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YEAR IN STORIES

n the United States, climate change is fueling an increase in the frequency, intensity, and duration of hurricanes, wildfires, ice storms, flooding, and heat waves. As the frequency of billion-dollar storms increases, Quanta operating companies stand ready to respond. We keep the lights on, the gas flowing, and communications connected.

RESPONDING TO INCREASING EXTREME WEATHER & CLIMATE

Atec

DISASTERS

2022 YEAR IN REVIEW

→9,757

total lineworkers deployed for storms Nicole, Ian, Elliot, and Fiona

809,249

an-hours spent restoring power service in response to major storms in 2022

HURRICANE IAN

3,585

peak of Hurricane Ian



end users whose power was restored

consecutive days of work

472 K

man-hours across 17 operating companies spent restoring power services

The costs of extreme weather are growing.¹ The U.S. experienced an estimated 18 billion-dollar weather and climate disasters in 2022, well above the average of seven events per year.² In recent years, disasters that have caused at least a billion dollars in damages have increased to become monthly occurrences. This dramatic change is notable because, until this past decade, the U.S. typically only experienced a handful of billion-dollar weather and climate disasters per year (see graph, right).³

These extreme weather events are increasing the number of weather-related power outages across the U.S. For example, from 2000 to 2021, there were 1,542 weather-related major power outages, of which 58% were caused by severe weather such as high winds, rain, and thunderstorms, while 22% were caused by winter weather, including snow, ice, and freezing rain.⁴

- 1 whitehouse.gov/cea/written-materials/2022/09/01/the-rising-costs-ofextreme-weather-events/
- ² ncei.noaa.gov/access/billions/
- ³ noaa.gov/news/ian-is-15th-billion-dollar-disaster-year-so-far

⁴ climatecentral.org/climate-matters/billion-dollar-disasters-in-2022

NUMBER OF MAJOR WEATHER-RELATED U.S. POWER OUTAGES



Source: oe.netl.doe.gov/OE417_annual_summary.aspx

NUMBER OF U.S. BILLION-DOLLAR DISASTERS PER YEAR (CPI-ADJUSTED)



Source: ncei.noaa.gov/access/billions/summary-stats



Hurricane Ian

In September 2022, Hurricane Ian made a series of landfalls across Cuba and the U.S. and will be regarded as one of the costliest tropical cyclones ever recorded. The Category 4 storm, which struck the southwest coast of Florida near peak intensity with 150 mph winds, left widespread and catastrophic damage near the landfall point in the greater Fort Myers/Naples/Port Charlotte region. Ian would later weaken and re-emerge in the Atlantic Ocean before making a final landfall in South Carolina as a Category 1 hurricane with 85 mph winds.⁵

The most substantial damage was due to the magnitude of the storm surge near the landfall locations on the east side of the center of lan's circulation, with Florida power outages peaking at 2.3 million. However, that number was reduced to below 1 million a week later. In addition, torrential rain from lan led to notable inland flood damage across nearly two dozen Florida counties. The total financial cost from lan is anticipated to result

⁵ nesdis.noaa.gov/news/hurricane-ians-path-of-destruction

TEMPORARY CAMP DELIVERS REPAIRS AHEAD OF SCHEDULE

Within two days of an urgent request to repair a storm-damaged transmission line caused by Hurricane Ian, Quanta had constructed a temporary 160-person camp adjacent to the project right-ofway. A Quanta mobile command center was set up and relocated to the base camp. The project was completed, and the line was returned to service six days ahead of schedule.

in total economic losses (including direct physical injury, direct non-physical financial loss, and net-loss business interruption) approaching or exceeding \$100 billion. This would make lan one of the costliest natural hazard events in U.S. history, regardless of peril.

At the peak of the response to Hurricane Ian, Quanta had 3,585 resources and related equipment deployed from 18 Quanta operating companies. Crews worked 16-hour rotating shifts around the clock. Away from their families, brave lineworkers even slept in their trucks the first few nights following the storm, as hotels didn't have working power.

HURRICANE FIONA

Damage Assessments in damages sustained

▶54%

of distribution feeders damaged

▶30% of transmission lines damaged

substations submerged

Restoration Efforts

90% +customers restored in 12 days



utility workers deployed

▶239 total flight hours with over 12.000 miles flown

Hurricane Fiona

Hurricane Fiona made landfall in Puerto Rico on September 18, 2022, and inundated the island with vast amounts of rainfall, according to data from the National Hurricane Center.⁶ Southern Puerto Rico was hit with 12 to 20 inches of rain, while some areas received a maximum of nearly three feet of rain during the storm. Landslides destroyed many bridges and roads, making many residents' homes unlivable. Damage assessments indicated that 54% of distribution feeders and 30% of transmission lines sustained damage, while seven substations were submerged.

LUMA's Response

LUMA Energy, LLC (LUMA), a joint venture in which Quanta owns a 50% interest, is responsible for the operation and maintenance of Puerto Rico's electric transmission and distribution system. LUMA's response and restoration efforts following Hurricane Fiona represented a historic undertaking in Puerto Rico. LUMA followed a rigorous emergency response plan (ERP) that prioritized restoration in an organized manner to restore power to critical customers such as Lifeline residential services customers, hospitals, and water facilities. LUMA prepositioned crews, vehicles, and equipment before Hurricane Fiona's landfall. As restoration efforts progressed following Hurricane Fiona and the hardest-hit areas became accessible, LUMA deployed crews and contractors to prioritize restoration in the southern and western regions.

LUMA made historic progress restoring customers affected by Hurricane Fiona. Over 90% of customers had their power restored in less than two weeks, representing a significant improvement compared to storms before LUMA's operation and maintenance of the grid.

⁶ nhc.noaa.gov/archive/2022/al07/al072022. public_a.024.shtml





SNOWSTORMS: WINTER STORM ELLIOT

In 2022, the U.S. faced its coldest Christmas in living memory as swathes of the country suffered ice storms, whiteouts, and ferocious sub-zero winds. At its peak, 1.6 million customers in states from Texas to Connecticut were without power.⁷ Quanta's family of operating companies provided over 2,000 employees to safely serve and support 19 utilities and multiple cooperatives with over 1,000,000 outages across the country. The work was painstaking; clearing downed trees to reach outage locations was slow and difficult. In the Kettle River, Minnesota, area, crews found 40 fallen trees on a line only three-quarters of a mile long. Quanta crews trudged through the snow to remove the trees before line crews could make repairs to restring the lines.



- IN FOCUS-

THE STATE OF THE GRID: Working with customers to improve grid resiliency

Hurricane lan has provided yet another example of the growing need for significant improvements in grid resiliency in the U.S.

he Department of Energy estimates that grid power outages cost U.S. businesses approximately \$150 billion in direct losses annually.⁸ A recent University of California, Berkeley lab study assessed the social and economic costs of more extended and frequent power outages.⁹ These costs arise from impacts such as school closings, food spoilage, supply chain disruptions, and deleterious health outcomes and underscore the need for improvements:

- The U.S. has more power outages than any other industrialized nation.
- The average annual number of weather-related power outages increased by roughly 78% between 2011 and 2021, compared to 2000 to 2010.
- Both frequency and duration of grid outages have been at their highest since 2013.
- Forty states are experiencing more extended grid outages than ever. California, Louisiana, Maine, and Florida are at the forefront, with greater than a 50% increase in power outage duration.
- The average age of critical power grid components is 40 years old, with more than a quarter of the grid 50 years old or older.⁹

In Florida, Quanta operating companies have worked with a customer to enhance grid resiliency by replacing more than 3,700 aging H-frame 500 kV structures. A notable feature of the project was that foundations were installed under existing energized 500 kV transmission lines, allowing for increased outage flexibility and a reduced overall impact on the customer base. Key to the success of the multi-phase project was the implementation of an electronic quality management plan (QMP) that required sophisticated project tracking, data collection, and reporting.

UNDERSTANDING • TERMINOLOGY

Reliability is a measure of the ability of a power system to supply power to customers in a continuous manner.

Resiliency is the ability of a power system to withstand severe weather conditions resulting in less damage and a more rapid return to normal.

Hardening the system refers to taking deliberate measures to minimize the impacts of severe weather events, such as installing stronger structures, fire-resistant poles, and shorter spans; and undergrounding existing overhead lines.



energy.gov/sites/prod/files/oeprod/DocumentsandMedia/DOE_SG_
Book_Single_Pages%281%29.pdf

⁹ emp.lbl.gov/publications/improving-estimated-cost-sustained