

Puerto Rico and Electric Power Restoration from Hurricane Maria

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Hurricane Maria made landfall in Puerto Rico as a Category 4 storm with sustained wind speeds of 155 miles per hour on September 20, 2017. The hurricane also brought torrential rainfall with over 20 inches of rain resulting in widespread flooding across the island. Puerto Rico's office of emergency management reported that the storm had incapacitated the central electric power system, leaving the entire island without power. Many wooden electric distribution poles have been knocked down, while some steel transmission system towers stand stripped of power lines. Recovery efforts from Hurricane Maria have focused on restoring electricity to hospitals, water plants, and some industries. The U.S. territory was already in recovery mode following Hurricane Irma, which struck the island on September 6, 2017, leaving 70% of electricity customers without power. Officials are estimating that many of Puerto Rico's 3.5 million people could be without electricity for up to six months. The Commonwealth is beginning the process of evaluating the damage, as helicopters are now able to fly over transmission line routes. Recovery efforts will likely be further slowed as personnel, trucks, and equipment-as-aid from other electric utilities (which mainland companies typically rely on; see CRS Report R42696, *Weather-Related Power Outages and Electric System Resiliency*) will have to be brought in by sea and air. As of October 3, 2017, approximately 5.4% of electricity customers have had their power restored. Assistance from mainland companies with fuel system and transportation expertise is just now deploying to the island.

Preexisting Vulnerability of Puerto Rico's Grid

Even before this year's hurricane season, Puerto Rico's electric power infrastructure was known to be in poor condition, due largely to underinvestment and poor maintenance. Concerns existed as to how the Puerto Rico Electric Power Authority (PREPA) could improve reliability while modernizing its power generation and supporting infrastructure. These concerns were magnified given the current debt crisis of the Commonwealth of Puerto Rico (see CRS Insight IN10747, *Puerto Rico Electric Power Authority and Debt Restructuring Under PROMESA, P.L. 114-187*). PREPA is a public power utility owned by Puerto Rico, and is the largest supplier of electricity in the Commonwealth. According to 2014 industry statistics, PREPA ranked in the top 10 of U.S. public power utilities in terms of net electric power generated, serving approximately 1.4 million customers. However, PREPA's abilities to manage its obligations as Puerto Rico's sole electric utility are under congressional scrutiny because of PREPA's huge public debt

level, and the aging and inefficient nature of its electricity infrastructure. PREPA's debt—about \$9 billion—is larger than any other operational U.S. public corporation. Electricity rates in Puerto Rico are lower than most Caribbean islands, but higher than most U.S. states (except for Hawaii).

PREPA's Proposed Modernization

PREPA has proposed a fiscal plan for investments to upgrade and modernize its power generation and delivery infrastructure as it seeks to restructure its debts. In a draft issued in April 2017, PREPA proposed a number of actions to modernize its infrastructure including public-private partnerships, increased use of renewable energy and distributed generation, making “smart grid” improvements, and initiating a robust short-term maintenance program for its transmission and distribution systems. Improving safety, reliability, and resiliency are also goals stated in the proposed fiscal plan. PREPA maintains that the proposal “commits PREPA to fiscal responsibility and implements urgently needed infrastructure modernization,” while allowing for “revised fuel prices, distributed generation trends, [and] urgent infrastructure investments for needed efficiencies.”

Building a More Resilient Electricity System

Hurricane Maria is the first Category 4 storm to make landfall in Puerto Rico since 1932. The magnitude of the damage from Hurricane Maria is as yet unknown, as telecommunications systems were also damaged. But the sheer magnitude of damage from the storm winds and resultant flooding may mean that an extensive rebuild of the electric power system will be needed, and the nature and extent of that rebuild has yet to be determined. Puerto Rico and the Virgin Islands will likely experience more hurricanes, and may want to consider additional actions to bolster resiliency beyond those considered in PREPA's proposed fiscal plan. (See CRS Insight IN10781, *Hurricanes and Electricity Infrastructure Hardening*.) Resilient electric systems are able to maintain some level of operations during hurricanes or storms, and quickly recover from storm-related damage. To promote system efficiency and resilience, many electric utilities have “hardened” exposed power generation and delivery systems. Some question how much more system hardening is appropriate in the context of the perceived risks from climate change and other factors. While some distribution poles and electric power facilities have been hardened in coastal areas to withstand a Category 3 hurricane, consideration may be warranted for upgrading certain facilities to withstand a more severe event. Aid from the Federal Emergency Management Agency and the U.S. Army Corps of Engineers is beginning to arrive in Puerto Rico and the U.S. Virgin Islands to help restore power. However, Congress may want to consider how to provide additional aid to Puerto Rico to help restore power to the island, considering that the damage from Hurricane Irma has been exacerbated by the damage from Hurricane Maria. Federal aid is just beginning to arrive in the U.S. Virgin Islands and Puerto Rico. While efforts to restore electricity are reported to be focused on priority facilities, people in the rural parts of the island may be without electricity for months. Puerto Ricans are U.S. citizens, and the prospect of a prolonged recovery may cause the island to lose population even faster than in recent years, as those who are able may choose to relocate to the U.S. mainland.

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