Solar panels on a roof in Old San Juan, Puerto Rico. *Photo by Robin Burton, NREL.*

A Path to Navigating the Storm: Load Forecasting and Increasing Resilience in Puerto Rico

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Puerto Rico Grid Resilience and Transitions to 100% Renewable Energy Study

Analysis was guided by stakeholder perspectives and priorities. A PR100 Community Engagement Tour event was held in Culebra, Puerto Rico in January 2023. *Photo by Conor McCabe, U.S. Department of Energy.*

Puerto Rico Grid Resilience and Transitions to 100% Renewable Energy Study (PR100) provided a **comprehensive analysis of pathways for Puerto Rico to achieve its goal of 100% renewable energy by 2050**, based on extensive stakeholder input.

The study illuminates **immediate and longer-term investments** needed to achieve reliability while pursuing Puerto Rico's energy goals and addressing critical energy needs. Expected benefits of these investments include improvements in **safety, security, health, and economic opportunity**.

Modeling Electric Loads for Puerto Rico's Goals and Priorities

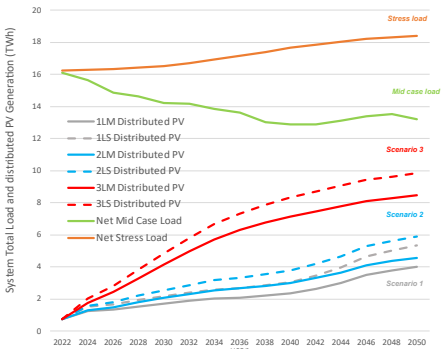
PR100 explored three scenarios for Puerto Rico to achieve 100% renewable energy by 2050.

Two electricity demand (load) variations—Mid case and Stress—were applied to the scenarios. In the Mid case trajectory, load is expected to decrease by 2050 based primarily on population and economic forecasts. The Stress variation increases over time, capturing uncertainty if loads do not decrease. Actual loads are likely to be between Mid case and Stress.

Modeling of electric vehicle adoption and energy efficiency found:

- **Electric vehicle adoption will increase energy demand,** and **energy efficiency measures will decrease energy demand**.
- **By 2050, 25% of light-duty vehicles** and **48% of medium- and heavy-duty vehicles are projected to be electric**.
- Puerto Rico's goal of **30% energy efficiency by 2040 is more ambitious** than bottom-up modeling results of **18% energy efficiency by 2050**.

Exploring the Connection of Loads to Rooftop Solar and Storage Projections



Rooftop solar generation across scenarios and Puerto Rico load forecasts plotted to demonstrate the fraction of annual load met by distributed generation.

Adoption of distributed (rooftop) solar and storage capacity is projected to increase considerably in all scenarios.

- **Projected increase is 2,500 megawatts (MW) to 6,100 MW by 2050**, or 4,000 to 9,900 terawatt-hours (TWh) of generation—**370% to 900% of current installations**.
- The higher—**Stress**—load trajectory leads to the adoption of **more rooftop solar and storage**.
- Projected load for Scenario 2—which extends rooftop solar and storage adoption to low-income and remote areas—is 11%–14% higher than in Scenario 1, which focuses on economic adoption of distributed energy resources.
- **Scenario 3**, which considers maximum deployment on all suitable rooftops, results in a **doubling of Scenario 1 adoption of rooftop solar and storage**.

Preparing for Your Resilient Renewable Energy Future

Customized National Renewable Energy Laboratory (NREL) studies like PR100 can:

- Help you understand the intersection of building loads, distributed generation, storage, electric vehicles, and electrification.
- Help you better understand markets for your building products, both domestically and internationally.
- Model and analyze future possibilities for market growth or contraction.
- Enable capacity building within your company on renewable energy topics.
- Introduce you to the specific characteristics of markets you're interested in.

Renewable energy resources added or removed as compared to other scenarios.

Scenario 1: Economic

Rooftop solar and storage adoption based on ***financial savings and value of backup power to building owners and prioritized for critical services (circled)***.

Scenario 2: Equitable

Rooftop solar and storage adoption ***expanded beyond Scenario 1 to include*** remote and low- and moderate-income households.

Scenario 3: Maximum

Rooftop solar and storage is added to all suitable rooftops to meet critical loads.

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