CLEAN ENERGY SOLUTIONS CENTER

ASSISTING COUNTRIES WITH CLEAN ENERGY POLICY

Puerto Rico Clean and Resilient Energy Solutions

25 June 2019

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Agenda

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Welcome & Introductory Remarks

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Overview of the Clean Energy Solutions Center

- **Kamyria Coney,** Clean Energy Solutions Center

Moderator

- **Megan O'Reilly**, Associate, RAP

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Presentations

- **Commissioner Ferdinand Ramos-Soegaard,** Puerto Rico Energy Bureau
- **Asa Hopkins**, Vice President, Synapse Energy Economics
- **Janine Migden-Ostrander**, Principal, RAP

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Question and Answer Session

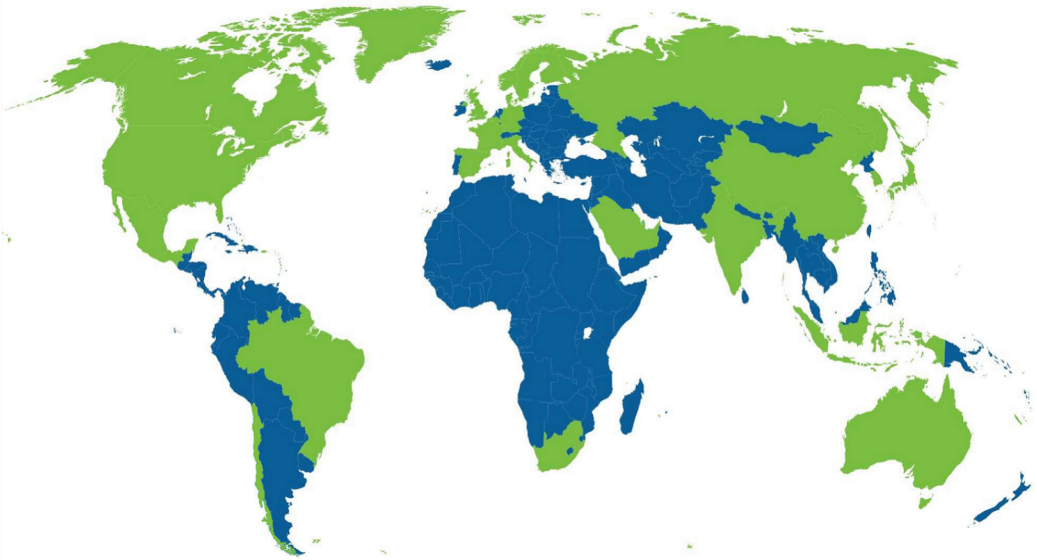
Clean Energy Ministerial

The Solutions Center:

- Launched under the Clean Energy Ministerial (CEM) in 2011

Clean Energy Ministerial:

- A high-level global forum to promote policies and programs that advance clean energy technology, to share lessons learned and best practices, and to encourage the transition to a global clean energy economy.



90% of Clean energy investment

&

75% of Global CO_2 emissions

Solutions Center: Background & Vision

- Multilateral initiative, of the Clean Energy Ministerial, is co-led by the Australian Department of the Environment and Energy, and the U.S. Department of Energy.
- Additional funding from Power Africa & the Hewlett Foundation
- The Solutions Center is a unique CEM initiative assisting countries in all regions of the world in strengthening clean energy policies and finance measures
- Supporting transition of clean energy markets and technologies

CLEAN ENERGY MINISTERIAL
Advancing Clean Energy Together

Solutions Center: Goals and Audience

Programs and Services

- **Team of 50+ experts from around the globe responded to 350+ requests for policy support from more than 80 countries**
  - Extensive support across Africa, Asia, and LAC
  - Launched support for finance measures in 2015
- **Trained over 15,000 officials through more than 225 webinars and training events with others**
- **Strong & growing partnerships with development agencies and regional and global organizations in delivery of support**
- **Over 3,500 resources in curated library for policy makers**

Target Audiences

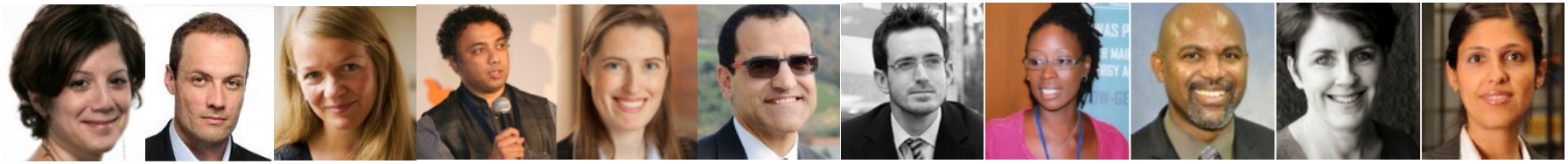
- **Primary**
  - Government Policy Makers and Advisors
- **Secondary**
  - Private-Sector Companies
  - Energy Entrepreneurs and Investors
  - Non-Governmental Organizations
  - Civil Society
  - Others Engaged in Clean Energy

Solutions Center: Partnerships

More than 35 international partners:

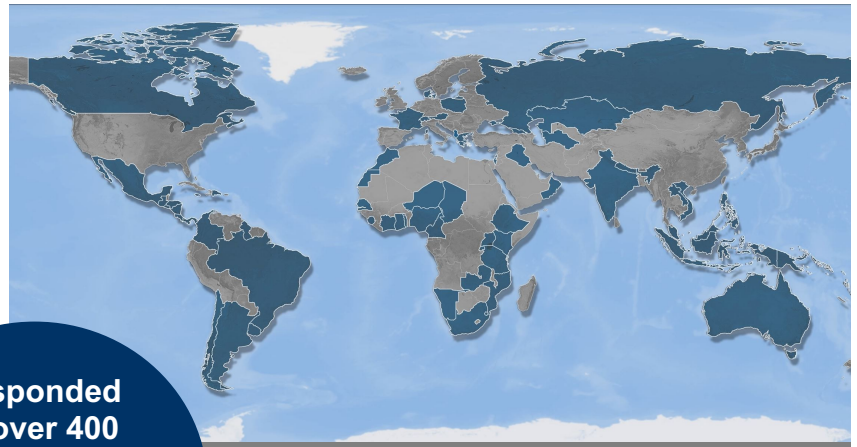
- Climate Technology Center and Network (CTCN)
- ECOWAS Center for Renewable Energy and Energy Efficiency (ECREEE)
- Inter-American Development Bank (IDB)
- International Energy Agency (IEA)
- International Partnership for Energy Efficiency Cooperation (IPEEC)
- International Renewable Energy Agency (IRENA)
- Low Emission Development Strategies Global Partnership (LEDS-GP)
- Renewable Energy Policy Network for the 21st Century (REN21)
- Sustainable Energy for All (SEforALL)
- United Nations Environment Programme (UN Environment)
- USAID Power Africa (USAID PA)

Ask an Expert: Our Experts in Action



We connect you to a global network of energy experts for personalized attention and quick response technical assistance on **strategies, regulations, standards, financial incentives, and energy transition programs** for a broad range of clean energy sectors and technologies including:

- Carbon Capture Utilization & Storage
- Energy Access
- Energy Efficiency
- Renewable Energy
- Smart Grid
- Transportation
- Utilities



Responded to over 400 requests for assistance from over 90 countries.

To request assistance, register on http://cleanenergysolutions.org/expert

Commissioner Ferdinand Ramos-Soegaard, Puerto Rico Energy Bureau

Commissioner Ferdinand Ramos-Soegaard obtained his Bachelor's Degree in Electrical Engineering (BSEE) from the Georgia Institute of Technology in the year 2000, with concentrations in power distribution systems and telecommunications. Prior to his appointment in the Puerto Rico Energy Bureau, he was involved in various aspects of the electrical industry like design, construction and maintenance of power distribution systems, including high-voltage transmission lines and interconnections of renewable energy resources to the Puerto Rico grid. He is a licensed professional engineer in the State of Florida and Puerto Rico.

Asa Hopkins, Vice President, Synapse Energy Economics

Asa Hopkins, PhD, is an expert in the development and analysis of public policy and regulation regarding energy and greenhouse gas emissions, including cost-benefit analysis, stakeholder engagement, state energy planning, and utility planning. He has provided analysis and testimony in both legislative and regulatory contexts, including state utility regulation and state and federal rulemaking.

Since arriving at Synapse in 2017, Dr. Hopkins has focused on utility and demand-side issues, including demand response in Quebec, comprehensive energy planning in Massachusetts, building decarbonization in California, energy and economic development in Ohio, and utility planning in Puerto Rico, as well as analysis of strategic end-use electrification across the Northeast region.

Janine Migden-Ostrander, Principal, RAP

Janine L. Migden-Ostrander advises regulators and advocates on energy efficiency, renewable energy, demand response, distributed generation and integrated resource planning. Recent projects include working closely with the Energy Bureau of Puerto Rico in establishing orders and regulations on subjects such as integrated resource planning and microgrids.

Ms. Migden-Ostrander leads RAP's work on a peer-to-peer power sector transformation group. She has worked with numerous commissions in facilitating meetings, providing workshops and writing reports on issues related to power sector transformation, including grid modernization. She has also served as a lecturer and educator on regulatory issues in a variety of forums.

Ms. Migden-Ostrander has worked in public utility law for more than 35 years, most recently as the Ohio consumers' counsel. In that role she oversaw the state agency that represents the interests of Ohio's 4.5 million residential households with their investor-owned electric, natural gas, telephone and water companies.

Resource Planning in Puerto Rico's Transforming Electric System

Clean Energy Solutions Center

June 25, 2019

Dr. Asa S. Hopkins

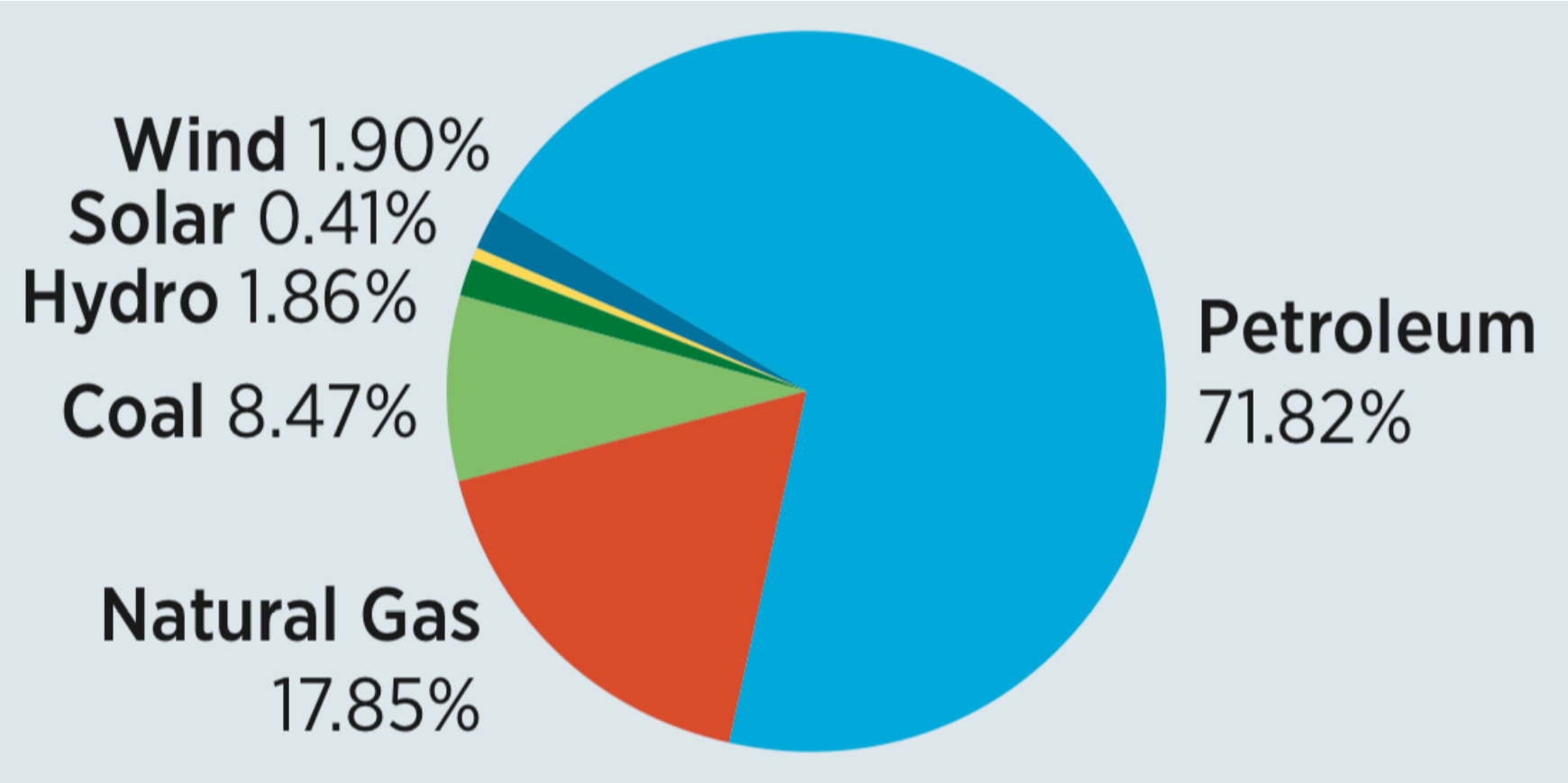
Outline

- Pre-hurricane resource planning challenges
- Hurricanes' impacts on resource planning approaches
- Electric sector transformation
- Integrated resource planning
- Ongoing planning processes

Synapse Energy Economics

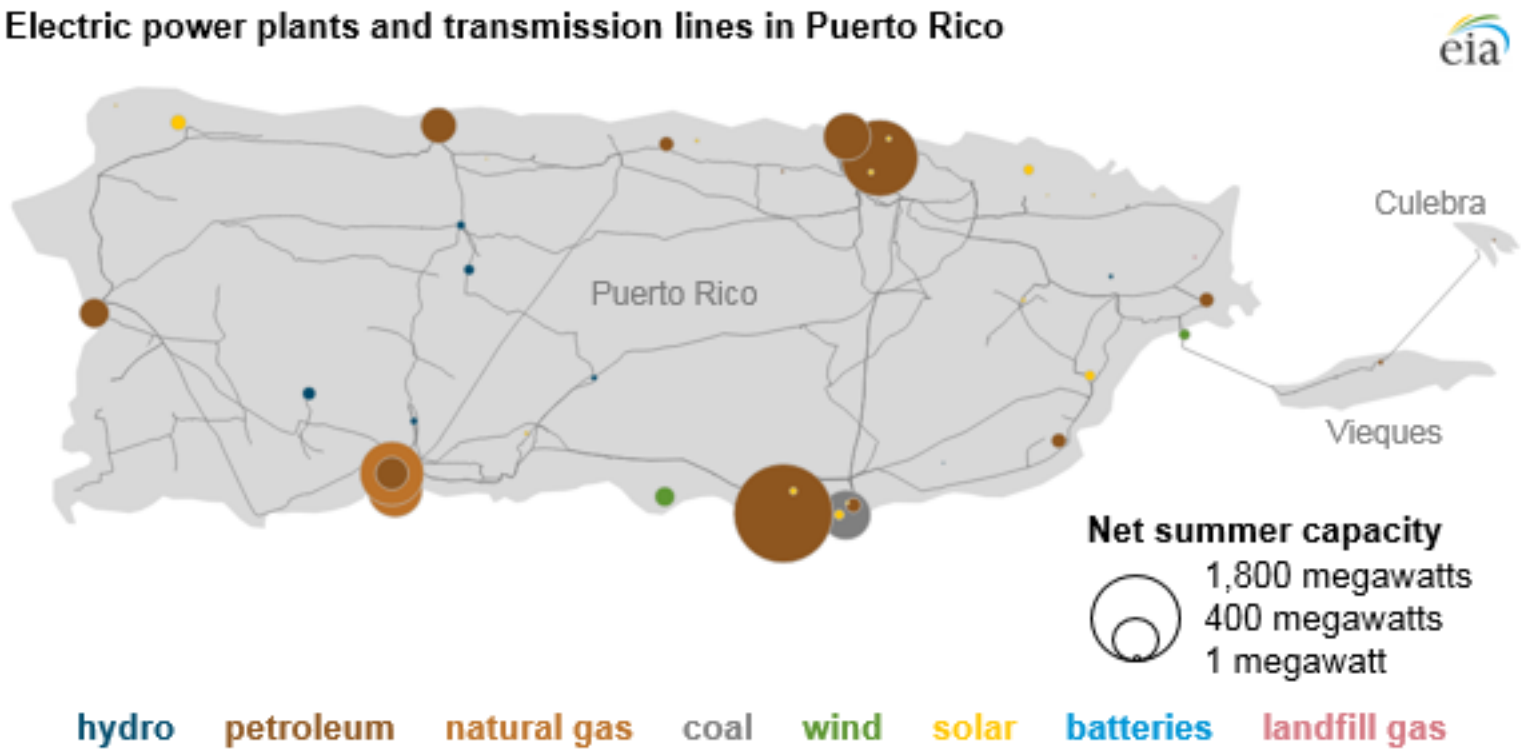
- Founded in 1996 by CEO Bruce Biewald
- Leader for public interest and government clients in providing rigorous analysis of the electric power sector
- Staff of 37 includes experts in energy and environmental economics and environmental compliance
- Providing technical, analytical, and policy support as regulators and utilities recognize the need to proactively plan for emerging technologies, enable customers to optimize their consumption, and promote innovative approaches for providing electricity services

PR Electric Portfolio as of 2015



Source: Energy Transition Initiative; https://www.nrel.gov/docs/fy15osti/62708.pdf

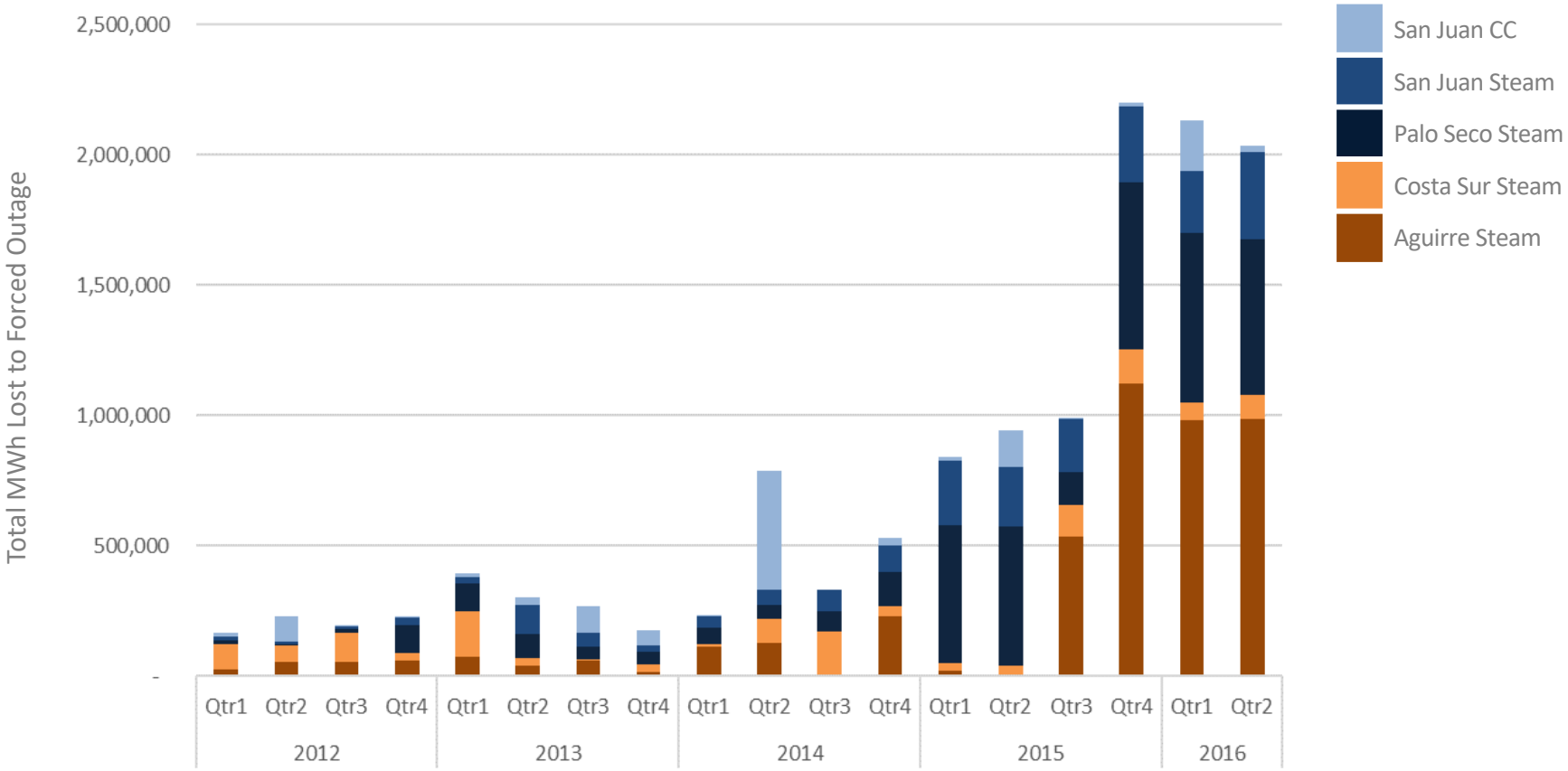
Electric System Map



Source: U.S. Energy Information Administration; https://www.eia.gov/todayinenergy/detail.php?id=36613

Forced Outage Rates

- Deferred maintenance and reduced capital spending in power plants contributed to high, and rising, forced outage rates.



Source: Fischer and Horowitz, Expert Report in CEPR-2015-AP-2015-0001

Hurricane Impacts

- Generation fleet relatively unscathed by Hurricanes Irma and Maria
- But transmission connecting plants to main load centers was severely damaged
- Impacts on resource planning:
  - Increased focus on resilience
  - Locate generation closer to load
  - Increased customer desire for self-generation and storage
    - Microgrids
  - Projections for flat GDP; falling population for the next 20 years

Transformation

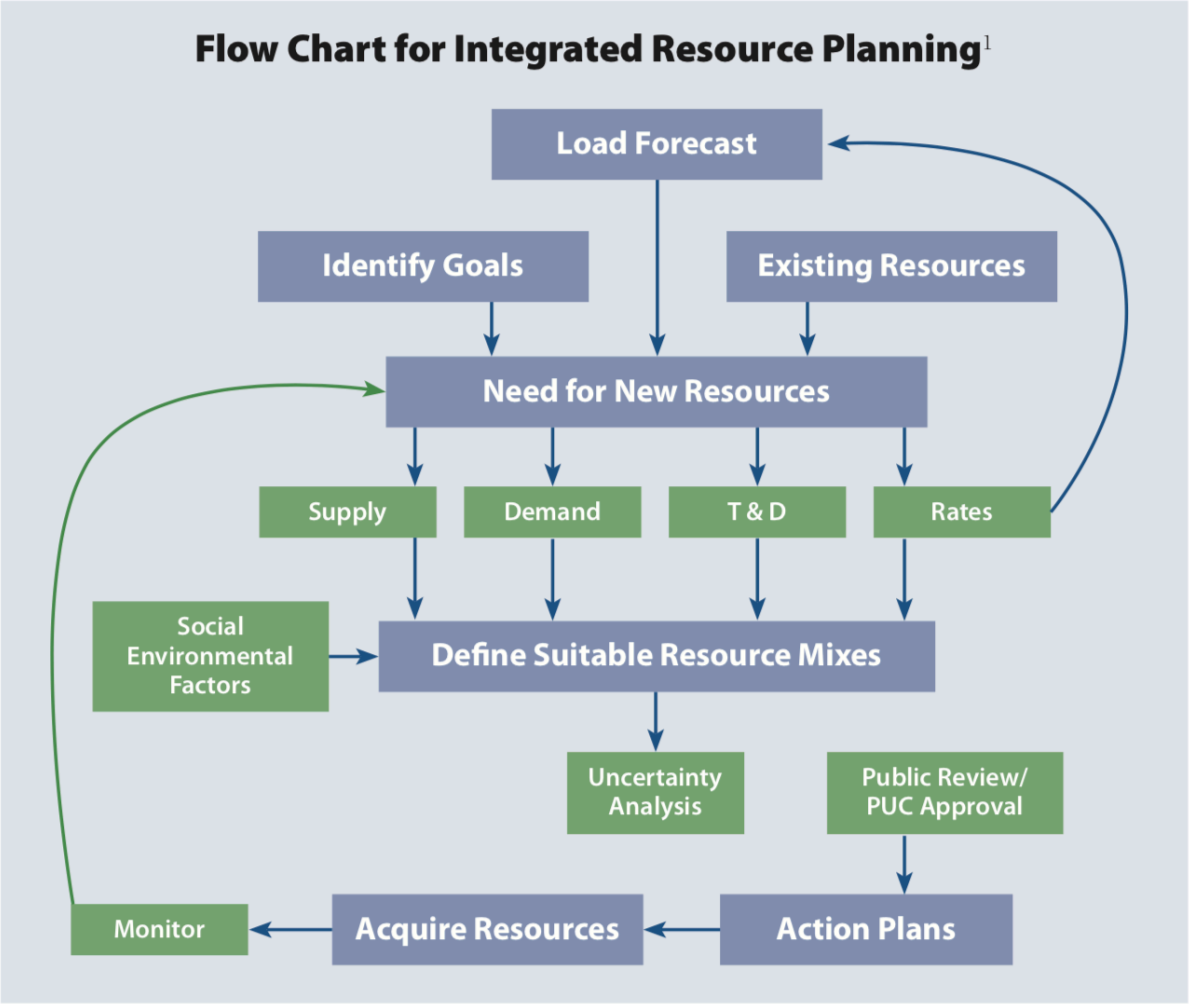
- Act 120 – 2018 – Electric Power System Transformation Act
  - Set in motion the transition in ownership or control of PREPA's assets
  - Generation to be sold/transferred
  - Transmission and distribution system to be operated by a concessionaire
- Act 17 – 2019 – Energy Public Policy Act
  - 100% renewable electricity by 2050
    - and 20% by 2022; 40% by 2025; 60% by 2040
  - Requires demand response plans from electric suppliers
  - Renews 30% by 2040 energy efficiency target; explicitly allows third-party administrator

Integrated Resource Planning

An integrated resource plan, or IRP, is a utility plan for meeting forecasted annual peak and energy demand, plus some established reserve margin, through a combination of supply-side and demand-side resources over a specified future period.

- If correctly implemented, IRP locates the lowest practical costs at which a utility can deliver reliable energy services to its customers.
- IRP differs from traditional planning in that it requires utilities to use analytical tools that are capable of fairly evaluating and comparing the costs and benefits of both demand- and supply-side resources.

IRP Process



Reference: Integrated Resource Planning for State Utility Regulators. Available at: http://www.raponline.org/document/download/id/817

Integrated Resource Planning in PR

- PR and Federal laws establish “consistency with the approved IRP” as a key threshold for utility and third-party actions in Puerto Rico
- 2015 IRP (Modified version approved in 2016) is still the controlling document
- PREB issued new IRP rule after the first IRP, to be more explicit about exactly what is required for IRP
- PREB and PREPA both recognize that a new IRP is necessary for the transforming island and a post-hurricane environment

2019 Integrated Resource Plan

- PREPA filed a version in February that PREB ruled was not in compliance with the regulation
- PREPA filed a new version in June; PREB is now evaluating it for compliance
- Expect examination of the IRP to take place over the second half of 2019
- Goal is to have an approved IRP that is high quality and reflects the island's needs as soon as practicable, so that subsequent actions can be judged against an up-to-date plan
- June draft evaluates options that are consistent with Act 17's renewable energy and energy efficiency policies
- PREPA proposes investments to allow segmentation of the PR grid into "minigrids" so that critical and priority loads will have resilient local electric supply in the event of catastrophic hurricane

Energy Efficiency and Demand Response Rules

- PREB is developing rules to implement Act 17's policies on energy efficiency and demand response
- Building from the Third-Party Administrator approach already described in the IRP rules
- Expects to release rules and implementation approach for public comment shortly, with the objective to have robust programs in place starting in 2020

Thank You

Asa S. Hopkins, PhD
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25 JUNE, 2019

Microgrid Regulations in Puerto Rico

Clean Energy Ministerial and Clean Energy Solutions

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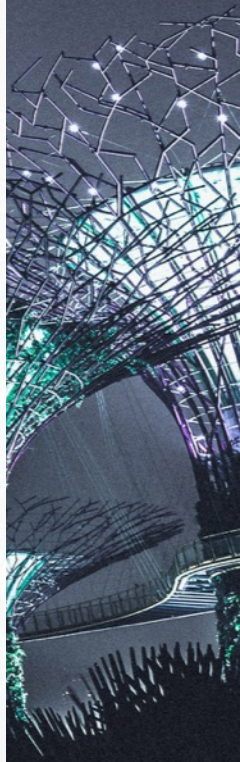

About RAP – US

- RAP provides technical and policy support at the federal, state and regional levels, advising utility and air regulators and their staffs, legislators, governors, other officials and national organizations.

- We help states achieve ambitious energy efficiency and renewable energy targets and we provide tailored analysis and recommendations on topics such as ratemaking, smart grid, decoupling and clean energy resources. RAP publishes papers on emerging regulatory issues and we conduct state-by-state research that tracks policy implementation.

About Your Presenter – Janine Migden-Ostrander

- Janine L. Migden-Ostrander advises regulators and advocates on energy efficiency, renewable energy, demand response, distributed generation, and integrated resource planning. Recent projects include working closely with the Arkansas Public Service Commission on energy efficiency as part of the Clean Energy Ministerial for the U.S. Department of Energy (DOE), facilitating the Mid-Atlantic Distributed Resources Initiative (MADRI), and providing workshops on energy efficiency policies as part of the SEE Action initiative for DOE. Her projects are predominantly in the U.S., but also overseas.

- Ms. Migden-Ostrander has worked in public utility law for approximately 35 years, most recently as the Ohio Consumers' Counsel, where she oversaw the state agency that represents the interests of Ohio's 4.5 million residential households with their investor-owned electric, natural gas, telephone, and water companies.

Context

- First ever comprehensive rules
- Rapid Commission response to ongoing emergency in PR:
  - Large area of the population without power for many months – many in remote areas
  - Widespread destruction of PREPA's T&D system

Source: Sara Armas / Shutterstock.com

Overview of Microgrid Rules

- Focus is on islanded microgrids
- Uses standard similar to PURPA
  - 75% renewable energy
  - CHP
- Based on Act 133 in Puerto Rico
- Rules for interconnection were drafted by the Energy Bureau and are being released for comment
- Proposed Performance Incentive Metrics may address cooperation with microgrid operators

Microgrid Rules: Article 1 General Provisions

- Section 1.01 - Title
- Section 1.02 - Legal Basis
- Section 1.03 - Purpose and Executive Summary
- Section 1.04 - Application
- Section 1.05 - Interpretation
- Section 1.06 - Provisions of Other Regulations
- Section 1.07 - Unforeseen Proceedings

Article 1 – continued

- Section 1.08 - Definitions
- Section 1.09 - Controlling Version
- Section 1.10 - Severability
- Section 1.11 - Forms
- Section 1.12 - Mode of Submission
- Section 1.13 - Effect of Submission
- Section 1.14 - Confidential Information
- Section 1.15 - Validity
- Section 1.16 - Penalties

Article 2 – Microgrid Categories

- Section 2.01 - Microgrid Classification

Article 2 - Continued

- Microgrids shall be classified by operational structure, size, and whether or not they engage in off-system sales of energy and/or other grid services to entities other than PREPA.

Article 2 - Continued

Microgrids shall be classified according to whether they operated by:

- One or two natural persons;
- A customer-owned cooperative of at least three or more Cooperative Members;
- A non-profit or for-profit legal entity, such as a corporation, limited liability company, or partnership;
- A single municipality, a group of municipalities or any other administrative division of the Commonwealth, or PREPA; or
- Other arrangements that are submitted to the Bureau for review.

Article 2 - Continued

Microgrids are classified based on size according to the following:

- Individual-sized microgrids - one or two customers or customer-owners and operated by at least one of the customers;
- Small microgrids – between 3 and 10 customers (or Cooperative Members) and no more than 250 kW; and
- Large microgrids - more than 10 customers (or Cooperative Members) or generating capacity over 250 kW.

Article 3 – Microgrid Technical Requirements

- Section 3.01 - Microgrid Composition - generation assets, loads and Distribution Infrastructure.
- Section 3.02 - Renewable Microgrids - 75% of the energy output must be renewable energy.
- Section 3.02 - Combined Heat-and-Power – specifies annual useful thermal energy output and the fuel input.
- Section 3.02 - Hybrid Microgrids – must meet RE and CHP standards above and explain how it will operate.
- Section 3.03 – Forms of Demonstrating Compliance
- Section 3.05 - Codes and Standards

Article 4 – Requirements for Cooperative Microgrids

- Section 4.01 - Ownership and Sales Restrictions
- Section 4.02 - Registration
- Section 4.03 - Rate for Service
- Section 4.04 - Fee for Use of PREPA Infrastructure
- Section 4.05.- Additional Requirements Applicable to Large Cooperatives

Article 5 – Requirements for Third-Party Microgrids

- Section 5.01 - Ownership and Sales Restrictions - may sell Energy and Grid Services to Customers and PREPA.
- Section 5.02 – Certification – compliance with Reg. 8701 for aggregated loads greater than 1 MW
- Section 5.03 – Registration – in addition to certification
- Section 5.04 – Rate Structure – nondiscriminatory, cost based, kWh basis
- Section 5.05 - Deposits
- Section 5.06 - Billing - regular intervals, 30 day payment

Article 5 - continued

- Section 5.07 - Bill Objections and Suspension of Service – Reg. 8863
- Section 5.08 - Complaint Procedure – internal and available. Customer can file complaint at PREB if not satisfied, Reg. 8543.
- Section 5.09 - Standard Contract
- Section 5.10 - Non-Discrimination
- Section 5.11 - Contract Length and Exit Requirements
- Section 5.12 - Fee for Use of PREPA Infrastructure
- Section 5.13 - Reporting
- Section 5.14 - Rate Review – At customer's request

Article 6 – Registration Process

- Section 6.01 - Registration Form
- Section 6.02 - Commission Review
- Section 6.03 - Filing Fee

Article 7 – Exemptions

- Any Microgrid Operator may file a request for exemption or modification of any of the requirements under these regulations. Any request for exemption shall describe the provision from which the applicant seeks exemption or for which the applicant requests a modification and shall include a clear justification of the applicant's request. This opportunity to file for an exemption may occur at the time of seeking approval or at a later date such as when the microgrid is already in operation due to a change in circumstances. In ruling on such motions, the Commission shall consider the reasonableness of the request; the cost impact on the project and the customers of the microgrid project including the prudence of incurred or anticipated costs, if applicable; whether the exemption is in the public interest and any other relevant factors pertaining to the requested waiver.

Article 8 – Reconsideration and Judicial Review

- Section 8.01 - Request for Reconsideration
- Section 8.02 - Judicial Review

About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

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Question and Answer Session

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THANK YOU!

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