



# **Microgrid Services Tariff Working Groups Joint Meeting**

*December 3, 2019*

# MGS Tariff WGs Agenda

Time	Duration (m)	Topic
8:00-8:30	30	Introduction <ul style="list-style-type: none"> <li>Review of Nov. 21 Meeting</li> </ul>
8:30-9:00	30	Presentations <ul style="list-style-type: none"> <li>Jorge Camacho – Puerto Rico</li> </ul>
9:00-9:15	15	Break
9:15-10:15	60	Hybrid Microgrid – Interconnection Considerations
10:15-10:30	15	Break
10:30-11:15	45	Hybrid Microgrid – Simplified Tariff Concept
11:15-12:15	60	Lunch Break (on your own)
12:15-1:15	60	Hybrid Microgrid – Tariff Considerations
1:15-1:45	30	Schedule and Next Steps





# **Review: Nov. 21 WG Meeting**

## **Customer Microgrids**

# Proposed MG Types for MGS Tariff

## ◆ Customer Microgrids

- ◆ Customer microgrids are self-governed, acting as a single controllable entity normally operated in utility grid-connected mode and can disconnect from the grid to operate in island mode **during emergency events or grid outages** ~~for resiliency~~.
- ◆ Customer microgrids may involve a single customer or multiple customers downstream of a point/s of common coupling (PCC) with an electric utility utilizing either (i) own, (ii) lease or otherwise obtain use of non-utility distribution wires and other internal infrastructure of the microgrid from non-utility third parties.

## ◆ Hybrid Microgrids

- ◆ Hybrid microgrids developed by customers/3rd parties acting as a single controllable entity with respect to the utility's electrical grid normally operated in grid-connected mode and can operate in an island mode **during emergency events or grid outages** ~~resiliency~~ within clearly defined electrical boundaries linking associated resources and loads using utility distribution wires or other utility infrastructure.



# Customer Microgrid MGS Tariff

Revised framework to identify specific topics and priorities for WGs' discussion

MG Type	Tariff Structure	Rule 14H & Process Chgs	Energy & Grid Services	Resilience Services	Retail Wheeling	Other
Customer Microgrids	<b>Portal Type Proposed</b>	<b>Minor Changes</b> (IEEE/UL microgrid safety standards)	<b>Yes</b> (Via Existing Pricing, Programs & Procurements)	<b>Parties to Propose per PUC Order 3641*</b>	<b>N/A</b>	<b>TBD</b>
	<ul style="list-style-type: none"> <li>WG Agreed to develop a new MG tariff.</li> <li>Tariff will include definitions of customer/synchronizing/hybrid MGs.</li> <li>New Tariff will reference existing tariffs (e.g., CGS+, CSS, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>What changes may be needed, if any to Rule 14H? WG Leads/HECO team to propose.</li> <li>Customer MGs that synchronize reconnection to utility grid after event may need to comply with IEEE 2030.7 and other standards <b>TBD</b></li> <li>Operating Agreement needed for Synchronizing Customer MG? <b>Yes, but will be developed specific to each MG.</b></li> </ul>	<ul style="list-style-type: none"> <li>Export compensation will be through existing and new DER tariffs.</li> <li>All MGs capable of participating in future Grid Svcs.</li> </ul>	<ul style="list-style-type: none"> <li>PUC Order initial priority is to facilitate applications of MGs that improve energy resiliency, particularly the islanding of MGs during emergency events and grid outages.</li> </ul>	<ul style="list-style-type: none"> <li>WG agreed N/A.</li> </ul>	<ul style="list-style-type: none"> <li>WG agreed no other issues.</li> </ul>

\*Updates from Nov. 21 discussion denoted in red



# Presentations

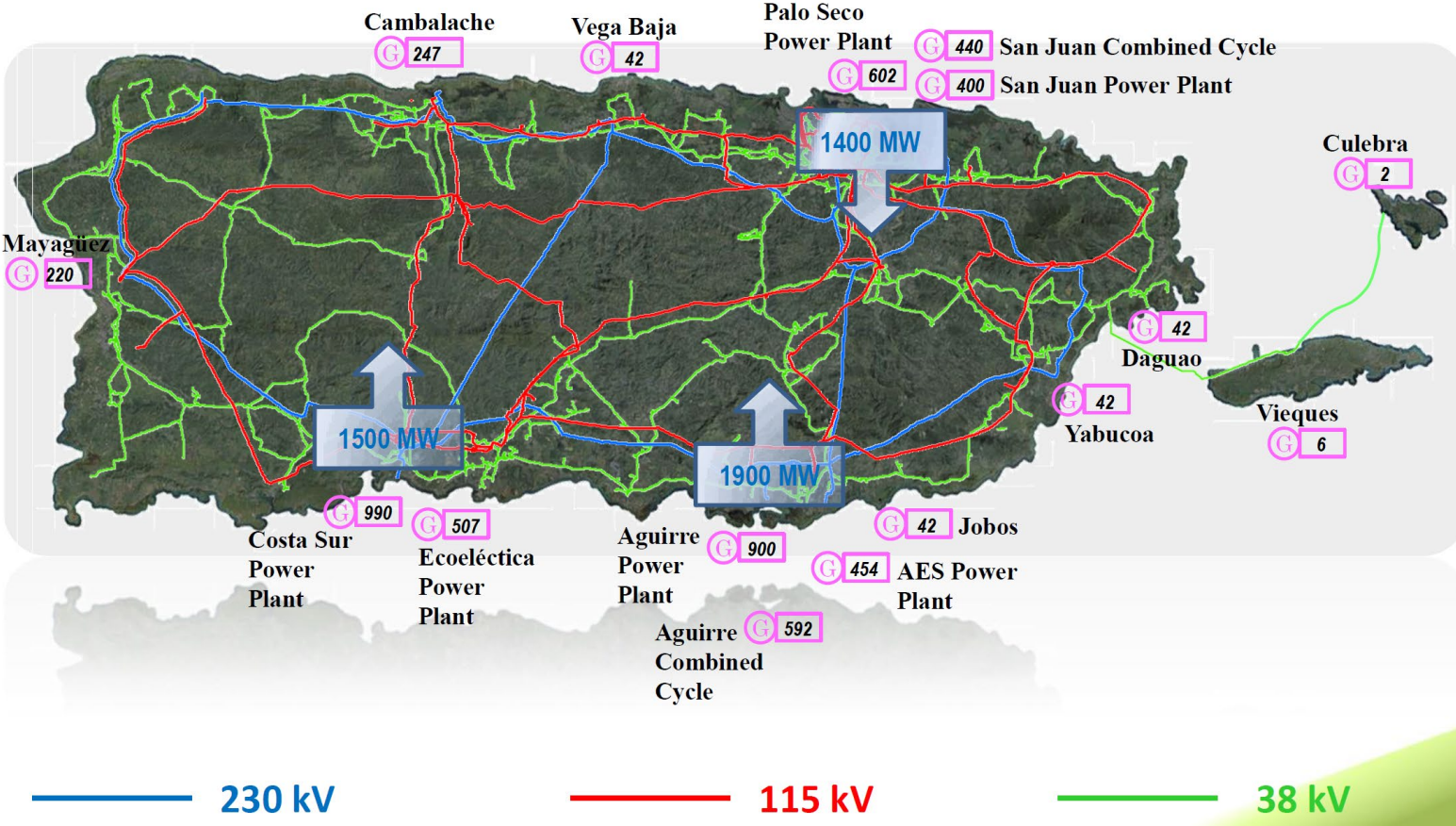
# Jorge Camacho, IEEE

## Puerto Rico Update



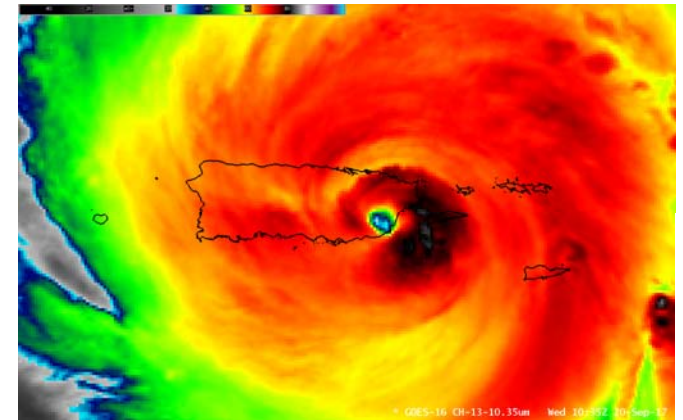
Hawaiian Electric  
Maui Electric  
Hawai'i Electric Light

# The microgrid space in Puerto Rico – driven by resilience needs





# Hurricanes Maria and Irma



Hawaiian Electric  
Maui Electric  
Hawai'i Electric Light



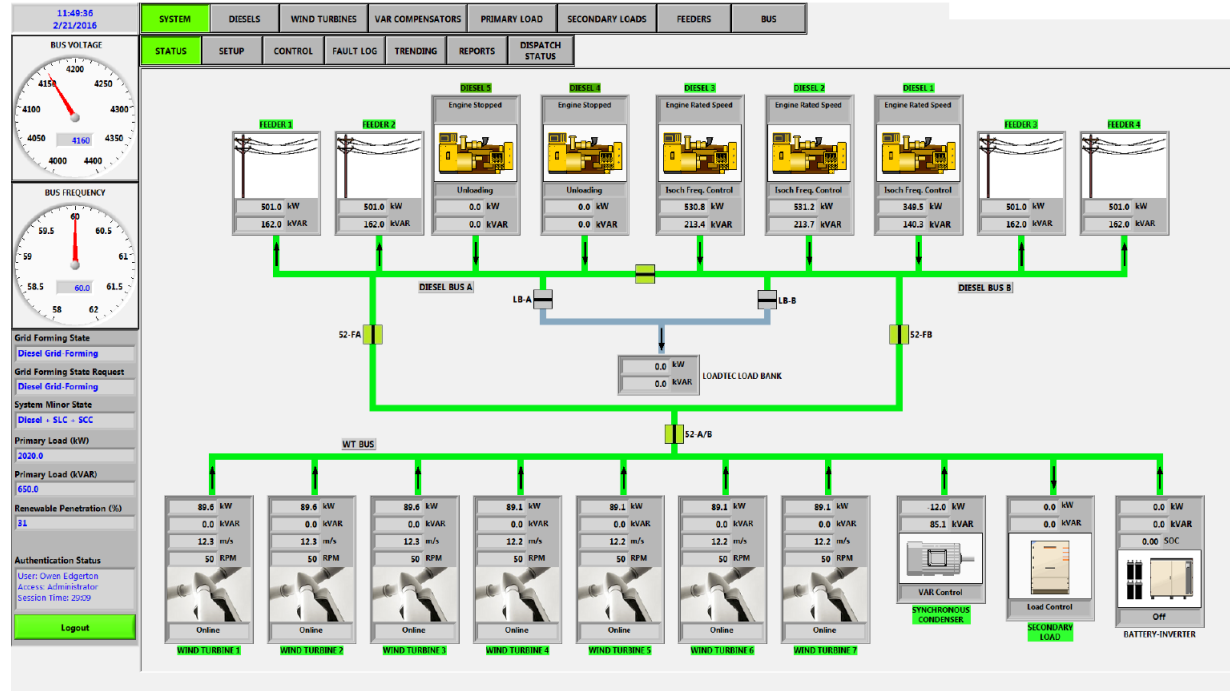
Wind turbines in Naguabo remained idle on February 13, 2018, due to damage from the hurricane's high winds.

K. C. Wilsey / FEMA

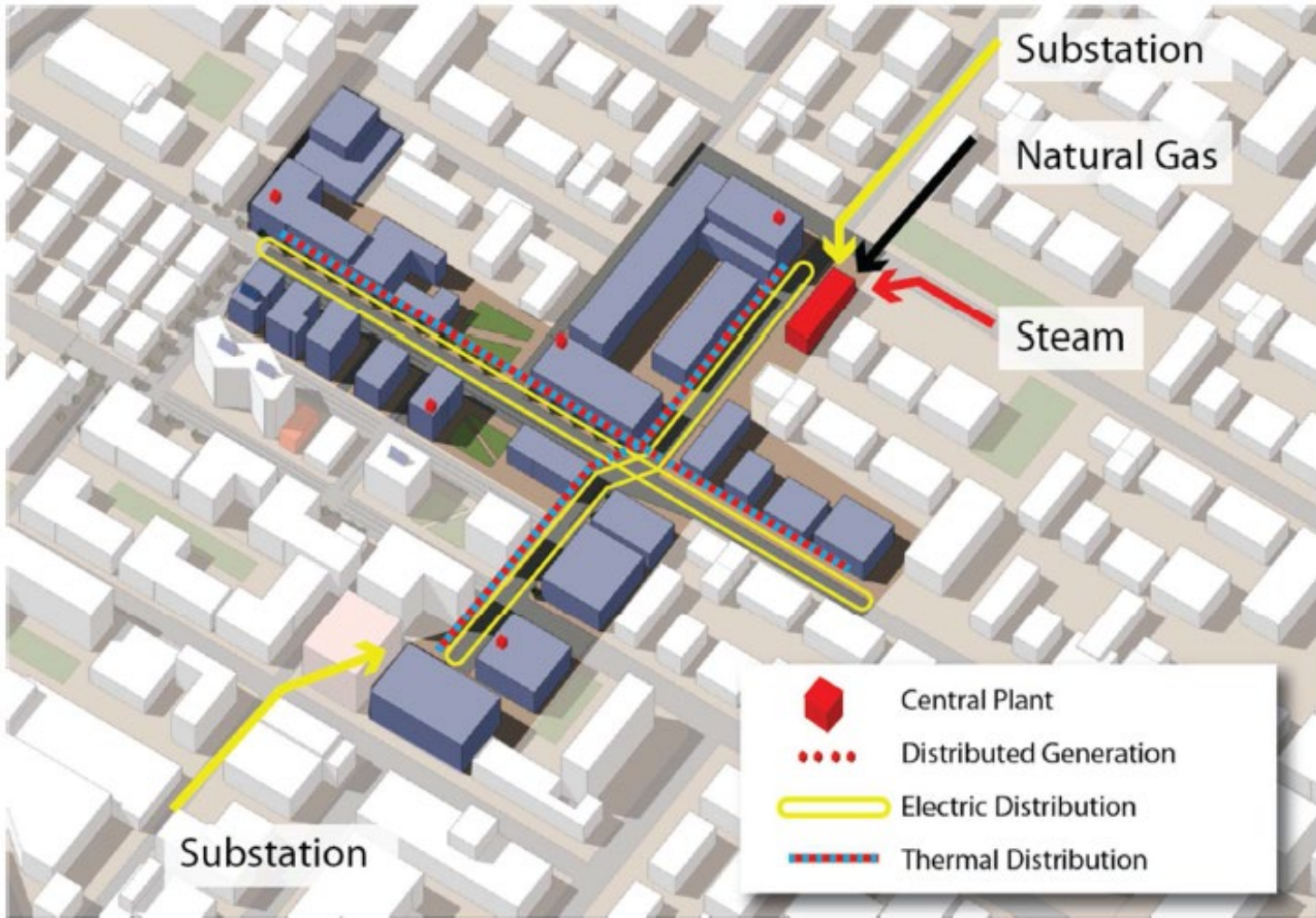
# The need for resilience

# Puerto Rico Microgrid Definition

“means a group of interconnected loads and Distributed Energy Resources (DER) within clearly defined electrical boundaries that acts as a single **controllable** entity that can connect and disconnect from the Electric Power Grid to enable it to operate in either grid-connected or off-the-grid (islanded) mode.”



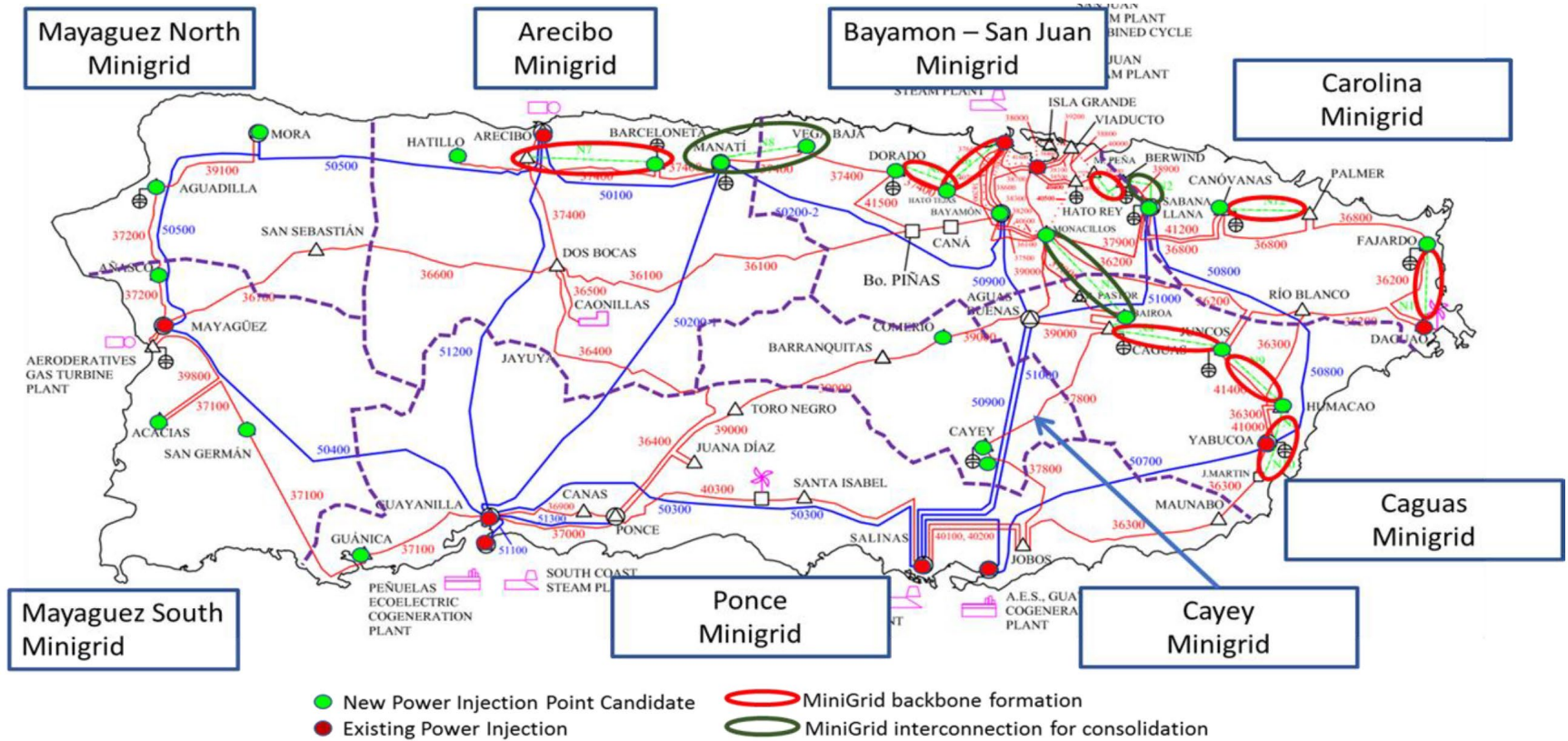




# Puerto Rico Microgrid Arrangements:

1. **Personal**  
[Campus]  
[BTM]  
<2 persons  
self-consumption
2. **Cooperative**  
>2 coop members  
self-consumption  
sale
3. **Third Party**  
[Multi-User]  
[Public-Sited]  
>2 persons  
sale
4. **Utility**

# Regional Minigrids Concept [Balancing Authority (?)]



## **The Hybrid Microgrid term in Puerto Rico is a function of microgrid composition:**

1. Renewable Microgrid
2. CHP Microgrid
3. **Hybrid** Microgrid -> 1+2 above

**The current regulations do not allow for the purchase or lease of utility facilities for integration in a non-utility microgrid arrangement.**

### Issues:

1. Maintenance Responsibilities – Safety/Reliability
2. Responsibilities for replacing infrastructure due to force majeure events
3. Adequate pricing of use fees
4. Possible changes in design required for isolation of the equipment

# Under Development – Microgrids

Electric Infrastructure Resilience Working Group [EIRWG]  
Electric System Planning Initiative – Puerto Rico

## Operational Coordination Roles

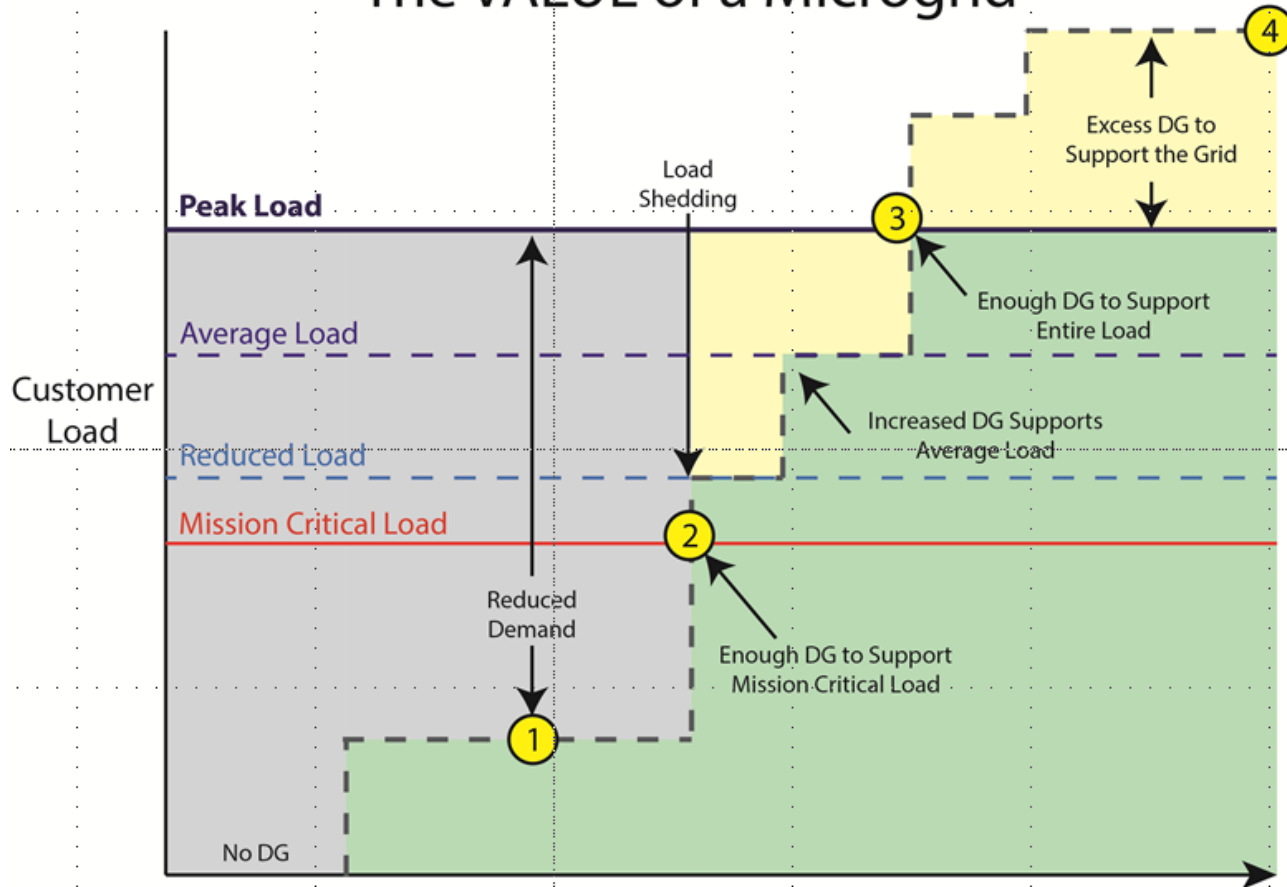
Adoption of Grid Codes [Operational Protocols]  
Considerations of Contractual Agreements  
Independent System Operator – Balancing Authority (?)



## Fee Schedule – Grid Support

Volt-Watt  
Frequency-Watt  
Specified Power Factor  
Volt/Var  
Low and High Frequency Ride Through  
Low and High Voltage Ride Through  
Normal Ramp Rate  
Soft Start Ramp Rate

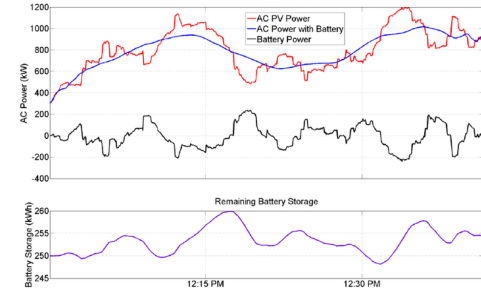
# The VALUE of a Microgrid





# Interconnection Considerations – Minimum Technical Requirements [MTRs], Additional Technical Requirements [ATRs]

As a mitigation measure PREPA requires DG greater than 1 MW a +/- 10% of rated capacity limit on 1-minute ramp rates (RR) by both wind and PV generation.



# Interconnection Considerations – Microgrid Controller

Adherence to:

IEEE STD 2030

IEEE STD 1547.4

Determination of utility communication protocol:

IEEE STD 2030.5 [SEP2]

IEEE STD 1815 [DNP3]

SunSpec Modbus

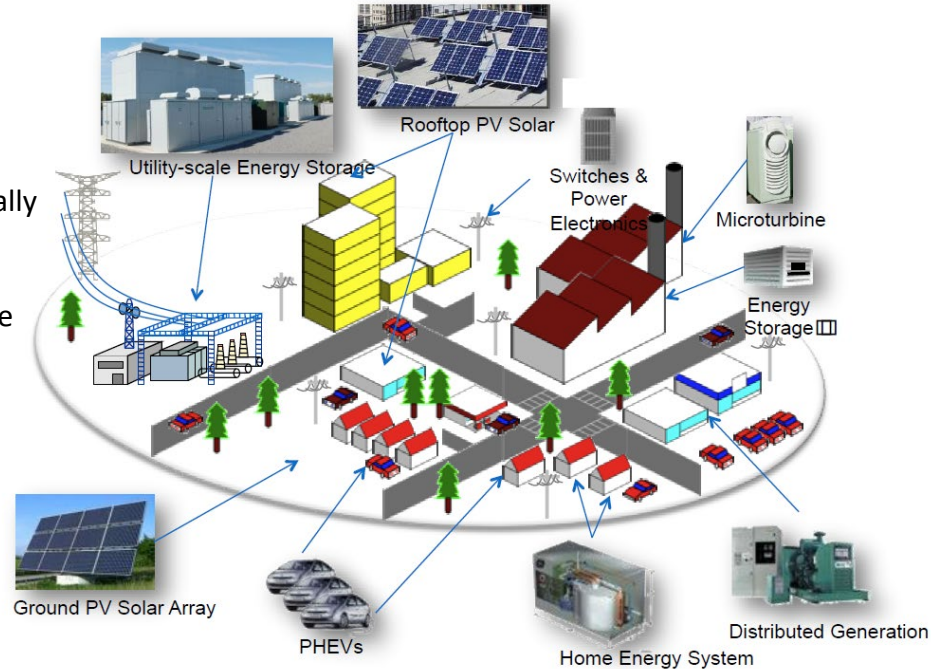
# Making a potential case for Microgrid deployment

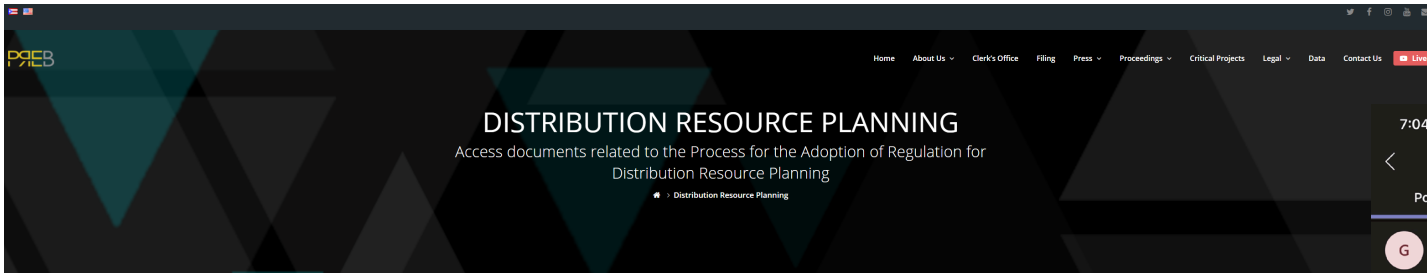
## Barriers

- Obligation to Serve
- Ability to balance generation, storage and load to maintain reliable operations when disconnected from the grid
- Safety, Reliability Oversight
- Wholesale FERC Regulation -> Any exported electrons will sink locally
- Risk Aversion Utilities
- Exclusive Franchising
- Attracting Third-Party Investment, it may not make economic sense
- It may make more sense for generation to sell into RTO -> sustainable business model
- Less distribution wires, less revenue to distribution utility, what's the ratebase?
- CHP Air -> Air+Noise Permitting

## Benefits

- Increased Efficiency -> Lower GHG
- Increased reliability to microgrid participants and possibly increased resiliency to surrounding areas (community stewardship), local balancing
- Deferral or elimination of utility capex to address Load Growth and Power Quality (reliability)
- Fast-Acting ancillary services to the distribution system
- Security advantages of distributed generation (less vulnerable than centralized generation)
- Total Cost of Energy decrease
- Energy infrastructure expenditure decisions possibly made closer to the customer
- Manage High DG/PV uptake





### Distribution Resource Planning

Act 17-2019 establishes Puerto Rico's new energy public policy. Based on the need to establish a process for the development and approval of long-term integrated planning of the Island's distribution resources, the Energy Bureau of the Public Service Regulatory Board determined it convenient to begin a formal regulatory process for these purposes.

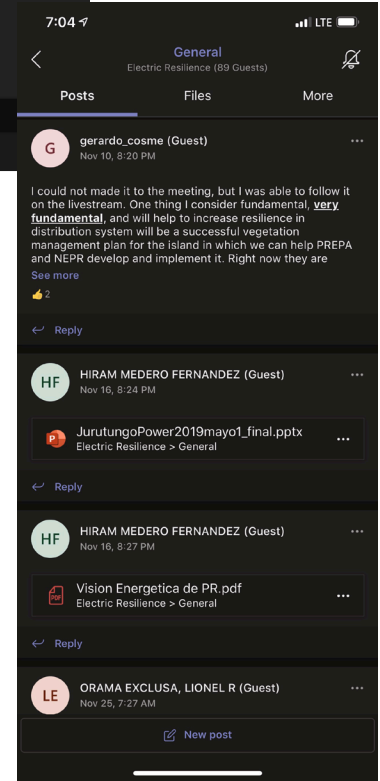
As a prelude to the beginning of the formal regulatory process, the Energy Bureau will gather input from different interest groups in the energy sector prior to the publication of a draft proposal for regulation through Stakeholder Workshops.

Below you can find documents related to the Stakeholder Workshops:

- Agenda – August 16, 2019. ([press here](#))
- Materials presented during the August 16, 2019 Workshop. ([press here](#))
- Agenda – September 13, 2019 ([press here](#))
- Materials presented during the September 13, 2019 Workshop. ([press here](#))
- Agenda – October 11, 2019 ([press here](#))
- Materials presented during the October 11, 2019 Workshop. ([press here](#))
- Agenda – November 7, 2019, Electric Resiliency Working Group. ([press here](#))
- Agenda – November 8, 2019, Hosting Capacity Working Group. ([press here](#))
- Materials presented during the November 7, 2019 Meeting, Electric Resiliency Working Group. ([press here](#))
- Materials presented during the November 8, 2019 Meeting, Hosting Capacity Working Group. ([press here](#))
- Agenda – November 21, 2019 – Planning Coordination Working Group. ([press here](#))
- Agenda – November 22, 2019 – Hosting Capacity Working Group. ([press here](#))
- Materials presented during the November 21, 2019 Meeting, Planning Coordination Working Group. ([press here](#))
- Materials presented during the November 22, 2019 Meeting, Hosting Capacity Working Group. ([press here](#))

### Relevant Documents on Distribution Resource Planning

Title	Description	Link
Distribution 101	Covers fundamentals of AC power, smart grids, grid components and emerging grid technologies.	<a href="#">Press here.</a>
Utility Distribution Planning 101	Describes the electric utility's distribution system planning process.	<a href="#">Press here.</a>



<http://energia.pr.gov/en/distribution-resource-planning/>



# Hybrid Microgrid Tariff Considerations

*(sample\* to start WG discussion)*

## ◆ Customers

- ◆ Request Process: Establishment of a process for a customer to opt-in to a Hybrid Microgrid.
- ◆ Determination of Payment: The method of payment by the customer to Hybrid Microgrid Operator.
- ◆ Quality of Service: What are the Hybrid Microgrid operator's obligations for provision of service to customers.
- ◆ Free-Riders: How do you deal with customers within a microgrid footprint but not willing to pay?

## ◆ Resilience Benefits

- ◆ What public resilience benefits do Hybrid Microgrids provide under various cyber and physical threats?
- ◆ How are any resilience benefits determined and estimated?
- ◆ Who pays for identified resilience benefits?

## ◆ Hybrid Microgrid Configuration:

- ◆ Eligible Services or Facilities: The type, extent and location of hybrid microgrid services/equipment needed.

## ◆ Hybrid Microgrid Interconnection Facilities:

- ◆ Equipment: What are the standard facilities the utility may need to install to enable the project?
- ◆ Determination of Cost: The net cost to the Hybrid Operator/Developer for the grid services/equipment required.
- ◆ Independent Review: Allow for appeal for an independent review of cost and requirements to 3<sup>rd</sup> party.

## ◆ Operational Coordination:

- ◆ Coordination of Hybrid microgrid function with other grid services.
- ◆ In island mode, what is the role of a Hybrid Microgrid operator?
- ◆ In island mode who controls the distribution infrastructure within the microgrid including addressing issues related to post event damage assessment & any repair
- ◆ Fixed vs. Dynamic: What equipment settings are pre-programmed, and what are managed.

## ◆ Tariff Structure:

- ◆ Is a standard tariff an effective structure or are Hybrids unique and best addressed through PPAs/Operating Agreements?

\* Largely drawn from prior WG presentation from Andrew Barbeau

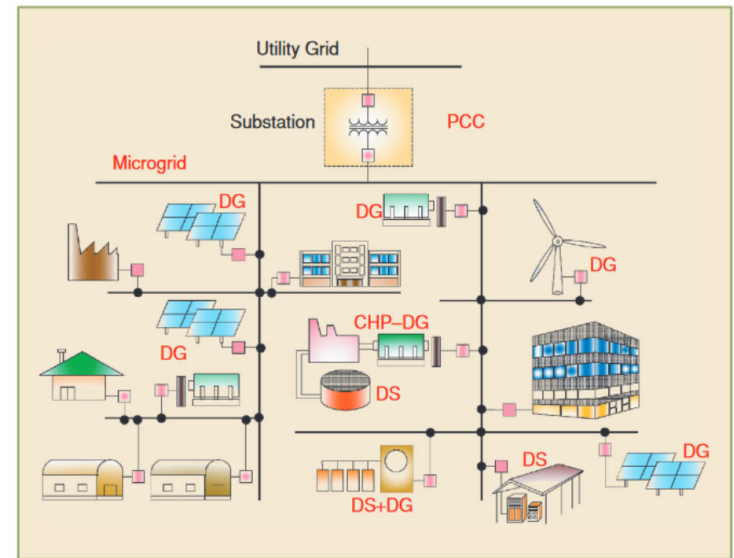
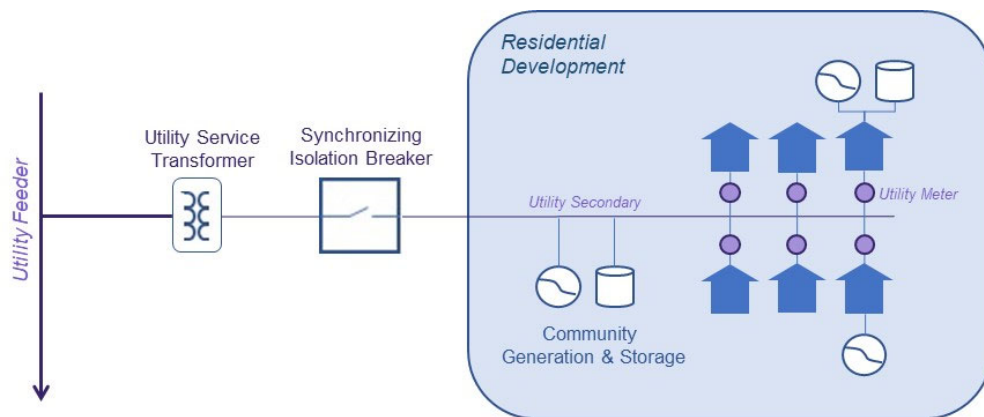




# Hybrid Microgrids

## Interconnection & Operational Discussion

# Hybrid Microgrids



## ◆ Interconnection Facilities:

- ◆ What are the standard facilities the utility may need to install to enable the project?
- ◆ Determination of Cost: The net cost to the Hybrid Operator/Developer for the grid services/equipment required.
- ◆ Independent Review: Allow for appeal for an independent review of cost and requirements to 3<sup>rd</sup> party.
- ◆ Interconnection Requirements Study (IRS) may be required
- ◆ Modify Standard Interconnection Agreement (SIA)?







# Hybrid Microgrids

## Simplified Tariff Concept



# Hybrid Microgrid Tariff Concept

(adaptation of WG suggestion in Nov 21<sup>st</sup> Mtg)

**An approach to Hybrid MG Services Tariff structure is to simplify the utility-customer-MG operator relationship complexity by :**

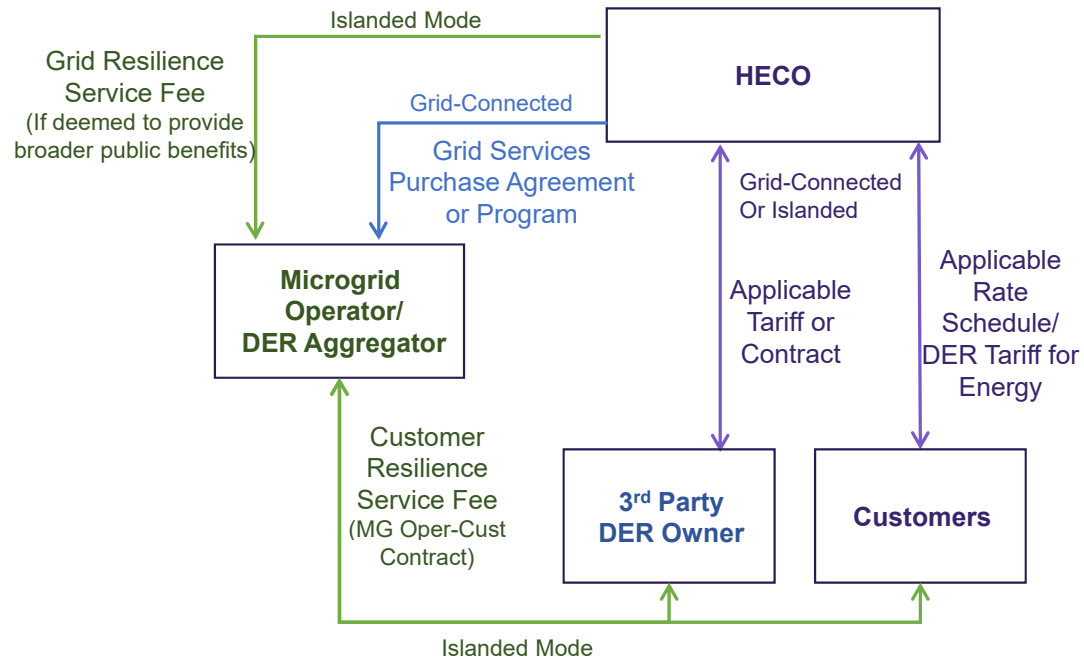
- ◆ Maintaining the same basic utility-customer/DER provider service tariff/program relationships during both normal and islanded modes.
- ◆ Recognize the MG Operator as providing a resilience operational service that temporarily dispatches MG resources to meet loads within MG boundary when islanded during a grid emergency or outage.

**Simplifying approach eliminates the complexity of:**

- ◆ Changing utility-customer/DER provider tariff relationships for energy purchases, sales and grid services and associated billing and settlement during relatively rare and short periods of time.
- ◆ Retail wheeling during island mode and ambiguity regarding operational & safety responsibility for utility distribution infrastructure
- ◆ Complex commercial/operational arrangement for MG Operator by using a simpler grid resilience service approach through the established Grid Services/NWA procurement/program approaches



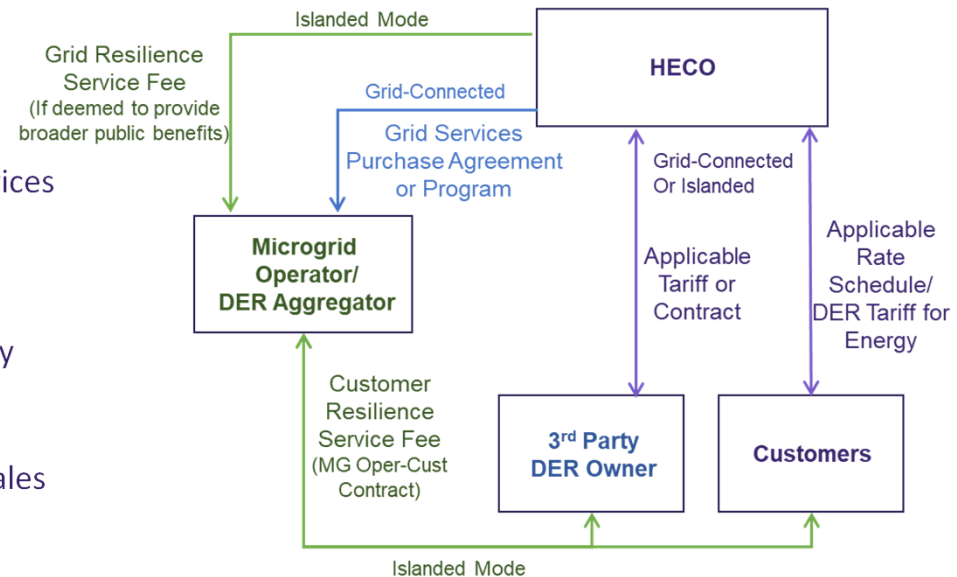
# Proposed Hybrid Microgrid Tariff Concept



# Proposed Hybrid Microgrid Tariff Concept

(adaptation of WG suggestion in Nov 21<sup>st</sup> Mtg)

- ◆ An approach to Hybrid MG Services Tariff structure is to simplify the utility-customer-MG operator relationship complexity by maintaining the same basic service relationships during both normal and islanded modes.
- ◆ MG Operator provides resilience services to customers within MG boundary and potentially to HECO for broader public benefits. (i.e., Operations as a Service)
  - ◆ MG Operator may also act as a DER Aggregator providing grid services to HECO during normal mode outside of MG Tariff
  - ◆ MG Operator may also be a DER owner within MG boundary
- ◆ HECO and customer/3rd Party DER owner relationships regarding energy sales (delivered and received) and distribution service remain the same independent of normal or island mode.
  - ◆ No change to utility metered services and export energy credits/sales
  - ◆ Grid (and NWA) services to HECO may be interrupted during emergency/outage depending on specific service/s provided, grid impacted and hybrid MG configuration.



# Proposed Hybrid Microgrid Tariff Structure & Roles

(adaptation of WG suggestion in Nov 21<sup>st</sup> Mtg)

## Hybrid Microgrid Operator

- ◆ Provides microgrid operations, control of associated MG resources, and single point of operational interface with HECO
- ◆ Provides resilience service to associated MG customers during emergency/outage
- ◆ May provide grid resilience service (where deemed to provide broader public benefits) to HECO during emergency/outage
- ◆ MG Operator may also act as a DER Aggregator during normal mode (i.e., Grid Services Purchase Agreements)

## Customer/3rd Party DER Owner

- ◆ HECO customer billed under applicable rate schedule/DER tariff/program during normal and emergency/outage conditions
- ◆ Customer/DER provider export energy delivered to HECO under applicable DER tariff/program during normal or emergency/outage
  - ◆ No change in transactional relationship
- ◆ Customer/DER Owner has contract with MG Operator for resilience services (includes resilience service fee) and operation and control of resources.

## HECO

- ◆ Customer/DER Owner service relationship during normal mode under applicable rate schedule/DER tariff/program
- ◆ HECO maintains operational responsibility for distribution infrastructure during emergency/outage in coordination with MG Operator
- ◆ HECO continues to buy export energy from customer/DER owner resources during islanded MG mode during an emergency/outage.
- ◆ HECO pays MG Operator a grid resilience fee only if broad public resilience benefits are provided. Grid resilience service and value would be identified in IGP resilience planning and conducted through a programmatic approach.





# Hybrid Microgrids

## Tariff Discussion

# Hybrid Microgrids

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## Hybrid Microgrid Configuration:

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- ◆ Cost for use of Utility Infrastructure

## Tariff Structure:

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# Hybrid Microgrids

## Resilience Benefits

- ◆ What public resilience benefits do Hybrid Microgrids provide under various cyber and physical threats?
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## Parking Lot Topics To-date

- ◆ Change of ownership
- ◆ Standby Charges
- ◆ Customer protection-related considerations
- ◆ Microgrid/IGP procurement considerations
- ◆ Considerations of gaming between utility-owned and 3rd-party MGs
- ◆ Army/Military MG issues such as WG will consider nested microgrids, if appropriate
- ◆ Interactions with other dockets
  - ◆ DER Tariff/Programs
  - ◆ IGP Resiliency
- ◆ Consideration of societal, environmental value
- ◆ Development of PPA model for hybrid MGs
- ◆ Other types of microgrids that don't fit Act 200 definition
  - ◆ Utility-Private Partnership Microgrids
- ◆ Puerto Rico microgrid ruling and related activity and relevance to Hawaii



# Proposed Timeline for MGS Tariff WGs

*Adjust as needed based on stakeholders feedback & co-chairs' direction*

