centered around prevention. In the planning phase, it's critical for services providers to evaluate natural disaster-related risks, identify vulnerable assets and infrastructure, and determine what can be done ahead of time to mitigate these risks.

## Design for Resiliency in New Infrastructure Construction

Although retrofits and repairs are unavoidable in some cases, the ideal strategy is to consider resiliency at the time of design and construction – going back as far as the site due diligence and land use planning stages. Before embarking on the development of critical infrastructure, consider the geographical features, elevations, and water levels of the proposed site. For ongoing construction projects, implement strategies to protect assets and equipment. Floodplains and shorelines are shifting, so assets close to waterways should consider a hydrology study and coastal terrain mapping. Energy utilities may want to consider a long-term approach to undergrounding their distribution and transmission lines in regions prone to weather-related disruptions; underground lines are less vulnerable to storm damage, falling debris and other environmental factors that cause outages.

## Mitigate Impacts to Existing Infrastructure

Aging infrastructure tends to be more at-risk; it's recommended to perform routine inspections and maintenance of rights-of-way. Develop a comprehensive hazard mitigation plan that includes

a thorough risk assessment, operational optimizations, disaster procedure development, personnel training, and technology upgrade recommendations. Procure essential replacement parts and equipment ahead of time to avoid supply chain disruption in future emergencies. Analyze organizational effectiveness to assure staff are trained and available at critical times. Frequently test communications networks used to distribute evacuation warnings and other life-saving information. Many areas also have Local Emergency Planning Commissions (LEPCs) available to advise utilities directly on how to make infrastructure and operations more resilient.

## Consider Climate Modeling

As weather events increase in severity, climate risk modeling is another modern planning measure that benefits service providers. Engaging a climate trend analysis consultant can provide valuable insights and help you make informed decisions regarding your service area. Predictive analytics reveal when existing infrastructure and physical assets may be at risk in the near and long term. These insights will help determine what, where and when to prioritize climate risk mitigation measures. Climate risk modeling also helps with making a strong business case for system hardening by enabling a cost-benefit analysis of potential preventative investments. [Black & Veatch's eBook on climate modeling for utilities](#) explains how to address key factors including location, weather patterns and climate change data.

### CASE STUDY

## Proactive Texas Utility Protects Customers a Decade After Implementing Winterization Strategies

In February 2021, a powerful storm blanketed Texas with snow and ice. Record low temperatures knocked out power and heat to 4.5 million homes and businesses across the state. More than 200 lives were lost, and property damage amounted to more than \$190 billion. New concerns arose about confidence in the grid's resiliency.

In the western Texas town of El Paso, the situation was significantly different. Out of El Paso Electric's 443,000 customers, less than 3,000 lost power during the polar vortex. Why was this city faring better than the rest of the state?

Ten years prior, El Paso had experienced a traumatic storm which, at the time, was the region's worst weather event in half

a century. After these life-threatening service disruptions back in 2011, El Paso Electric decided they would never let this happen to their city again. The utility enlisted Black & Veatch's expertise and spent 18 months winterizing their generation, transmission, and distribution assets. The Black & Veatch team methodically examined the following aspects to mitigate the likeliest causes of system failure during a freeze:

- Feedwater and drum levels
- Freeze-prone instruments
- Potential measurement piping leaks that dampen insulation and reduce effectiveness
- Vulnerabilities of blowdowns and steam drains

- Aging freeze protection systems, including pipe-warming heat trace cables
- Maintenance checklists and work processes specific to preparing for and enduring winter months

El Paso Electric set a prime example for other utilities by taking system hardening measures to bolster grid integrity. Objective evaluations, robust actions, and long-term planning are critical to protect communities from increasingly severe weather events such as what we saw in Texas in 2011 and again, a decade later, in 2021. In the event of the next polar blitz, strategic winterization blueprints could keep utilities and their most vulnerable customers from being left out in the cold.



# Step 2: Prepare

During the preparedness phase, plans are executed to ensure that people, equipment, resources and infrastructure are ready before disaster strikes. Although actions in the preparation phase still are considered preventative measures, the time available to implement them may be more limited than during the planning stage. Regardless of missed planning opportunities, preparation efforts still are more affordable than emergency responses and can minimize outage and recovery timelines.

## Focus on Low-Cost, High-Impact Strategies and Mobilize Personnel

There are cost-effective, high-impact preparation measures such as deploying sandbags to strategically re-route stormwater in flood-prone areas. If applicable to the type of natural disaster the community is experiencing, monitor the progress and adjust the response as necessary.

## Closely Coordinate with Other Stakeholders

To protect inhabitants of the service area, it's critical to cooperate with the federal, state and/or local emergency management departments and collaborate to prepare a customized, comprehensive plan. These public safety officials have the authority in all jurisdictions to enforce evacuations, and it's essential for all stakeholders (including other utilities, law enforcement, transit agencies, and local businesses) to follow their instructions in disaster situations. The emergency management department has planned for the worst-case scenario (such as a downed power line over a major road) and developed redundant evacuation routes to get people out of harm's way. Make sure personnel are informed on the latest version of this plan. Prepare a procedure on how to communicate real-time hazard updates and outages with customers and other affected stakeholders.

## Offer Specialized Support as Appropriate

An organization may be called upon to provide support under the guidance of the local emergency management department if they possess capacities and capabilities that the department does not have. For example, communications providers may be tasked with issuing evacuation watches and warnings so residents can prepare at home and be well-informed of exactly what to do and where to go if the situation worsens.

### BONUS STEP

## Digitize the Built Environment to Identify Vulnerable Assets

Maintaining current inventories of field assets creates serious challenges for power, water and telecommunications providers as existing infrastructure deteriorates or becomes obsolete. Drone and satellite imagery are widely available, but may not provide sufficient resolution for ground-based engineering work. Manual data collection can be prohibitively expensive and time-consuming. With GeoAI, Black & Veatch is leveraging artificial intelligence to make data collection more accurate, efficient, and affordable for critical infrastructure providers.

The [California Public Utilities Commission \(CPUC\)](#) ensures safe, reliable, and affordable utility service for residents of California. Owners are required to provide detailed information about every electric and communications pole attachment in their asset inventories. Sharing data and managing poles are more than just good regulatory business practices; they are essential to ensuring public safety. Poles overloaded with unauthorized attachments have collapsed or experienced equipment failures, resulting in major wildfires. Other poles weakened by termites



and dry rot have been knocked down by windstorms. These situations are not uncommon, but they are preventable. Ground-based imagery and data collected through GeoAI can be used to build accurate asset inventories and perform preventative maintenance, mitigating loss of life and property damage.

While these CPUC use cases are more focused on planning and preparation, GeoAI can also benefit energy, water, and communications providers in the response and recovery phases:

- Pre- and post-event imagery can be compared to detect condition changes and triage damage responses.
- Damage assessments can be conducted remotely and quickly, and emergency personnel can be deployed on an as-needed basis.
- Accurate asset condition imagery accelerates the administrative process when applying for relief funding from federal and state governments.

# Step 3: Respond

Much like planning and preparation, response and recovery sometimes are seen as interchangeable, but the distinction in this context is important. Response refers to actions taken during and immediately after a natural disaster, while recovery refers to the more long-term efforts to get a community back on its feet. With aging infrastructure plaguing virtually every service provider, the possibility of failure is looming. The planning and preparedness phases are critical for increasing the resilience of these systems, and those pre-disaster phases should inform response and recovery activities when facing the threat of a system failure.

## Prioritize the Three Ps: People, Property and Prevention

Response efforts include protecting people, protecting property, and preventing the situation from escalating. Even if the customer has been evacuated from the service area, the hazards aren't gone. A damage assessment and triage of district assets needs to be completed to identify and immediately address broken water mains, live electrical wires and fallen communications poles. Damage assessments can be completed by personnel on foot, by vehicle, through remote-enabled technology such as drones, or a combination of these methods. Service providers benefit from employing either in-house or external damage assessment professionals that can be mobilized immediately after a natural disaster.

## Safely Repair Assets and Restore Services

Restoration of energy, water, and communications services is also important in the response phase. It's not safe for customers to go without heat, clean drinking water, or timely emergency announcements. To ensure a complete restoration of operations, deploy crews for repair and replacements as necessary. Conduct adequate testing of repaired equipment and infrastructure before restoring to full operation.



### CASE STUDY

## Supporting Utilities Through the Biggest Storms of Our Generation

Bird Electric, a Black & Veatch company, is a self-perform electrical construction service provider with a national reach in emergency power restoration. In early 2023, Winter Storm Mara had damaging, widespread impacts from Texas to Tennessee — causing more than 150,000 systemwide power outages. A local energy utility hired Bird Electric as an outside contractor to augment their ongoing power restoration efforts. The utility historically hadn't needed to request external contractor support,

but the unprecedented scale of these outages and post-storm conditions of ice and fallen trees called for special expertise. Bird Electric provided essential equipment and placed more than 1,000 full-time employees in the field. Coordinating a vast number of outside resources resulted in logistical, staging, and assignment challenges, but Bird Electric was able to expedite crew onboarding and resource allocation. Collaboration with the utility enabled safe and timely restoration of power for the impacted community.

# Step 4: Recover

Recovery encompasses long-term and future-focused efforts to restore damaged infrastructure and get the community back to “business as usual.” These recovery efforts could take months, years or even decades depending on the severity of the disaster and the region’s level of resiliency. Mitigation activities should be considered while conducting recovery efforts, to increase resiliency and ensure that future disasters do not repeat the same damage to infrastructure.

## Leverage Applicable Funding

If an organization is eligible, the recovery phase presents an opportunity when federal funding may become of greater interest. The Infrastructure Investment and Jobs Act (IIJA) provides funding for new and existing programs related to storm resiliency and response. Even with billions of dollars on the table, it can be challenging for power, water, and communications service providers to navigate the funding available for recovery efforts and the complex requirements. Consider working with [an expert consultant partner](#) that specializes in getting the most out of federal grant dollars.

## End at the Beginning: Continue Bolstering Resiliency to Break the Cycle of Devastation

The recovery phase builds upon all the previous steps: planning from years prior, preparation from just before disaster strikes and damages remaining after the initial response. Although recovery is the “final” step in this context, this is actually where the resiliency journey makes a full circle back to the planning phase. Reflecting on lessons learned and continuously improving the resiliency plan is essential to prevent history from repeating itself.



### BONUS STEP

## Leverage Rapid-Deploy Modular Solutions to Accelerate Recovery

Mobile and modular solutions offer a range of benefits including rapid deployment, cost-effectiveness, and the potential to provide life-saving services during times when critical infrastructure and essential buildings are undergoing repairs. These solutions are designed to be scalable and adaptable for many situations relating to disasters:

- Command centers to coordinate first responders and volunteers
- Storage and distribution locations for food, water, and other essential supplies

- Shelter for community members whose homes have been compromised or destroyed
- Field medical facilities to tend to the injured

Mobile and modular solutions can even be prefabricated and stored so they are ready to “plug and play” in the wake of a disaster, ensuring redundancy when combined with other response and recovery strategies. Although mobile and modular solutions are not necessarily intended to be used long-term, they allow communities to begin the recovery process as quickly as possible, minimizing suffering for those affected.

# Collaborate with an Expert Advisory Partner to Guide Your Resiliency Journey

Natural disaster-related dangers are only increasing in severity. In terms of climate risk, half of all U.S. states will be in the [top 5% most at-risk locations in the world by 2050](#). Many critical systems are built upon aging infrastructure and are at risk of catastrophic failure. Providers haven't been able to make upgrades due to complicated funding qualifications or uncertainty about the best path forward. Fortunately, [expert advisory partners](#) are available to help power, water, and communications providers navigate all the complexities of developing a robust and comprehensive resiliency strategy.

At the end of the day, the core mission is to ensure uninterrupted water, energy, and communications service for customers, regardless of the challenges posed by nature. Although all four of these steps — plan, prepare, respond and recover — are important, planning cultivates the biggest opportunity to mitigate risk and bolster resiliency. Mapping out resilience before critical infrastructure is even built is ideal. Collaborating with a design-build expert that offers a full suite of engineering, construction, management,

funding advisory, and disaster readiness services can provide numerous advantages for both new and existing assets. By partnering with a company that offers all these capabilities in-house, providers can benefit from a streamlined process that ensures continuity and consistency throughout the project lifecycle. This approach can help to optimize project outcomes, reduce delays and budget overruns, and ensure that assets are well-equipped to withstand natural disasters and other disruptive events.

[Black & Veatch shares your commitment to your communities. Whether we're preparing for future disasters or rapidly responding to service disruption emergencies, Black & Veatch and our subsidiary Bird Electric have the resources to plan and execute recovery strategies across the nation. Backed by more than 100 years of delivering critical infrastructure, we can provide step-by-step guidance or just fill in the specific areas of expertise that you need. Contact us to learn more about developing a customized plan to protect your energy, water, and communications operations — above all, protecting your customers.](#)

## How resilient and responsive are your services?

Contact us