Electrical Power Generation In Puerto Rico

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Power Generation in Puerto Rico

Here's a detailed overview of how electricity is (and has been) generated in Puerto Rico, how the system is structured, who the main players are, and where things are located. If you like, I can also drop pins on a live map for current plants.

Overview of Puerto Rico's Electricity System

Fuel mix & capacity

- As of recent data, Puerto Rico remains heavily dependent on fossil fuels. Petroleum-based plants (oil, diesel) remain a dominant generation source.
- According to the U.S. Energy Information Administration (EIA), in 2024 petroleum-fired plants accounted for ~62 % of installed generating capacity, with natural gas at ~24 %, coal ~8 %, and renewables ~7 %. U.S. Energy Information Administration
- More comprehensive assessments (including distributed sources) put the generation capacity mix closer to: petroleum ~42 %, natural gas ~33 %, coal ~7 %, and renewables ~19 %. Every CRS Report
- Renewable generation (solar, wind, hydro) is still a small share of actual output, but growing (especially distributed solar). IEEFA
- Because many major plants are located on the southern (leeward) side of the island, electricity often must be transmitted across the interior mountain range to reach the populous north coast (San Juan, Bayamón, Carolina). Every CRS Report

Institutional & Operational Structure

Here are the key players you mentioned (and a few more), and how generation, transmission, and distribution are organized:

Entity	Role / Responsibilities	Notes & Recent Changes
PREPA (Puerto Rico Electric Power Authority)	Historically the integrated utility: generation, transmission, distribution	PREPA has long been the main generation owner and operator (especially for central thermal plants). NREL Docs
LUMA Energy	Operates transmission & distribution (wires)	In recent years, the Puerto Rican government contracted out T&D operations to LUMA as part of grid restructuring. Negociado de Energía de Puerto Rico
Genera PR	Operates PREPA's generation assets (power plants)	In 2023, Puerto Rico selected Genera PR to take over operation and maintenance of PREPA's generation assets under a privatization arrangement. AP News

Entity	Role / Responsibilities	Notes & Recent Changes
Independent Power Producers (IPPs)	Own and operate some major generation units, typically natural gas / LNG plants	Examples include **EcoEléctrica** and **AES Puerto Rico**. These IPPs supply power to the grid under contracts/agreements. Global Energy Monitor

So the current structure is roughly:

- Genera PR runs the bulk of the large centralized generation (former PREPA plants)
- IPPs contribute generation through contracts
- LUMA handles transmission and distribution
- PREPA remains as an entity (for regulatory, planning, and legacy contracts) in many respects

In the *"Resource Adequacy"* document from Puerto Rico's energy regulator, they explicitly monitor and dispatch available generation from Genera PR, EcoEléctrica, AES, and "PREPA generation plants now operated …" under the new structure. Negociado de Energía de Puerto Rico
Also, the "Ruta Energética" site tracks planned shutdowns and new additions under the island's energy policy (Act 17, etc.). Ruta Energética para Puerto Rico

Major Generation Plants & Locations
Here are some of the most significant power plants (thermal and otherwise), their fuels, and approximate locations:

Plant / Facility	Fuel / Type	Location / Municipality	Notes
EcoEléctrica	Natural gas / LNG / dual-fuel	Tallaboa Poniente, Peñuelas (south coast)	This is a major IPP plant (~574 MW) and includes LNG infrastructure. Global Energy Monitor
AES Puerto Rico	Coal / bituminous (and potentially natural gas conversions)	Guayama	AES-PR is a large power station (≥ 510 MW) located in Guayama. Global Energy Monitor
Palo Seco, San Juan CC	Combined-cycle / gas, etc.	Northern side, near San Juan / Toa Baja	These are important plants for the northern load zones (Palo Seco ~302 MW, San Juan CC ~440 MW). Negociado de Energía de Puerto Rico
Costa Sur / Aguirre	Oil / gas (coastal southern plants)	Near Salinas / southern coast	These are older, large coastal thermal plants; many of the island's big plants are on the south coast. NREL Docs
Hydro & small renewables	Water, solar, wind	Scattered across interior, south, north	Examples: Yauco Hydroelectric, Caonillas Dam Hydro, wind farms like Santa Isabel, solar farms (e.g. San Fermín, La Cometa) Open Infrastructure Map

From the Open Infrastructure Map, you can also see a number of smaller generating plants:

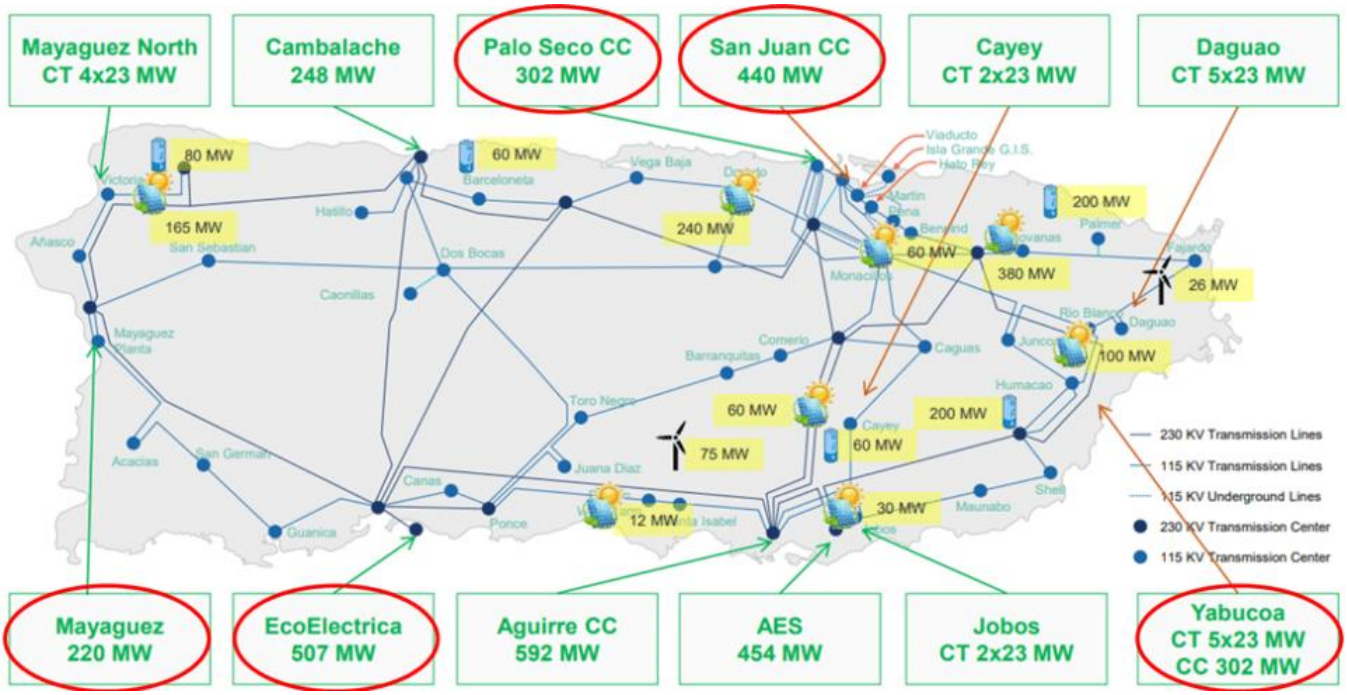
- Yauco Hydroelectric (34 MW), Caonillas Dam (22 MW) Open Infrastructure Map
- Vega Baja oil generator (42 MW) operated by LUMA (combustion) Open Infrastructure Map
- Wind farms, solar farm projects (Parque Solar San Fermín, Punta Lima wind, etc.) Open Infrastructure Map

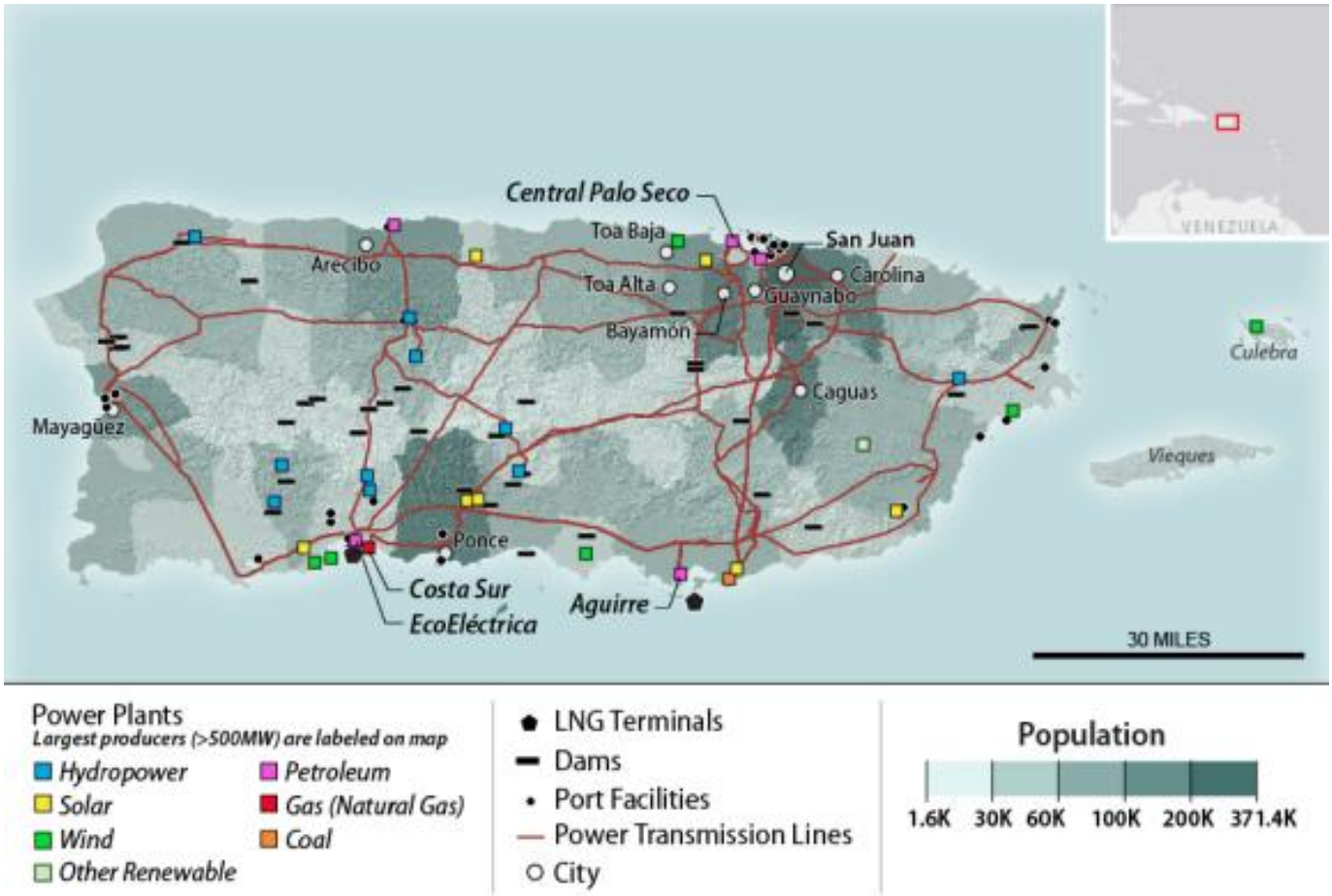
One of the maps (the CRS/EIA map) highlights major plants like Aguirre, Costa Sur, AES, EcoEléctrica along the south coast, as well as transmission lines crossing the terrain to reach the north side.

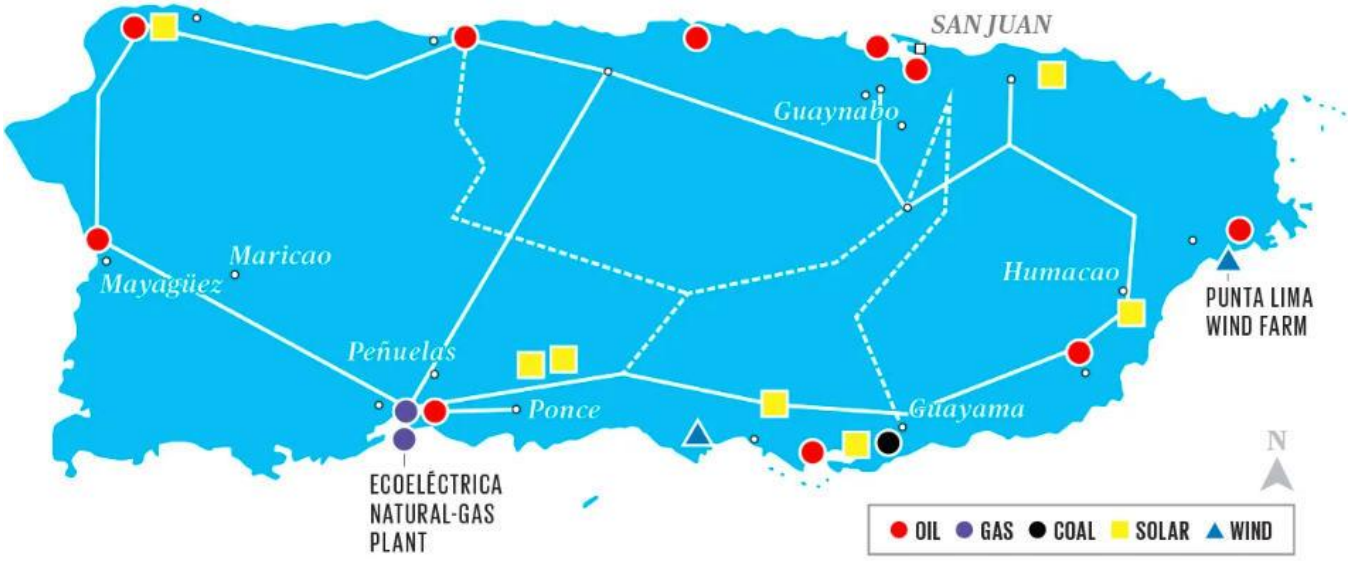
Challenges, Trends & Policy

- Many of Puerto Rico's thermal plants are aging, inefficient, and reliant on expensive imported fuels (oil, diesel). NREL Docs
- The island has ambitious renewable energy targets embedded in its energy laws: e.g. 100 % renewable by 2050 under Act 17. The Department of Energy's Energy.gov
- Transitioning to a cleaner, more distributed energy system is a priority (more solar + battery + microgrids) to improve resilience. The Department of Energy's Energy.gov
- In the near-term, much of the dispatchable generation will likely rely on natural gas / LNG to replace older oil plants. Ruta Energética para Puerto Rico
- The DOE's **PR100** study is analyzing pathways for Puerto Rico to meet its electricity demand with 100 % renewable energy. The Department of Energy's Energy.gov
- Funding and resilience grants are being directed toward grid upgrades, solar + storage for households and communities, and better infrastructure. The Department of Energy's Energy.gov

GENERATION SITES




Central Palo Seco
Toa Baja
San Juan
Arecibo
Carolina
Toa Alta
Guaynabo
Bayamón
Culebra
Caguas
Mayagüez
Vieques
Ponce
Costa Sur
EcoEléctrica
Aguirre
30 MILES
VENEZUELA
Power Plants
Largest producers (>500MW) are labeled on map
Hydropower
Solar
Wind
Other Renewable
Petroleum
Gas (Natural Gas)
Coal
LNG Terminals
Dams
Port Facilities
Power Transmission Lines
City
Population
1.6K 30K 60K 100K 200K 371.4K


SAN JUAN
Guaynabo
Maricao
Mayagüez
Humacao
PUNTA LIMA
WIND FARM
Peñuelas
Ponce
Guayama
ECOELÉCTRICA
NATURAL-GAS
PLANT
N
OIL GAS COAL SOLAR WIND

Electricity Generation Sources in Puerto Rico – Transition & Challenges

Puerto Rico generates most of its electricity from petroleum (around 62%), followed by natural gas (24%), coal (8%), and renewables (7%), though its energy mix has shifted since recent hurricanes, leading to a greater reliance on fossil fuels for power generation and significant power reliability issues. The island aims for 100% renewable energy by 2050 but currently faces a challenge in transitioning away from fossil fuels, with ongoing debates about the future of coal and the potential for rooftop solar and energy storage.

Primary Sources of Power Generation

Petroleum: As of early 2025, this is the largest source of electricity generation capacity.

Petroleum generation was a significant part of Puerto Rico's electricity, but is being phased out as the island transitions to cleaner energy sources. In the past, the island relied on fossil fuels to generate most of its electricity, but it lacks local crude oil production and has a high dependence on imported petroleum products. Recent efforts are focusing on improving grid reliability and incorporating more renewable energy sources.

- **Heavy historical reliance**: For decades, Puerto Rico has relied on petroleum-fired power plants for the majority of its electricity, with petroleum products accounting for about three-fifths of its total energy consumption.
- **Lack of local production**: The island has no crude oil production, refining capacity, or proved oil reserves.
- **High costs**: This reliance on imported petroleum has contributed to Puerto Rico having higher average electricity prices than all but three U.S. states.
- **Grid vulnerability**: Years of deferred maintenance on the grid, combined with severe storms, have made the system vulnerable to frequent outages and high costs.
- **Transition to renewables**: Recent funding and initiatives are focused on improving the power grid's reliability and integrating more renewable energy sources to move away from fossil fuels.

Natural Gas: Represents a significant portion of generating capacity and is seen as an important component of the island's energy bridge to a net-zero future, according to RAND.

Puerto Rico uses natural gas for electricity generation, although it relies heavily on fossil fuels overall, particularly petroleum. The island has secured a new long-term contract for liquefied natural gas (LNG) to support its supply. Natural gas is used in both large power plants and smaller industrial units.

- **Current Status**: Natural gas is a component of Puerto Rico's energy generation, supplementing the island's significant use of petroleum-based fuels.
- **Recent Developments**: The government of Puerto Rico recently finalized a multi-year agreement with a U.S. company for the supply of liquefied natural gas (LNG).
- **Scale of Use**: Natural gas is utilized in various power generation settings, including large power plants and smaller units at industrial sites.
- **Context**: The island's electrical grid has faced challenges, including deferred maintenance and grid vulnerability, making reliable energy supply a priority.

Coal: The AES Puerto Rico power station, the island's single coal plant, is set to continue operations beyond its original 2028 retirement date, potentially through 2035.

Puerto Rico is phasing out coal power generation. While historically reliant on fossil fuels, the island is transitioning to cleaner energy sources after years of underinvestment in its power infrastructure. The process involves a move away from all fossil fuels, including coal, towards a more resilient and modern energy grid.

- **Historical context**: For decades, Puerto Rico depended heavily on fossil fuels to generate electricity, a situation worsened by a history of deferred maintenance on the power grid.
- **Transition to renewables**: The island is now moving away from fossil fuels, including coal, to transition to a cleaner energy future.
- **Modernization efforts**: Significant funding is being allocated to rebuild and modernize the electric grid, making it more resilient to outages and better able to integrate new energy sources.
- **Impact of storms**: The legacy of underinvestment was exposed by hurricanes like Maria in 2017, which caused widespread damage to the grid and accelerated the need for change.
- **Current status**: The transition involves a fundamental shift in how Puerto Rico produces and distributes electricity, emphasizing modernization and a move toward a renewable energy mix.

Renewables: Renewable energy, primarily from utility-scale solar, hydropower, and wind, contributes a small but growing percentage to total generation.

Puerto Rico's power generation currently relies heavily on fossil fuels, but there is a major push for more renewable energy, supported by significant federal funding. The island receives about $1.2 billion in federal funds to finance renewable energy projects, aiming to reduce its dependence on fossil fuels and improve grid stability, which has suffered from frequent outages. Solar is a major component of the renewable transition, encouraged by financial incentives such as tax credits and exemptions.

- **Current generation mix:** Puerto Rico's electricity is predominantly generated from fossil fuels, especially petroleum products, which account for roughly three-fifths of its total energy consumption, notes the U.S. Energy Information Administration (EIA).
- **Transition to renewables:** The U.S. Department of Energy has committed $1.2 billion to help fund renewable energy projects, aiming to lessen the island's dependence on fossil fuels, according to AP News.
- **Grid stability:** The transition to renewables is intended to address the grid's instability, which has resulted in frequent power outages, with customers experiencing an average of 27 hours of interruptions per year between 2021 and 2024, even without major events like hurricanes, reports the U.S. Energy Information Administration (EIA).
- **Financial incentives:** To encourage renewable adoption, Puerto Rico offers incentives like a 30% federal income tax credit on the cost of a solar system (including a battery) and a 100% exemption on the added value to a home from solar, which means property taxes will not increase.
- **Energy prices:** Due to its heavy reliance on fossil fuels, Puerto Rico has one of the highest average electricity prices in the U.S..

Energy Transition and Challenges

Fossil Fuel Dependency: Puerto Rico relies heavily on imported fossil fuels, a dependence that has historically contributed to some of the highest electricity costs in the U.S.

Puerto Rico has high fossil fuel dependency, primarily relying on imported petroleum for electricity generation, which results in some of the highest electricity prices in the U.S.. Despite having renewable energy potential like solar and wind, the island's energy infrastructure is heavily based on fossil fuel-fired power plants and faces challenges with its transmission and distribution systems. This dependency, combined with system issues, contributes to frequent power outages and high costs for consumers.

Key aspects of Puerto Rico's fossil fuel dependency:

- **Reliance on imports:** Puerto Rico has no domestic fossil fuel production and must import its energy sources to meet its needs.
- **Dominant energy source:** The majority of electricity is generated by burning fossil fuels, with petroleum products accounting for about three-fifths of total energy consumption.
- **High electricity prices:** Due to the reliance on imported fossil fuels and inefficient generation, Puerto Rico has a higher average electricity price than all but three U.S. states.
- **Infrastructure challenges:** The transmission and distribution system is a significant point of failure, which, along with generating capacity issues, leads to frequent power interruptions.
- **Renewable potential vs. reality:** While the island has potential for renewable energy sources like solar and wind, it has not fully transitioned away from its dependence on fossil fuels.

Grid Instability: The electric grid suffered significant damage from Hurricane Maria in 2017, and ongoing power reliability issues and outages persist, partly due to inadequate generation and vegetation interference.

Puerto Rico's grid instability is due to a combination of factors, including decades of deferred maintenance and underinvestment, which has left the grid fragile. The situation was significantly worsened by Hurricane Maria in 2017, and ongoing issues include an outdated and difficult-to-stabilize transmission system. Recent funding aims to address these issues, but the grid remains vulnerable to frequent outages and high costs.

Causes of instability

- **Deferred maintenance and underinvestment:** For decades, the Puerto Rico Electric Power Authority (PREPA) did not make necessary investments or perform routine maintenance, leading to a crumbling infrastructure.
- **Hurricane Maria:** The powerful 2017 hurricane caused catastrophic damage to the already weak grid, exacerbating long-standing problems.
- **Outdated transmission system:** The transmission system is outdated, fragile, and difficult to stabilize, making it prone to failure.
- **Reliance on fossil fuels:** The grid relies heavily on fossil fuel plants, which contributes to high electricity prices and grid vulnerability.

Consequences of instability

- **Frequent outages:** The grid's fragility leads to frequent power outages for families and businesses.
- **High costs:** The system's issues contribute to higher electricity costs for residents and businesses.

Efforts to improve the grid

- **Government funding:** The Department of Energy has announced significant funding to support overdue improvements to Puerto Rico's power grid.
- **Ongoing challenges:** Despite funding, the grid remains vulnerable and faces ongoing challenges related to its infrastructure and maintenance.

Renewable Energy Goals: Puerto Rico has committed to achieving 100% renewable energy by 2050 through the Puerto Rico Energy Public Policy Act.

Puerto Rico's renewable energy goal is to achieve 100% renewable energy by 2050, with interim targets of 40% by 2025 and 50% by 2040. These goals are part of the Puerto Rico Public Policy Act, aimed at reducing fossil fuel dependence and strengthening the grid after past challenges. To help finance these efforts, the U.S. Department of Energy announced a $1.2 billion funding initiative for renewable energy projects in 2025.

- **Ultimate Goal:** 100% renewable energy by 2050.
- **Interim Goals:** 40% by 2025 and 50% by 2040.
- **Key Driver:** To lessen dependence on fossil fuels and increase energy independence.
- **Support:** The U.S. Department of Energy has allocated $1.2 billion to help fund these projects.

Rooftop Solar: Rooftop solar installations have grown significantly, with a net metering program allowing customers to receive credits for excess energy, placing Puerto Rico among the top territories for rooftop solar adoption.

Grid Management:

- **LUMA Energy:** Management of the electric grid shifted from the Puerto Rico Electric Power Authority (PREPA) to LUMA Energy in 2021.
- **Genera PR:** A subsidiary of New Fortress Energy, Genera PR took over the operation of the island's power plants in 2023.

6 MW Electricity Generation Revenue Calculations

Below is a quick reference chart to show what the daily, monthly, and yearly revenue totals would be for a variety of price per kilowatt hour, and for 6,000 kWh or electricity generation.

Step-by-Step Calculation

1. Convert MW to kWh per day:
   6 MW = 6,000 kW
   Daily Energy = 6,000 kW × 24 hours = 144,000 kWh/day

2. Daily Revenue = 144,000 × Rate per kWh

3. Monthly Revenue (30 days) = Daily Revenue × 30

4. Annual Revenue (365 days) = Daily Revenue × 365

Revenue Table – 6 MW Plant

Electricity Sale Price (¢/kWh)	$/kWh	Daily Revenue ($, 1 day)	Monthly Revenue ($, 30 days)	Annual Revenue ($, 365 days)
7¢	$0.07	$10,080	$302,400	$3,679,200
8¢	$0.08	$11,520	$345,600	$4,204,800
9¢	$0.09	$12,960	$388,800	$4,730,400
10¢	$0.10	$14,400	$432,000	$5,256,000
11¢	$0.11	$15,840	$475,200	$5,781,600
12¢	$0.12	$17,280	$518,400	$6,307,200
15¢	$0.15	$21,600	$648,000	$7,884,000