



Rebuilding the Puerto Rican Power System from the Bottom Up

Alison Mason, SunJuice Solar LLC

The Microgrid Symposium

August 11, 2019

Grid Transformation in Puerto Rico

Puerto Rican
Electric Power
Authority
(PREPA)

Disaster:
Economic,
Political,
Infrastructure,
Hurricane

End Monopoly
BUILD
BOTTOM UP

Microgrids

Dynamic
Prosumer
Driven Energy
and Resilience
Market

Puerto Rico is Solar Motivated

- Plentiful sunshine
- High cost of electricity
- Unreliable power grid
- High cost of backup fuel
- Blatant health effects of fossil fuel contamination
- Desire for independence from power authority
- Urgent need for resilience



Puerto Rico Microgrid Regulation 9028

*established by Puerto Rico Energy Commission
(PREC, now part of Public Service Regulatory Board) with Public Input in May 2018*

Personal Microgrids

- 1-2 consumers
- can apply for permission to provide excess energy and/or grid services to neighboring customers

Cooperative Microgrids


- 3 or more members
- small co-op microgrids of less than 250 kW
- large co-op microgrids of more than 250 kW
- can apply for permission to provide excess energy and/or grid services to neighboring customers

Third-Party Microgrids

- owner/operator sells energy services to customers
- rates must be approved by PREC
- “reasonable rate of return” for the first three years of operation

As provided by fiscal plan, residential rate now is \$0.23/kWh;
next year will be \$0.28/kWh and will keep increasing

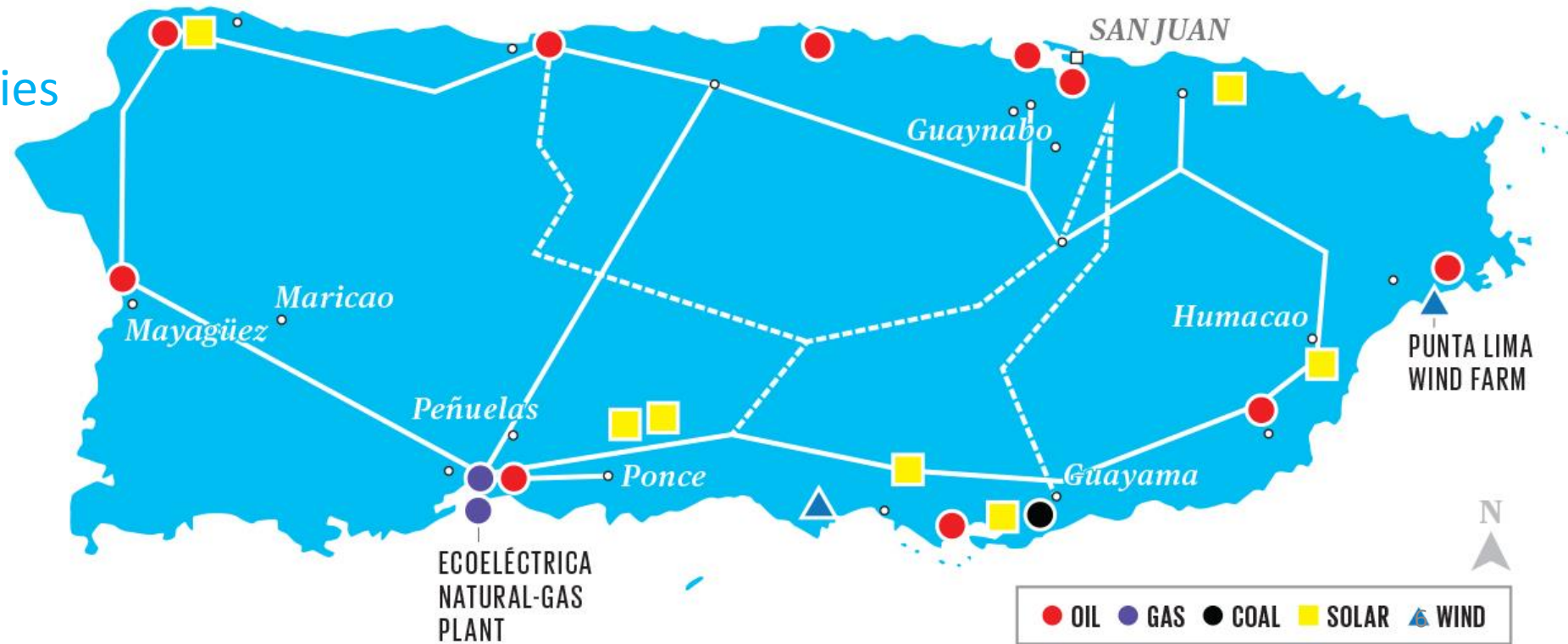
The One and Only Microgrid - Esperanza Village

- 
- A man wearing a wide-brimmed straw hat and a dark long-sleeved shirt is kneeling on a roof covered with solar panels. He is holding a green cable and appears to be working on the wiring. In the background, there are more solar panels, a satellite dish, and some greenery.
- 18 kW PV
 - 32 kWh battery storage
 - 4 Schneider MPPT Charge Controllers
 - 3 Schneider XW 6048 Inverters
 - 9 modest homes
 - Leviton revenue grade meters
 - Designed by Sun Power Energy
 - Funded by Community Foundation of PR

Puerto Rico Electric System

1.5 M customers (91% residential)
6,000 employees
2,478 miles transmission
30,000 miles distribution
500,000 poles
20 generation facilities

Peak capacity 5,839 MW
Renewable energy 4%
Duration of outage after Hurricane
Maria – 11 months



Electric Cooperatives Law – 984

Signed into law by Governor December 14, 2018

Amends existing laws to establish that the new energy model will include:

Solar communities

Electric or energy cooperatives

Microgrids of community, regional, or municipal scale

With explicit objectives to:

Democratize people's
Access to renewable
energy

Contribute to community
resilience in the face of
natural disasters

First Electric Cooperative (application pending 8/9/2019)

La Cooperativa Hidroeléctrica de la Montaña

- Utuado + Jayuya + Adjuntas
- 6 of 43 MW delivering from existing hydroelectric dams
- Affordable, resilient power
- Commercial solar
- Authorized under law 984

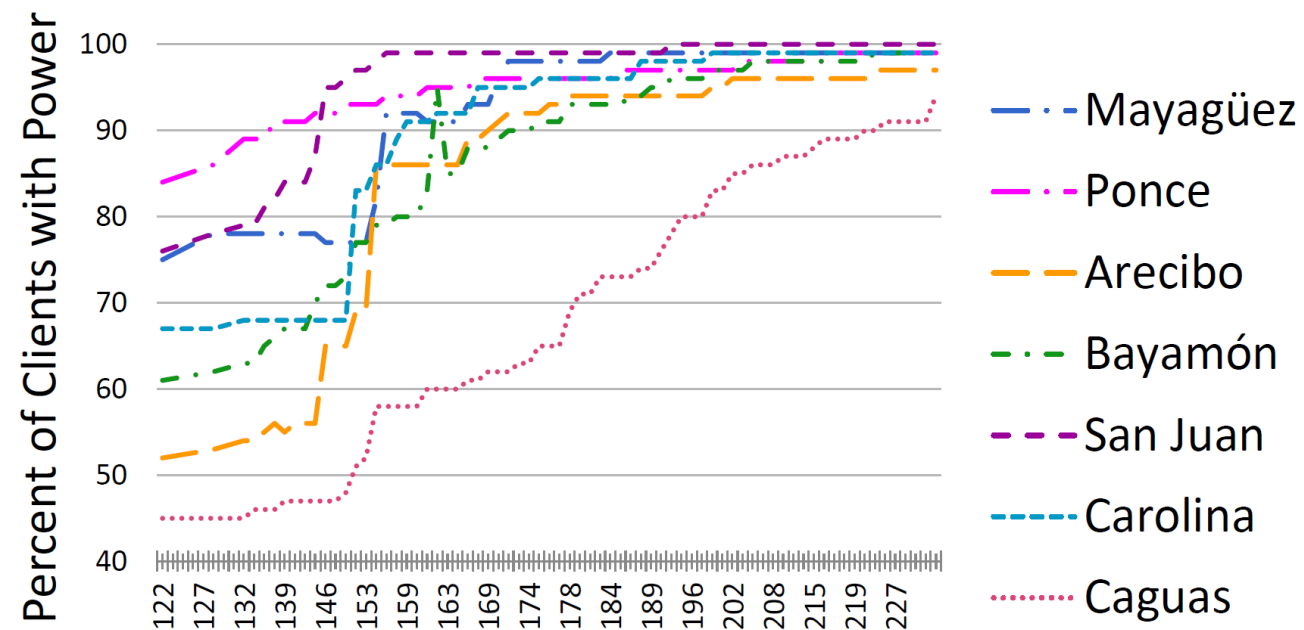


UNIDOS
POR UTUADO



8/19

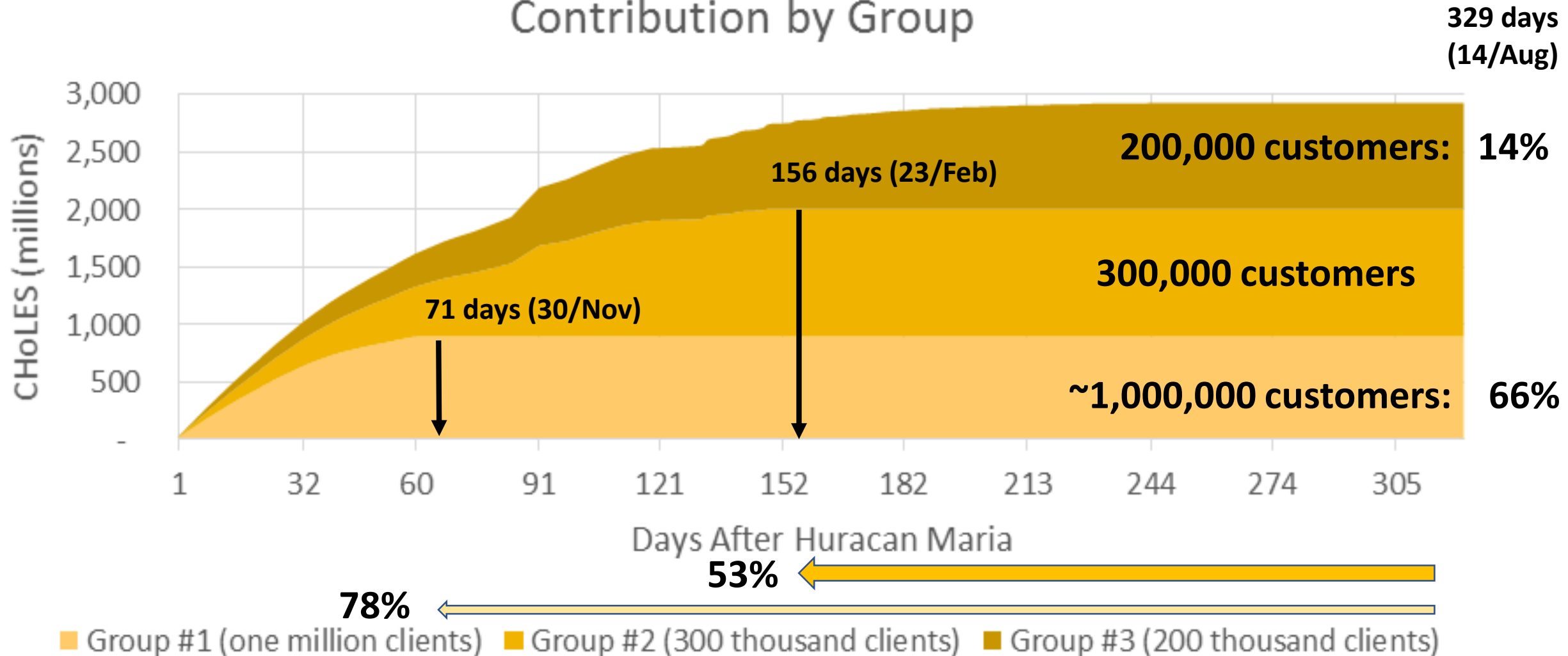




The slow recovery in the mountains

M. Castro-Sitiriche, J. Gomez, Y. Cintron, "The Longest Power Outage, María and Energy Poverty", International Conference on Appropriate Technology, November, 2018

Customer Hours of Lost Electric Service (CHoLES) Contribution by Group



Energy Public Policy Act 120

Signed into law by Governor in April 2019

GOALS:

- 40% renewable energy by 2025
- 60% by 2040
- 100% by 2050
- 30% energy efficiency by 2040

Credit: McConnell & Valdes Newsroom

- integration of prosumers, DG, microgrids
- elimination of coal-based energy companies by 2028
- energy storage across consumer classes
- transfer of the operation, administration, and maintenance of Transmission & Distribution systems to a private concessionaire via a public private partnership by end of 2019
- **interconnection of electric service companies (limited to 50% of total generation capacity)**
- expedited interconnection of residential and commercial solar rooftop systems less than 25 kW
- expedited interconnection of microgrids up to 5 MW
- **studying the viability of a free market system by 2025**

Barrio Eléctrico

Addressing Energy Equality

- ▶ Community Supportive
- ▶ Economic Development
- ▶ Appropriate Technology
- ▶ Fair Cost



Barrio Eléctrico

Community Supportive

- ▶ Taps trusting relationships of existing community networks
- ▶ Modest cash flow supporting community development
- ▶ In depth consumer education
- ▶ Rapid customer acquisition
- ▶ Quality assurance
- ▶ Path to electric coops



Economic Development

- ▶ Qualify and/or train local installers
- ▶ Work with Solar Energy International, Pathstone, Bosque Modelo, & Solar Libre to train solar workforce
- ▶ Hire trainees to:
 - ▶ Liaise with communities
 - ▶ Site and load analysis
 - ▶ Installation
 - ▶ Customer satisfaction
 - ▶ Operations and maintenance
 - ▶ Educate individuals and communities



Appropriate Technology

- ▶ Independent or grid interactive
- ▶ No net metering
- ▶ Battery storage for one day
- ▶ Auto consumption
- ▶ Critical loads 3-5 days



Fair Cost

- ▶ Trusted Counter Party
- ▶ Structured Finance
- ▶ Lease to Purchase
- ▶ 20 year term
- ▶ Parity with PREPA today (\$0.21/kWh)
- ▶ Eligible to receive government and foundation assistance



Advisory Board – Barrio Electrico

- ▶ Alison Mason of SunJuice Solar;
- ▶ Dr. Marcel Castro Sitiriche, professor of Electrical Engineering at UPRM and co-director of Co-Hemis;
- ▶ Jorge Gaskins, social-agricultural entrepreneur;
- ▶ Lauren Rosenblatt, lawyer and energy business model innovator;
- ▶ Javier Zapata, Deputy Director for PECl and Economic Development Finance Professional, Pathstone;
- ▶ Alana Feldman, project designer at Bosque Modelo; and
- ▶ Fernando Abruña, architect and father of Puerto Rico's green building movement.

Grid Transformation in Puerto Rico

Puerto Rican
Electric Power
Authority
(PREPA)

Disaster:
Economic,
Political,
Infrastructure,
Hurricane

End Monopoly
BUILD
BOTTOM UP

Microgrids

Dynamic
Prosumer
Driven Energy
and Resilience
Market



Thank You

Alison Mason

SunJuice Solar LLC

alison@greyrock.org

970.218.8742