
“EXTREME WEATHER MEANS WE NEED TO DO OUR PART TO KEEP THE GRID RESILIENT”
— TONY, Chief Field Inspector
Honeywell

UTILITIES' ROLE IN PROTECTING THE GRID AGAINST EXTREME WEATHER

The modern power grid faces increasing exposure to extreme weather, which stresses generation, transmission and distribution systems and can lead to outages, safety risks and economic disruption. Extended outages disrupt businesses, schools and emergency services, while increasing energy volatility. Infrastructure costs are ultimately passed on to consumers. By strengthening the grid, utilities can better manage load growth, integrate renewable energy and reduce costs to deliver more reliable service to communities.

WEATHER-RELATED POWER OUTAGES IN THE U.S.

Weather-related events are responsible for most major power outages in the United States, primarily because most of the country's electrical infrastructure is above ground and exposed to environmental stressors.

- **70%** of the U.S. power grid is over 25 years old[1]
- **2X** weather-driven outages in 2014-2023 compared to 2000-2009[2]
- **80%** of all major power outages in the U.S. were weather-related (2000-2021)[3]
- **$150 billion** in costs due to outages in the U.S. annually[1]

$10.5 BILLION FEDERAL INITIATIVE[4]: GRID RESILIENCE AND INNOVATION PARTNERSHIP (GRIP)

Resources and guidance for utilities to modernize the grid faster and more efficiently

- **Supports 105 projects in all 50 states**
- **Strengthens generation, transmission and distribution infrastructure**
- **Accommodates rising electricity demand and renewable energy integration**
- **Improves outage response and resilience against extreme weather**

LEADING CAUSES OF POWER OUTAGES

Understanding the causes of failures and their impacts can help utilities plan for prevention and restoration.

WEATHER EVENT[2]	MECHANISM OF FAILURE	IMPACT & MITIGATION
58% **SEVERE WEATHER** (high winds, rain, thunderstorms)	Uprooted poles, falling trees, conductor snapping, thermal stress on equipment	**Impact:** Widespread outages, network severance, localized grid instability **Mitigation and Response Measures:** Regular tree trimming, pole reinforcement, conductor maintenance, use of weather-resistant equipment, real-time monitoring of grid stress, rapid response crews for restoration
23% **WINTER WEATHER** (snow, ice, freezing rain, extreme cold)	Ice loading, line sag, structural overload, icing on equipment, fuel supply strain	**Impact:** Collapse of lines, prolonged restoration, cascading outages **Mitigation and Response Measures:** Weather-proofing lines, heating elements on critical equipment, structural reinforcement, proactive de-icing, emergency fuel reserves, predictive weather modeling for pre-staging crews
14% **TROPICAL CYCLONES** (including hurricanes, flooding and storm surge)	High winds, flooding, debris impact, substation inundation, corrosion	**Impact:** Short circuits, asset destruction, extended outages **Mitigation and Response Measures:** Elevated substations, flood barriers, wind-resistant structures, corrosion-resistant materials, pre-storm shutdowns of vulnerable lines, post-storm rapid assessment and repair teams
3% **EXTREME HEAT** (heat waves, dangerous temperatures)	System overload	**Impact:** Outages due to increased demand **Mitigation and Response Measures:** Demand response programs, upgrading transformers and conductors for high temperatures, real-time load management, public energy-saving campaigns
2% **WILDFIRES**	Systems overheating or malfunctioning due to high temperatures	**Impact:** Shutoffs to reduce risk of equipment-related ignitions **Mitigation and Response Measures:** Vegetation management, insulated or underground lines, proactive public safety power shutoffs (PSPS), fire-resistant equipment design, rapid fire response coordination

BUILDING GRID RESILIENCE:
PHYSICAL HARDENING AND DIGITAL INTELLIGENCE

Protecting the grid against extreme weather requires layered resilience, combining hardened infrastructure with intelligent, adaptive grid control.

Physical Hardening:

Protecting and reinforcing grid assets to withstand extreme weather and recover quickly from damage.

- Selective undergrounding of high-risk lines to reduce storm, flood and tree damage exposure
- Substation flood mitigation (elevated equipment, barriers, corrosion-resistant materials)
- Reinforced poles and transmission structures to withstand wind and ice loads
- Prioritizing circuits serving hospitals, emergency services and dense population centers

Digital Intelligence:

Strengthening grid monitoring and control systems to withstand and rapidly recover from weather-related disruptions.

- Real-time monitoring to detect voltage issues and overloads before failure
- Predictive analytics and digital twins to model extreme weather risk and guide investments
- DER and microgrid coordination to maintain power for critical facilities
- Automated fault isolation and restoration to speed recovery and reduce outage impact

PROTECTING THE GRID WITH TECHNOLOGY AND DATA

Honeywell supports utilities across the full resilience lifecycle — from detection and prediction to response and recovery — using real-time visibility, advanced analytics and automated control.

A4 Pro – Real-Time Electric Grid Monitoring

- Detects transient faults within milliseconds
- Records at least 55 days of instrumentation data at 1 minute resolution
- Sends outage alerts and Power Quality alarms in as few as 20 seconds (customer programmable)

NXU Residential Smart Gas Meter

- Monitors pressure, flow and temperature for leaks or blockages
- Enables remote shutoff to isolate hazards
- Monitors, manages and reduces greenhouse gas emissions

Forge Performance+ for Utilities

- Unifies data from meters, SCADA and DERs along with weather data
- Delivers predictive insights, weather aware energy forecasting and operational recommendations
- Helps to optimize distributed energy management and outage response

As extreme weather intensifies, grid resilience is essential. Utilities that combine physical hardening with digital intelligence can better protect communities, manage costs and maintain reliable power. Honeywell partners with utilities to plan and implement grid-monitoring strategies aligned with operational, regulatory and community priorities.

Refereneces

1. Joint Economic Committee, "How Renewable Energy Can Make the Power Grid More Reliable and Address Risks to Electricity Infrastructure," January 19, 2024.
2. Climate Central, "Weather-related Power Outages Rising," April 24, 2024.
3. Climate Central, "Surging Weather-related Power Outages," September 14, 2022.
4. U.S. Department of Energy, "Grid Resilience and Innovative Partnerships (GRIP) Program Projects." [Accessed February 15, 2026]

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