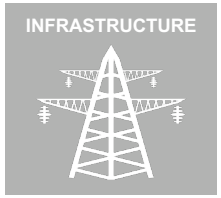
Puerto Rico
Electric Power
Authority

# THE ISLAND RESILIENCY ACTION CHALLENGE

**Puerto Rico Electric Power Authority (PREPA)**
**CREF**
**October 16, 2019**

# Overview of Historical Challenges




- Inadequate maintenance of T&D infrastructure
- Outdated codes and standards
- Key generation located far from major load centers
- Inadequate systems for monitoring and controls
- Thermal generation older than industry average
- Major towers unable to withstand winds of 150 mph
- Distribution lines built in small, crowded corridors, with lower than industry standard clearance to vegetation


- Year-round tropical growth
- Transmission over mountainous ranges
- Isolated system with no neighboring utilities
- Susceptible to repeated hurricane events
- Difficult logistics for aid and restoration work


- Lack of market access and ability to invest capital
- Poor credit rating
- Subsidized rates for certain customers
- Revenue impacts due to economic recession
- High-level of technical losses and theft


- Mass migration and significant losses of experience personnel
- Safety records below industry standards
- Lack of institutionalized processes and procedures
- Outdated information technology and systems
- Above-market benefits in collective bargaining agreements
- Underfunded pension obligations

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# Actions taken so far

**PREPA, in collaboration with the Government of Puerto Rico, has achieved measurable progress in several key areas and is working to implement initiatives that will improve its operations and overall resiliency**

- **Completed system repair and restoration** of damages caused by Hurricanes Irma and Maria through the utilization of available federal funding sources
- Issued RFP to solicit the **transfer of operation and management of PREPA's T&D system** to a private operator
- Started on the implementation of key strategic initiatives to modernize generation fuel mix, reduce fuel cost and price volatility, and improve operations, including commencement of the **conversion of San Juan 5 & 6** units from diesel to natural gas, **renegotiation of PPOAs**, and commencement of **vegetation management** work
- Developed **Energy System Modernization (ESM) Plan**, which includes investments needed to improve grid resilience
- Submitted a proposed **Integrated Resource Plan (IRP)** (pending regulatory approval) that will serve as the planning document for new generation investment
- Executed on a **Definitive Restructuring Support Agreement (RSA)**, which provides for substantial savings in the recovery of legacy costs associated with the financing of Puerto Rico's electric infrastructure
- Obtained **Fiscal Plan** approval from the Financial Oversight Management Board (FOMB), three years in a row

# What needs to be done

**The Energy System Modernization (ESM) Plan provides the vision, transformation approach, and cost estimate input for the permanent reconstruction work needed to achieve a more reliable and resilient Puerto Rico energy system**

**The following summarizes the key work components to be completed in order to achieve greater resiliency:**

| Transmission | Substations | Distribution and Metering | Generation and Fuel |
|---|---|---|---|
| ▪ Harden 350 miles of the 230 kV transmission grid, mostly hardening along new or existing ROW<br>▪ Harden about 20% of existing 115 kV lines<br>▪ Conduct tree removal and trimming activities<br>▪ Underground selected transmission wires<br>▪ Replace lattice towers with monopole design<br>▪ Build new transmission to enable the deployment of islandable grids | ▪ Relocate or elevate selected existing substations<br>▪ Install hurricane rated fencing<br>▪ Repair/replace old breakers, transformers, and grounding systems<br>▪ Digitize substations (e.g., SCADA, remote video monitoring, etc.)<br>▪ Replace or reinforce selected control buildings<br>▪ Install water barriers or other engineered solutions | ▪ Strengthen existing distribution poles<br>▪ Underground selected distribution lines/circuits<br>▪ Replace existing insulators with higher insulation levels<br>▪ Install submersible and flood-proof equipment<br>▪ Deploy distribution automation technology<br>▪ Install advance metering infrastructure (AMI) | ▪ Improve reliability of existing units<br>▪ Improve operational flexibility to support integration of a decentralized system<br>▪ Convert key facilities into natural gas and deploy new combined cycle capacity<br>▪ Replace existing peaking units<br>▪ Install additional LNG/gas import, storage and delivery infrastructure<br>▪ Deploy renewables and battery technology |

# How much will it cost?

**The ESM Working Group estimates a total of $20 billion of investments is needed to rebuild the Puerto Rico power system to industry standard levels of reliability and resiliency, as shown in table below**

- Throughout the development of the ESM plan, a collaborative process referred to as the Working Group, assessed what needs to be done to rebuild the Puerto Rico power system and to achieve industry standard levels of reliability and resilience
- The Working Group was led by the Puerto Rico Central Office of Recovery, Reconstruction, and Resiliency (COR3) and engaged key stakeholders such as PREPA, the New York Power Authority (NYPA), the U.S. Department of Energy (DOE) and National Labs

| Category | Cost Estimates ($M) |
|---|---|
| *Transmission & Substations* | $6,498 |
| *Distribution* | $5,703 |
| *Generation and Fuel* | $3,552 |
| *Technology Transformation* | $1,835 |
| *DERs & Microgrids* | $1,755 |
| *Security* | $290 |
| *System Operations* | $215 |
| *Emergency Preparedness* | $112 |
| *Operational Efficiencies* | $21 |
| *Regulatory & Policy* | $12 |
| **Total** | **$19,993** |

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# What is the greatest challenge to achieve resiliency?

**The most urgent obstacle to greater energy resiliency for the island is:**

*Securing the necessary funding to make the required capital investments needed to achieve grid resiliency while minimizing the impacts on customer rates*

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