Microgrid Services Tariff
Working Groups Joint Meeting

November 21, 2019

MGS Tariff WGs Agenda

Time	Duration (m)	Topic
8:00-8:15	15	Introduction • Feedback from PUC Status Meeting Nov. 14th
8:15-8:45	30	MGS Tariff Microgrid Type Definitions • Review & Finalize • Examples
8:45-9:15	30	IEEE Microgrid Standards – Annabelle Pratt (NREL)
9:15-9:45	30	Customer Microgrid Interconnections • IEEE 2030.7/8 Considerations
9:45-10:00	15	Break
10:00-10:30	30	Princeton University Microgrid – Ted Borer (Princeton)
10:30-11:15	45	Customer Microgrid Tariff Structure • Portal type tariff discussion
11:15-11:45	30	Hybrid Microgrid • Identify and prioritize issues to address
11:45-12:00	15	Agenda for Dec. 3rd Joint WG Meeting • Proposed Agenda Topics • Call for presenters

Nov. 14 PUC Status Update - Feedback

- PUC Feedback
  - Customer Microgrids
    - Consider whether a tariff is needed for Customer Microgrids
    - More clarity needed on Synchronizing Microgrids
  - Hybrid Microgrids
    - WG needs to prioritize the development of the Hybrid MST
      - Focus of Act 200 was to facilitate Hybrid Microgrids
      - Development of a Hybrid MST will facilitate development
    - Confirm Hawaii examples of Hybrid Microgrids
- WG Member Questions
  - Are there Tariff/Materials/Insights available from the Walter Reed Hospital MG?
  - How do you determine whether the MG is a utility or hybrid MG when joint development is involved?

MGS Tariff Microgrid Types

Revised Working Definitions & Examples

Proposed MG Types for MGS Tariff

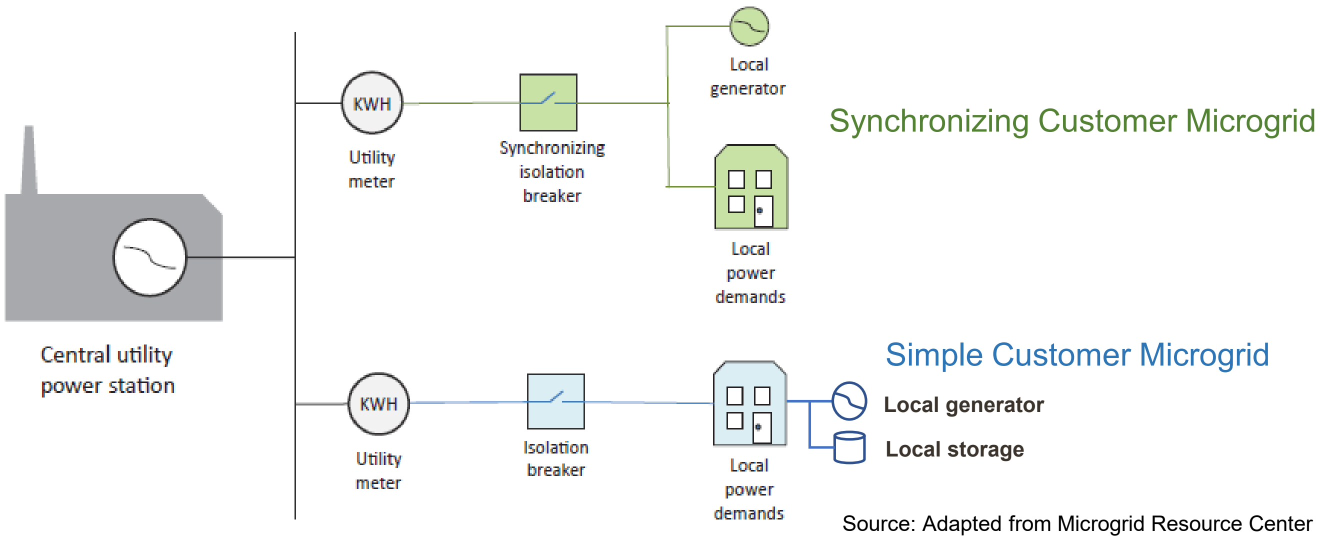
- **Customer Microgrids**
  - Customer microgrids are self-governed, acting as a single controllable entity normally operated in utility grid-connected mode and can disconnect from the grid to operate in island mode for resiliency.
  - Customer microgrids may involve a single customer or multiple customers ~~Customer microgrids are~~ 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**
  - ~~3rd Party~~ 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 for resiliency within clearly defined electrical boundaries linking associated resources and loads ~~within their micro-control area~~ using utility distribution wires or other utility infrastructure.

Customer Microgrid Types

for discussion

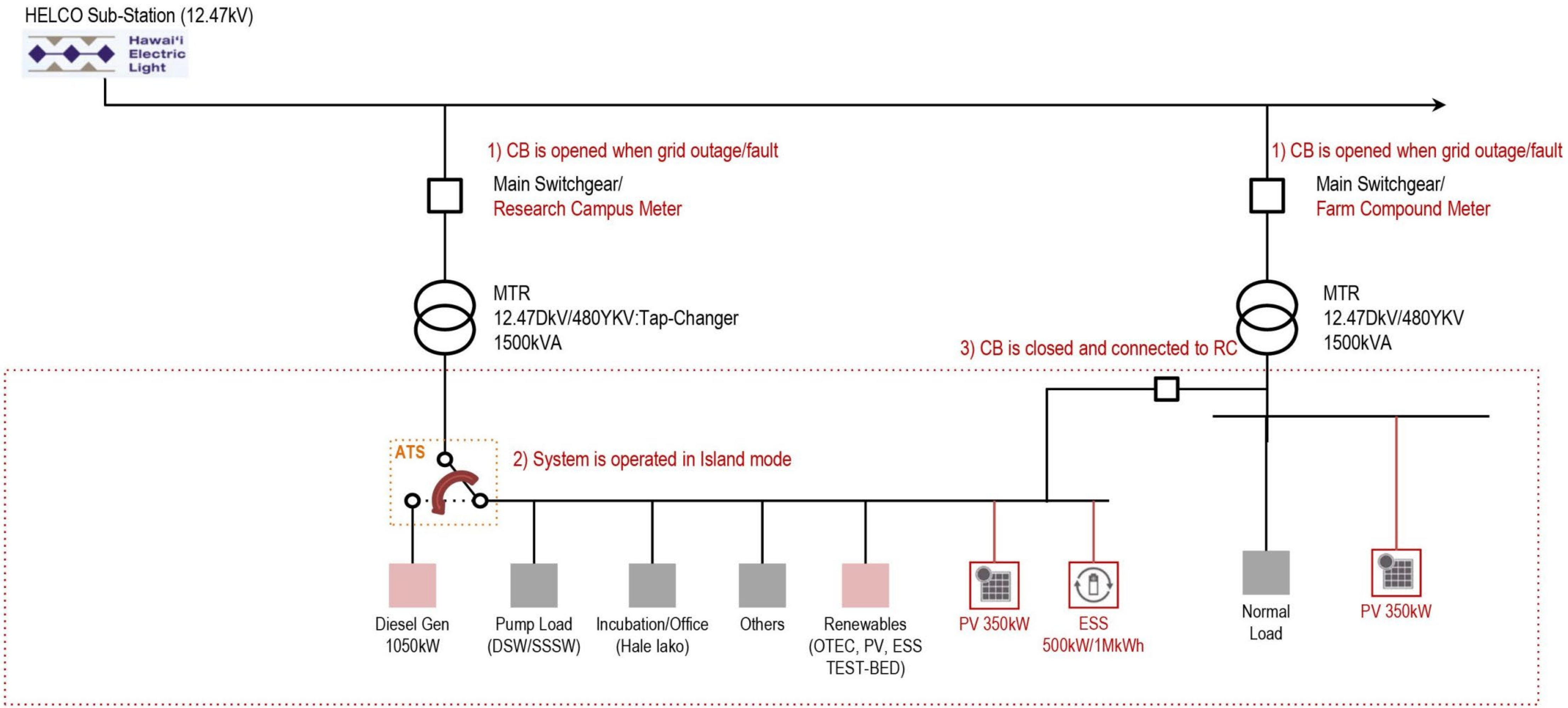
Customer MG Types	Hawaii Examples	Interconnection Considerations	Tariff Considerations for WG Discussion
Simple Customer Microgrids that disconnect on grid outage via an isolation breaker and requires “drop & pick-up” of load when reconnecting to grid	Kalaeloa, Kaimana, Mahana and Makai Apartments	This type may not require any changes to Rule 14H	WG idea of a potential creation of a “portal” tariff that provides a gateway to other relevant DER tariffs and interconnections
Synchronizing Customer Microgrids that seamlessly island on grid outage and reconnects via a synchronizing isolation breaker after grid is restored	Univ. of Hawaii (see slide)	IEEE 2030.7 and 2030.8 relating to standards and testing procedures for microgrid controllers	Interconnection facilities are specialized to accommodate synchronized interconnection, may need operating agreement for safe coordination



Source: Adapted from Microgrid Resource Center

NELHA Microgrid (2nd Step Configuration)

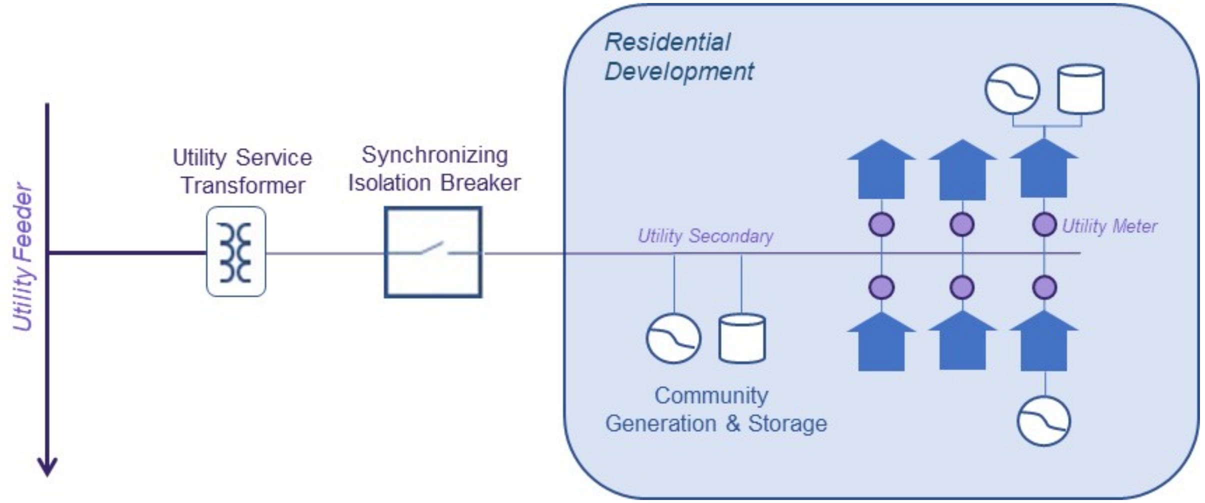
Example for discussion



Hybrid Microgrid Example: Simple Hybrid MG

Example for discussion

- **Simple Hybrid Microgrid** involves a smaller geographic area with a simpler electrical boundary, such as a defined residential community/industrial park/commercial retail center.
- A single entity representing all customers involved with microgrid, such as a home owners association, property manager, etc.
- Contiguous loads and resources within a section of a distribution feeder (primary and or secondary) that allows a single point of common coupling and relatively simpler operational coordination to ensure safety and operational effectiveness.

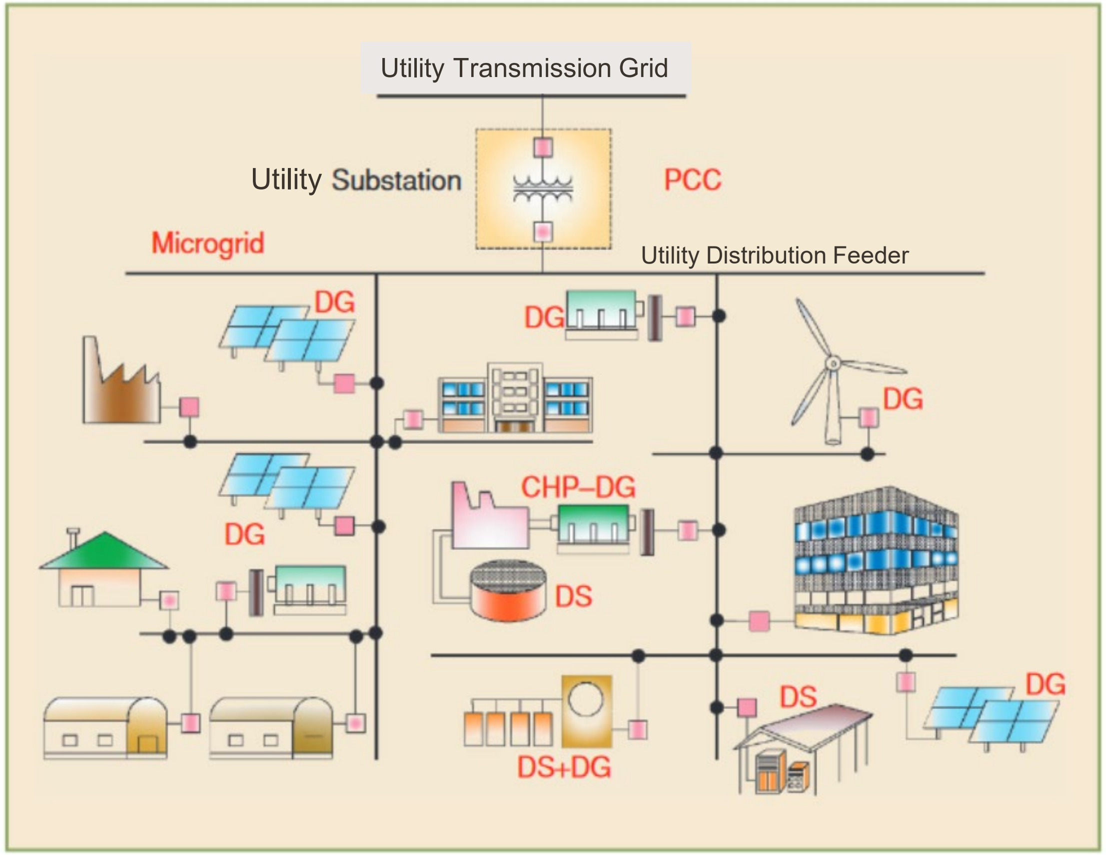


Hawaii examples:
- Keahumoa Place Affordable Housing
- Century West Condominium

Hybrid Microgrid Example: Mini-grid

Example for discussion

- **Mini-grid Hybrid Microgrid** involving a 3rd party microgrid operator operating a multi-user microgrid on behalf of itself and/or one or more microgrid participants to meet operational, environmental, reliability, resiliency and redundancy goals of the participants, managing both purchases from and sales of services to the grid. It will manage the microgrid in island mode.
- This mini-grid configuration involves linking various customer and 3rd party resources across utility distribution grid to supply energy to all customers within the electrical boundary.
- In the graphic, the electrical boundary (point of common coupling – PCC) is the distribution feeder breaker at the substation. All loads on the feeder illustrated are within the microgrid.
- This is a relatively complex engineering solution involving significant operational coordination, customer issues and other considerations to operate safely and effectively.



Source: "Microgrids Management" by Katiraei, Iravani, Hatziargyriou and Dimeas, IEEE, 2008

Graphic referenced in BU-NECEC, "Multi-User Microgrids: Obstacles to Development and Recommendations for Advancement", Nov 2018

Microgrid Types Out of Scope for MGS Tariff

Type	Description	Rationale for Not Including
Utility microgrids (e.g., Schofield Generating Station)	Microgrid developed by utility on distribution system that may involve both utility resources (own or contracted) and customer resources providing services.	Utility microgrid related investments are approved through existing regulatory processes.
Utility-Private Partnership microgrids	Microgrid jointly developed through utility - private partnerships which may involve customer or hybrid microgrid architectures.	Utility microgrid related investments and such joint partnerships are approved through existing regulatory processes.
Remote microgrids	Customer microgrid that is off-grid, not connected to the utility grid in normal mode and unable to connect to the utility grid.	Remote microgrids do not fit Act 200 definition of a microgrid.
Virtual microgrids	Virtual microgrids also known as Virtual Power Plants (VPP) are a set of aggregated resources that can provide grid services under normal operating conditions. Resources are not able to support load within clearly defined electrical boundaries.	Virtual microgrids do not fit Act 200 definition of a microgrid. VPPs already eligible to provide energy and services under existing programs and procurements.

Applicable IEEE Standards

Annabelle Pratt, NREL

IEEE Microgrid Standards

2018 CIRED Paper as background: http://www.cired.net/publications/workshop2018/pdfs/Submission%200333%20-%20Paper%20(ID-20872).pdf

Overview of 2030.7 and 2030.8

Annabelle Pratt, Principal Researcher, NREL
November 2019

For Microgrid Services Tariff WG

Context for standard participation

- Microgrid Controller Evaluation projects:
  - EPRI/Buffalo Niagra Medical Campus (DOE OE FOA 997)
  - SDG&E/Borrego Springs Community Microgrid (CEC)
- Completed prior to release of 2030.7 & .8

FOA 997: Functional Requirements

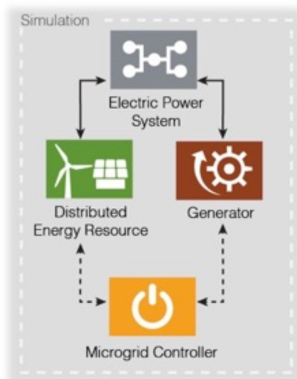
1. Disconnection
   – disconnect time based on voltage & frequency
2. Resynchronization and Reconnection
   – frequency, voltage and phase angle difference
3. Steady-State Frequency Range, Voltage Range, and Power Quality
4. Protection
   – external & internal faults; unintentional islanding
5. Dispatch
   – survivability, economic and environmental performance
6. Enhanced Resilience
   – meet community-defined resilience objectives

Microgrid Controller Evaluation Options

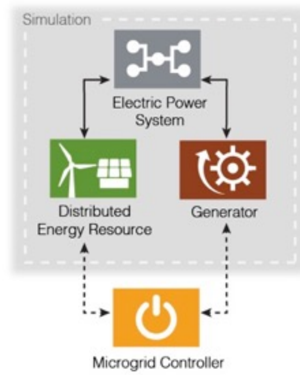
A) Pure simulation

Abstract or real-time

Need to integrate microgrid controller



A) Pure Simulation



B) CHIL

B) Controller hardware-in-the-loop (CHIL)

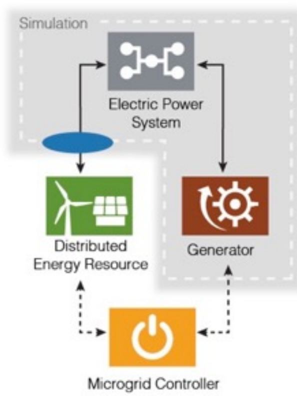
Interface real controller

Need to add communications interface

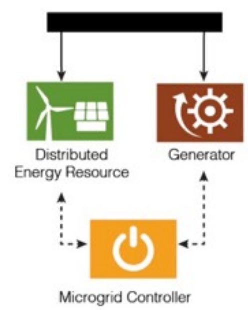
C) Controller and power HIL (PHIL)

Interface real controller and power assets, including internal proprietary controls

Power interface, more complex



C) CHIL & PHIL



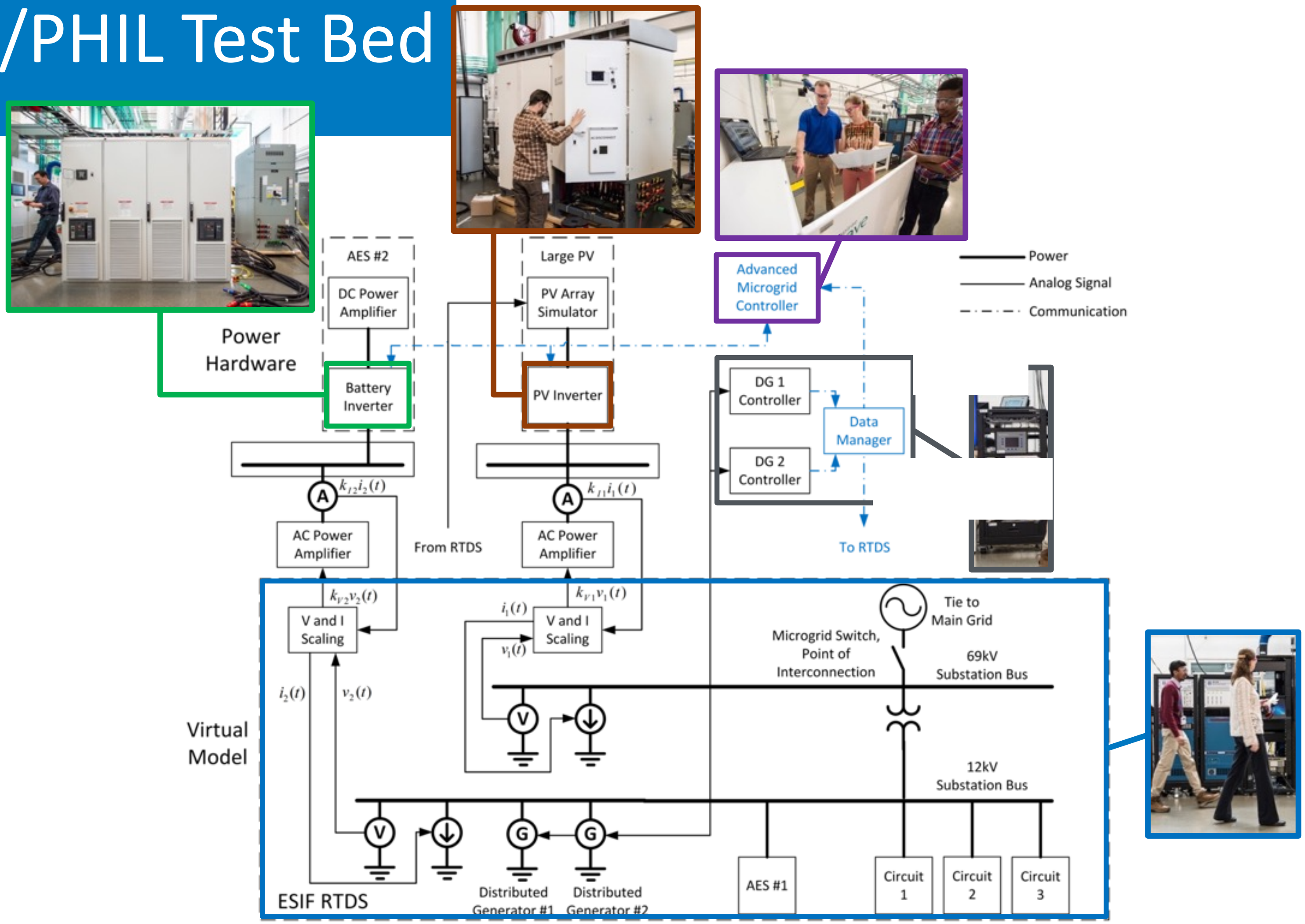
D) Hardware only

D) Hardware only

Real controller and assets

Does not include power system model

CHIL/PHIL Test Bed



NREL Microgrid Testing Facilities

http://www.nrel.gov/eis/facilities_esif.html

- Energy Systems Integration Facility (ESIF)
  - Low Voltage (600V and Under) and Medium Voltage (15kV and Under) test areas
  - Flexible connections for electrical, thermal, and fuel infrastructure

- National Wind Technology Center (NWTC)
  - 7MW grid simulation
  - access to MW scale wind turbines
  - MV distribution system

IEEE 2030.7 & .8

- 2030.7 – Standard for the Specification of Microgrid Controllers
  - Geza Joos, *Chair (McGill University)*
  - Russ Neal, *Vice Chair*
  - Jim Reilly, *Secretary (Consultant)*
- P2030.8 – Standard for Testing of Microgrid Controllers
  - Ward Bower, *Chair (Bower Innovations)*
  - Erik Limpaecher, *Vice Chair (MIT Lincoln Laboratories)*
  - Geza Joos, *Secretary (McGill University)*

- Supported by the US Department of Energy, Office of Electricity
- NREL participated in working group for IEEE Std. 2030.8

Generic Microgrid – Structure and Components

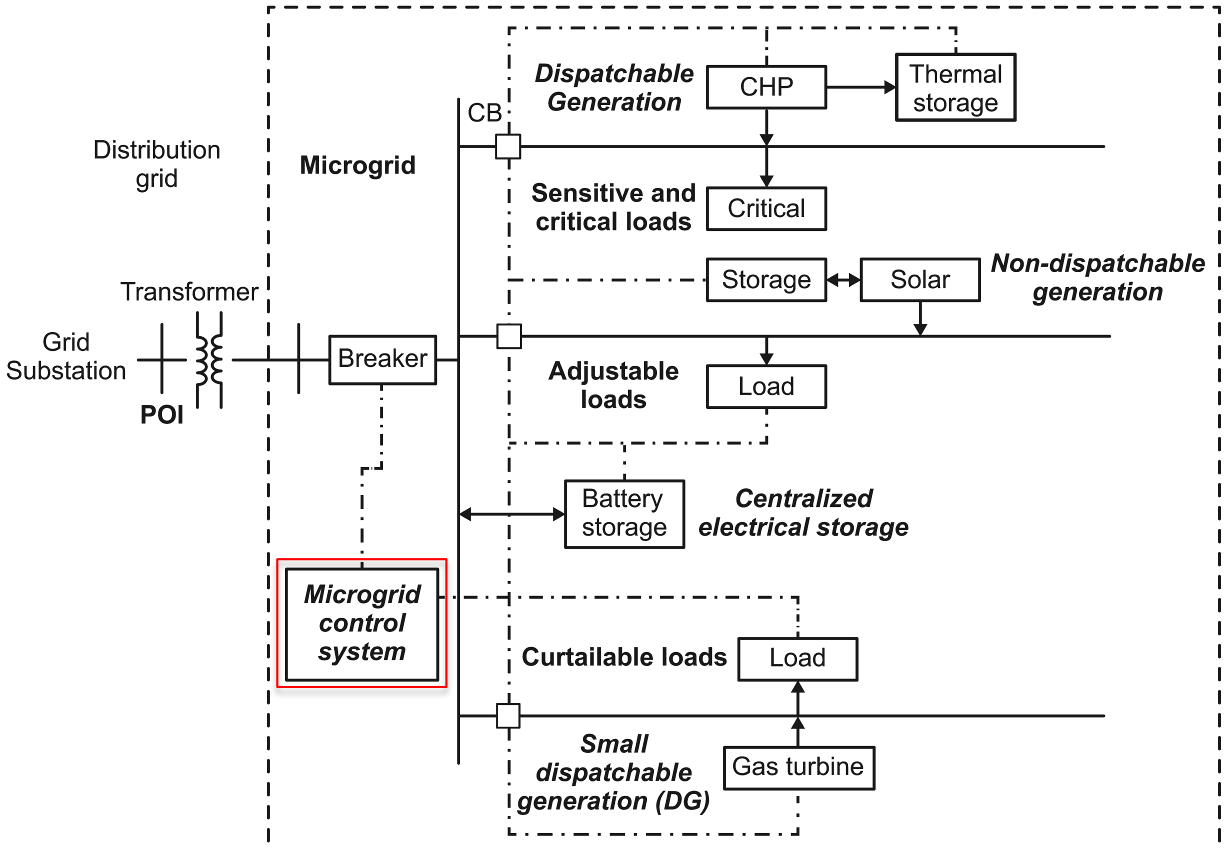


Figure A.1. IEEE 2030.8

Microgrid control system core functions – P2030.7

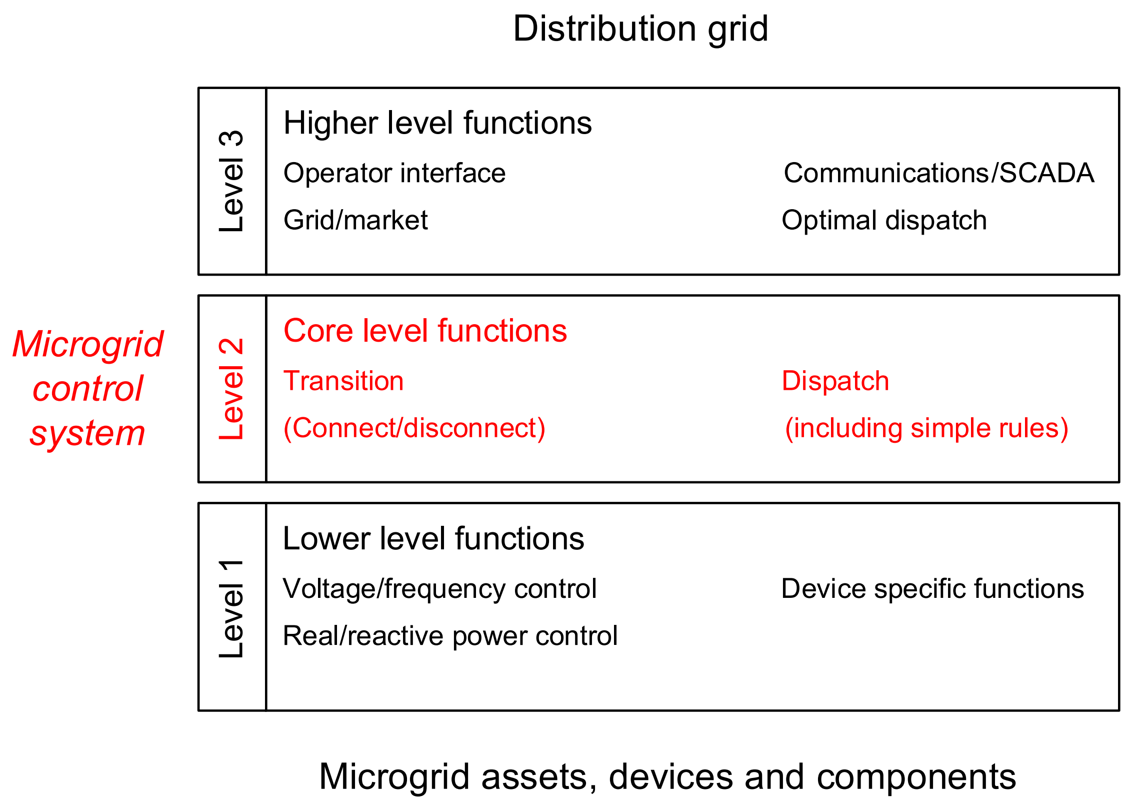


Figure 1 - 2030.7

Functional specification of core functions – P2030.7

- **Dispatch function** – optimizes the use of DER assets, ensures operation of the microgrid meets requirements for internal operation and as seen from the point of interconnection to the distribution system; dispatch orders:
  - Steady state conditions – execution of commands at regular intervals (typically 15 min or less)
  - Transitions – execution of emergency dispatch orders (EDOs) in an interrupt mode
- **Transition function** – manages transitions :
  - (a) unplanned islanding, resulting from a loss of distribution grid power
  - (b) planned islanding, resulting from a request from the distribution grid operator to disconnect
  - (c) reconnection/resynchronization with black start as required in the islanding process
  - Provides the signal to switch the dispatch function from one mode to another, the dispatch function then being responsible for reconfiguring the control system functions

FOA 997: Functional Requirements (Revisited)

1. **Disconnection**
   – disconnect time based on voltage & frequency
2. **Resynchronization and Reconnection**
   – frequency, voltage and phase angle difference
3. Steady-State Frequency Range, Voltage Range, and Power Quality
4. Protection
   – external & internal faults; unintentional islanding
5. **Dispatch**
   – survivability, economic and environmental performance
6. Enhanced Resilience
   – meet community-defined resilience objectives

2030.7 Specifications

- For microgrid control system, provides:
  - General functional requirements
  - Core function interactions
  - General description of core functions
- For each (dispatch & transition) requirement, provides:
  - Description of features
  - Functional specification, summarized in table
  - Developing metrics
  - Scenarios for testing
- Annexes on microgrid structure, objectives, implementation, bibliography

Testing of core functions – testing approach – P2030.8

- Context & purpose; General considerations; etc.
- **Functional testing requirements** – Testing conditions, conceptual flow chart

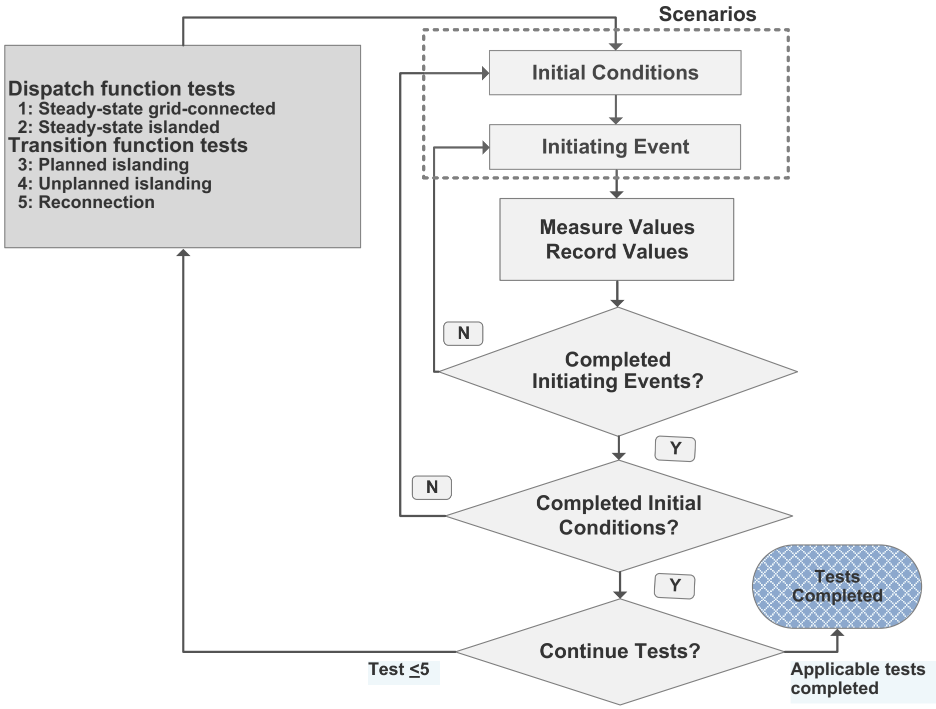


Figure 1 – 2030.8

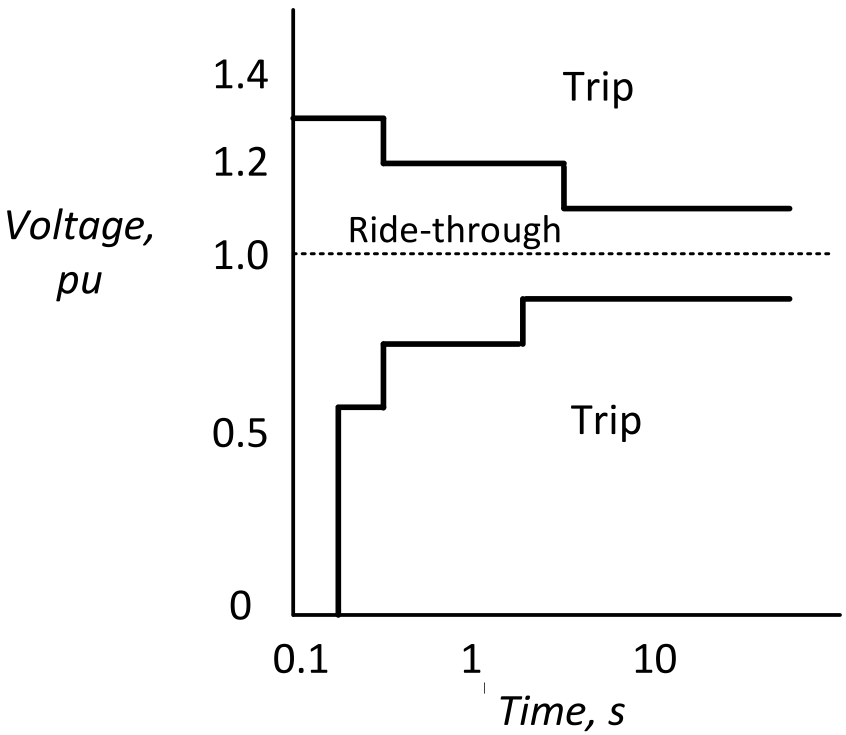
Testing of core functions – testing approach – P2030.8

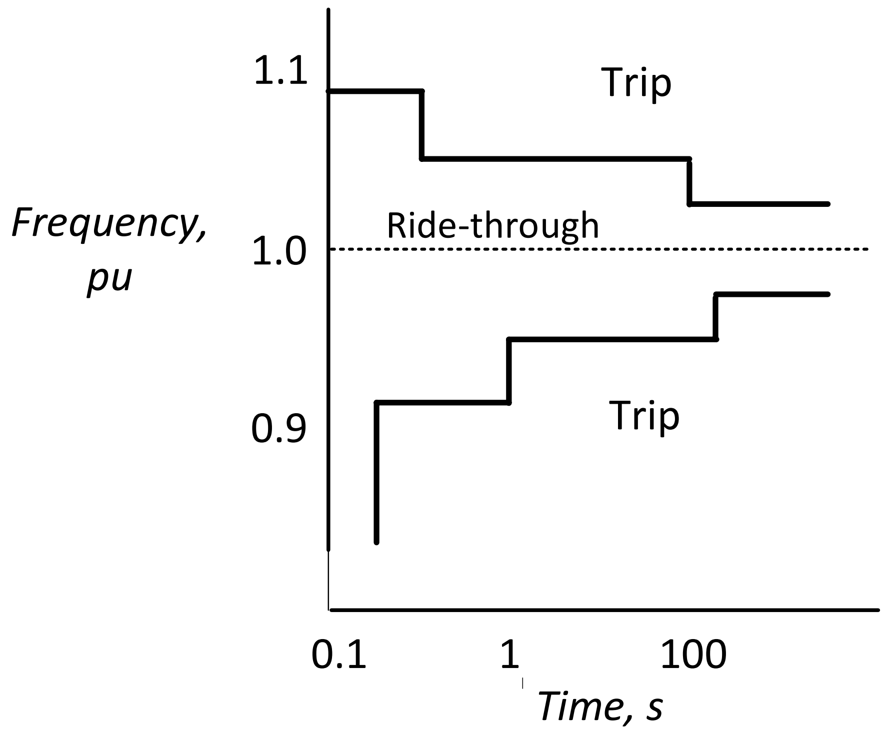
- For each core function (dispatch & transition):
  - **Defining test scenarios**
    - Allow testing of individual core functions or the combination of the two core functions under well-defined and representative conditions
    - Combination: e.g., transitions, where the transition function initiates an emergency dispatch order, particularly in the case of an unplanned islanding event)
  - **Defining performance metrics** – must consider existing applicable standards related to electric distribution systems, applicable distribution grid requirements and grid codes, and relevant and applicable instrumentation and measurement techniques
- **Annexes** on MGCS, core functions (maps to 2030.7), field and lab data collection, and **testing environment options:** can range from a fully numerical/software environment to fully hardware (full scale) set-ups

Testing of core functions – metrics – P2030.8

- "This standard only deals with the SS and transient response of voltage, frequency, and power exchanges (real and reactive) at the POI."
- **Grid-connected mode** – Voltage and frequency at the point of connection with the distribution grid set by the interconnection requirements, relevant grid codes or applicable standards: voltage and frequency operating ranges, real and reactive power (or power factor) requirements, and the power quality requirements
- **Transitions from grid-connected to islanded modes** – Transient excursions in voltage, frequency and power, duration, to remain within the interconnection requirements, standards or grid codes
- **Islanded mode** – Voltage and frequency ranges in steady state and under transient conditions associated with load or generation variations and line switching, can be relaxed if the design of the equipment allows these deviations

Typical voltage and frequency requirements





The IEEE 2030 Series Overview

IEEE #	Title
2030- ***2011***	Guide for Smart Grid Interoperability of Energy Technology and Information Technology Operation with the Electric Power System (EPS), End-Use Applications, and Loads
2030.1.1- ***2015***	**Standard** Technical Specifications of a DC Quick Charger for Use with Electric Vehicles
2030.2- ***2015***	**Guide** for the Interoperability of Energy Storage Systems Integrated with the Electric Power Infrastructure
2030.3- ***2016***	**Standard** Test Procedures for Electric Energy Storage Equipment and Systems for Electric Power Systems Applications
P2030.4-	**Guide** for Control and Automation Installations Applied to the Electric Power Infrastructure
2030.5- ***2015***	Adoption of Smart Energy Profile 2.0 Application Protocol **Standard**
2030.6- ***2016***	**Guide** for the Benefit Evaluation of Electric Power Grid Customer Demand Response
P2030.7	**Standard** for the Specification of Microgrid Controllers
P2030.8	Draft **Standard** for the Testing of Microgrid Controllers
P2030.9	Draft **Recommended Practice** for the Planning and Design of the Microgrid
P2030.10	Draft **Standard** for DC Microgrids for Rural and Remote Electricity Access Applications

Other Microgrid-related standards and efforts

- IEEE 1547.4: IEEE Guide for Design, Operation, and Integration of Distributed Resource Island Systems with Electric Power Systems

- DSF/IEC/TS 62898-1: 1st Edition, 2016, Guidelines for microgrid projects planning and specification, published
- IEC TS 62898-2 ED1: Microgrids Guidelines for Operation, working document
- IEC TS 62898-3-1 ED1: Microgrids – Technical/protection Requirements – working doc

Thank You

www.nrel.gov

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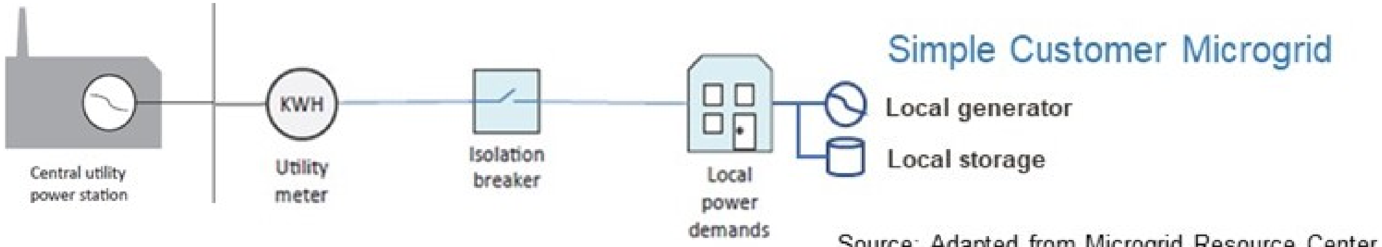
Further Reading from NREL projects

- Maitra, Arindam, Annabelle Pratt, Tanguy Hubert, Dean Weng, Kumaraguru Prabakar, Rachna Handa, Murali Baggu, and Mark McGranaghan. 2017. "Microgrid Controllers: Expanding Their Role and Evaluating Their Performance." *IEEE Power and Energy Magazine* 15, no. 4 (July–August): 41–49.
- K. Prabakar, A. Pratt, J. Fossum, J. Wang, B. Miller, M. Symko-Davies, M.U. Usman and T. Bialek, "Site-Specific Evaluation of Microgrid Controller Using Controller and Power-Hardware-in-the-Loop," accepted for publication at IECON 2019, the 45th Annual Conference of the IEEE Industrial Electronics Society, October, 2019.
- K. Prabakar, A. Pratt, D. Krishnamurthy and A. Maitra, "Hardware-in-the-loop test bed and test methodology for microgrid controller evaluation," *2018 IEEE PES T&D Conference & Exposition*, April 16-19, 2018, Denver, CO, USA.

- J. Wang, B. Miller, A. Pratt, J. Fossum, T. Bialek and S. Mason, "Diesel Generator Controller Evaluation via Controller-Hardware-in-the-Loop for Various Microgrid Operation Modes," *IEEE Conference on Innovative Smart Grid Technologies (ISGT)*, Feb 2019.
- J. Wang, B. Lundstrom, I. Mendoza and A. Pratt, "Systematic Characterization of Power Hardware-in-the-Loop Evaluation Platform Stability," *IEEE Energy Conversion Conference and Exhibition (ECCE),* September 2019.
- Wang, Jing, John Fossum, Kumaraguru Prabakar, Annabelle Pratt, and Murali Baggu. 2018. "Development of Application Function Blocks for Power-Hardware-in-the-Loop Testing of Grid-Connected Inverters." 2018 IEEE 9th International Symposium on Power Electronics for Distributed Generation Systems (PEDG), June 25–28, Charlotte, North Carolina.

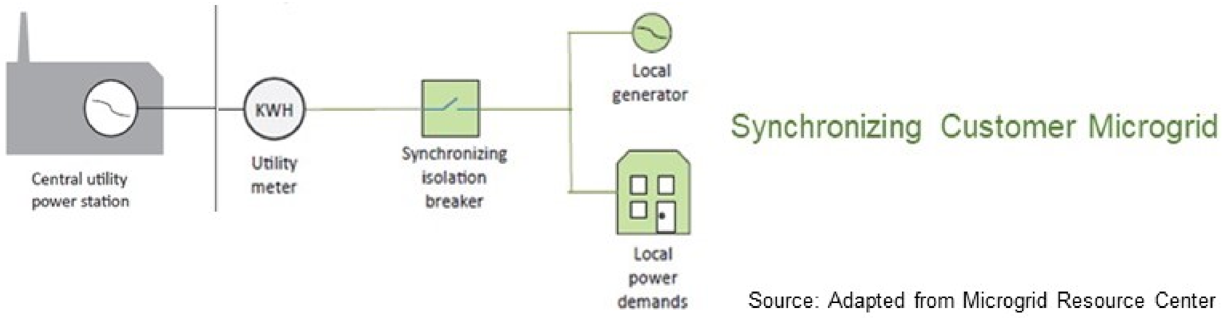
Customer Microgrid Interconnection

Simple Customer Microgrid



- Because there is no synchronization with the utility grid after an event, this is a relatively simple interconnection
- This type of utility interconnection is effectively the same as currently required in Rule 14H consistent with existing DER interconnection standards
- HECO proposes to treat this type of Customer Grid interconnection according to the applicable DER interconnections under Rule 14H
- *Are there language additions needed in Rule 14H to affirm this approach? If so, what would HECO suggest for WG to consider?*
- *How does the current update to Interconnection rules to incorporate IEEE standards & other affect microgrids? How will the interconnection docket impact this?*

Synchronizing Customer Microgrid



- Synchronization with the utility grid after an event is a more complex interconnection, albeit well understood, involving a number of engineering considerations
- This type of utility interconnection is different in nature to existing Rule 14H and will involve IEEE standards for microgrid controllers that synchronize with utility grids
- *Will this type of interconnection will involve changes to existing interconnection processes?*
- *Will this type of interconnection require an operating agreement be needed?*

Ted Borer
Princeton University Microgrid

Customer Microgrid MGS Tariff

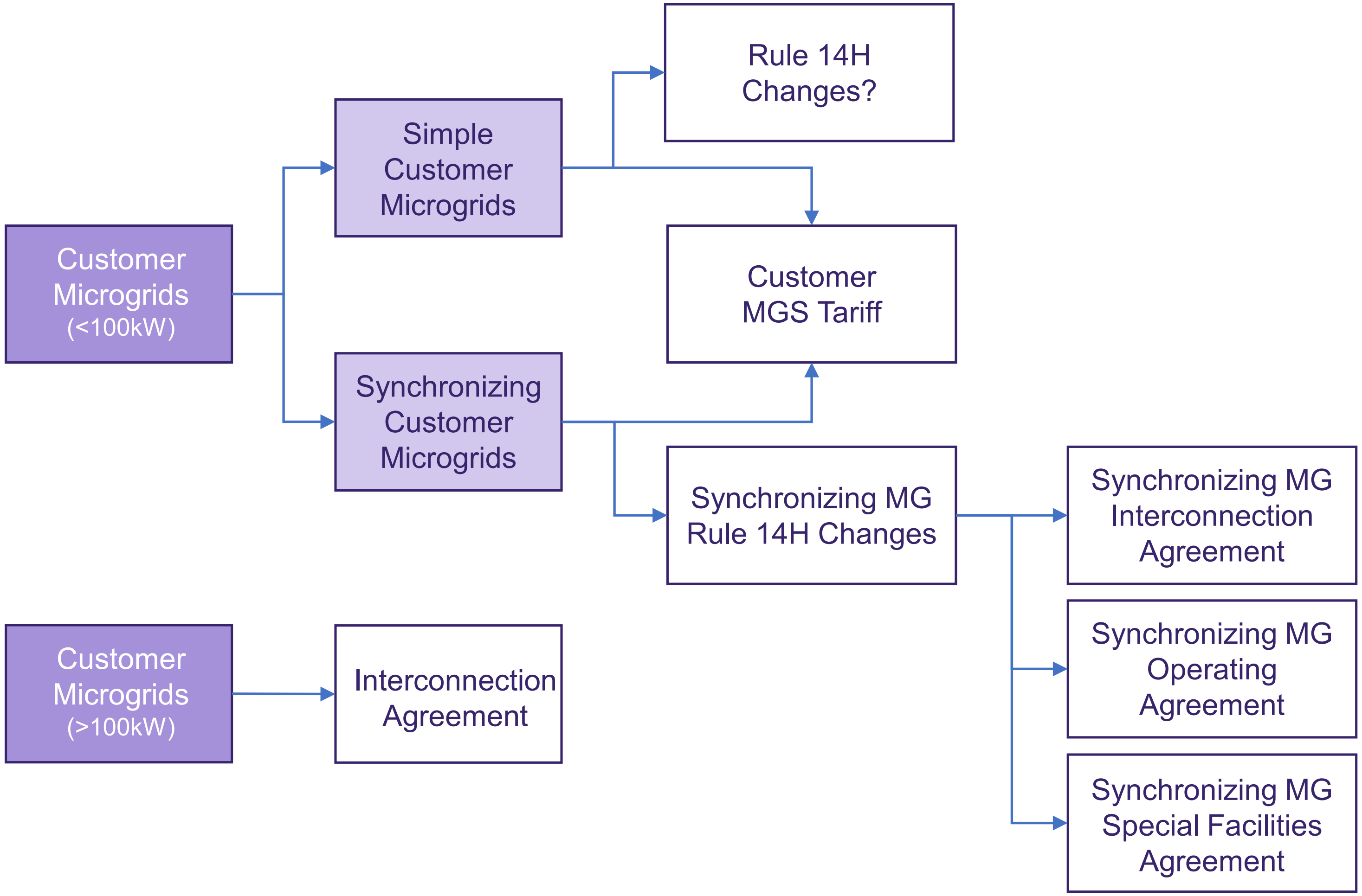
Customer Microgrid MGS Tariff

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	**Portal Type Proposed**	**Minor Changes** (IEEE/UL microgrid safety standards)	**Yes** (Via Existing Pricing, Programs & Procurements)	**Parties to Propose per PUC Order 3641***	**N/A**	**TBD**
	• What are the elements of a portal type tariff? • Do the variations of Customer MGs need different tariff elements? • Are there other tariff structures WG would like to consider for Customer MGs?	• What changes may be needed, if any to Rule 14H? • Customer MGs that synchronize reconnection to utility grid after event may need to comply with IEEE 2030.7 and other standards • Operating Agreement needed for Synchronizing Customer MG?	• MGs can provide energy and grid services already • What, if anything, may be needed to affirm this in existing tariffs/programs? • Are there any new programs to consider?	• Unclear that Customer Microgrids generally provide broad-based resilience benefits, however, there may be individual cases that can. * *"In cases with clear, broad-based public benefits, the commission may consider compensation through the MGS tariff for resilience benefit, but the burden is on the Parties to justify this benefit."* p.54	• No retail wheeling involved in Customer MGs as they don't use utility grid to function in island mode	• No other issues for Customer Microgrid MGS Tariff identified as yet

Customer Microgrid MGS Tariffs & Interconnection

Structural Aspects for WG Consideration & Discussion



Simple Customer Microgrid MGS Tariff Structure

Propose for Discussion Creation of a new Standalone Tariff that Appropriately Adapts Rule 24 Tariff Structure & Language

A. AVAILABILITY FOR CUSTOMER-MICROGRIDS
- *Appropriately Adapt Rule 24 wording for Simple Customer Microgrid?*

B. GRID SUPPLY INTERCONNECTION AGREEMENT
- *Use Rule 24 wording but reference to any changes needed to Rule 14H?*

C. METERING AND BILLING
- *Use Rule 24 wording but reference to any changes needed to Rule 14H and applicable rates and credits references?*

D. COMMUNICATIONS AND CONTROLLABILITY
- *Use Rule 24 wording?*

E. INTERCONNECTION PROCESS
- *Use Rule 24 wording but reference to any changes needed to Rule 14H?*

F. APPLICATION CHARGE
- *Use Rule 24 wording?*

Please refer to Rule 24 Tariff for reference

Synchronizing Customer Microgrid MGS Tariff Structure

Propose for Discussion Creation of a new Standalone Tariff that Appropriately Adapts Rule 24 Tariff Structure & Language

A. AVAILABILITY FOR CUSTOMER-MICROGRIDS
   - *Appropriately Adapt Rule 24 wording for Synchronizing Customer Microgrid?*

B. GRID SUPPLY INTERCONNECTION AGREEMENT
   - *Use Rule 24 wording but reference to any changes needed to Rule 14H incl. IEEE 2030.7 requirements?*

C. METERING AND BILLING
   - *Use Rule 24 wording but reference to any changes needed to Rule 14H and applicable rates and credits references?*

D. COMMUNICATIONS AND CONTROLLABILITY
   - *Rule 24 wording augmented by reference to new Rule 14H IEEE 2030.7 requirements?*

E. INTERCONNECTION PROCESS
   - *Use Rule 24 wording but reference to any changes needed to Rule 14H, SIA, other?*

F. APPLICATION CHARGE
   - *Use Rule 24 wording?*

Please refer to Rule 24 Tariff, SIA (Appendix II of Rule 14H) for reference

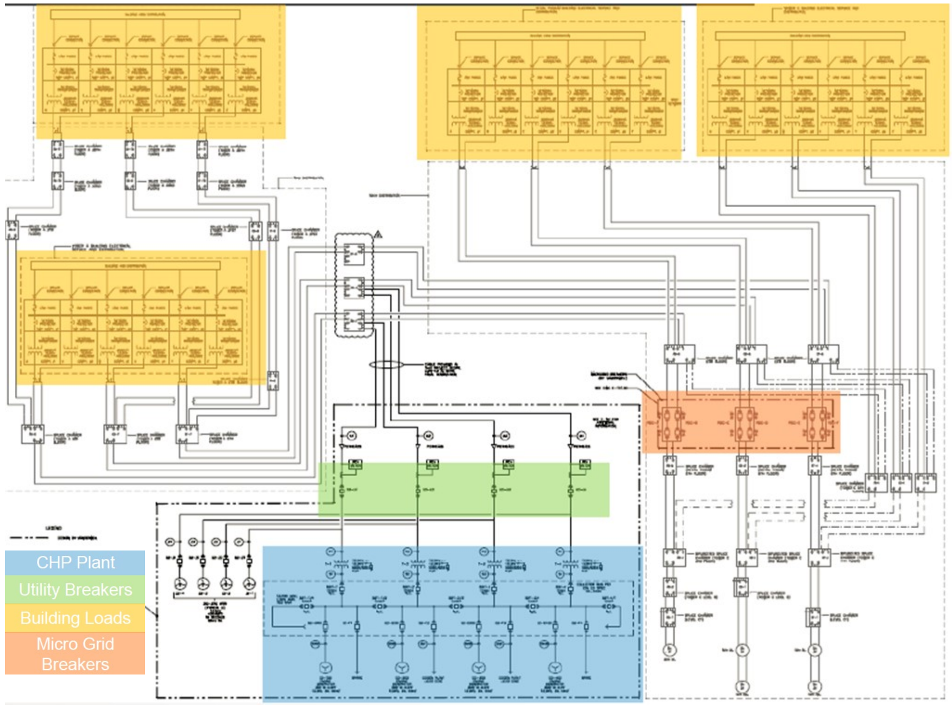
Hybrid Microgrid MGS Tariff

Hybrid Microgrids Findings

- Limited development of 3rd Party Hybrid Microgrids to-date based on initial research
- Initial Hybrid Microgrid development appears to involve Simple Hybrid configurations involving well defined customer loads served within clearly defined operational boundaries involving secondary distribution infrastructure.
  - Hudson Yards in New York City
  - Redwood Coast Airport in Humboldt, CA
- Other Developments
  - The Parks at Walter Reed was originally designed to be a Simple Hybrid Microgrid, but property owner is now selling the low voltage distribution system to Pepco (utility) to operate.
  - Commonwealth Edison is to file a microgrid services tariff in Dec 2019 addressing hybrid type microgrids
  - Puerto Rico microgrid rule was intended to facilitate 3rd party Hybrid microgrid development, presentation by Jorge Camacho, consultant to PR Commission at Dec 3rd WG meeting.

Hybrid Microgrid: Hudson Yards, New York City

- Hudson Yards, in New York City, is the largest privately funded development projects in the United States comprising a mixed use development.
- Resiliency drove collaboration with ConEdison to create an interconnection which meet ConEdison standards but also allowed for sharing of ConEdison switches and wires during an outage.
- Designed as a Hybrid Micro Grid with ConEdison 13.2kv network system interconnections to customer-owned microgrid breakers then to utility transformers to low voltage (secondary) connections to customer buildings and microgrid resources. In the event that Con Edison's grid fails, breakers open to isolate Hudson Yards from the rest of the grid, and cogen power will be delivered directly to the buildings via the utility secondary.
- The 13.3-MW cogen plant, thermal loop, and Con Edison interconnection cost nearly $200 million.
- Cogen plant delivers power directly to the Con Edison grid, and Con Edison offsets this power from the buildings' electricity bills. Hudson Yards sells various forms of power to the buildings and tenants through a subsidiary set up for its power business. This setup allows Hudson Yards to cover ongoing operating costs and the facilities' mortgage payments and comes with a binding commitment that rates will be no higher than they would be if the microgrid did not exist.



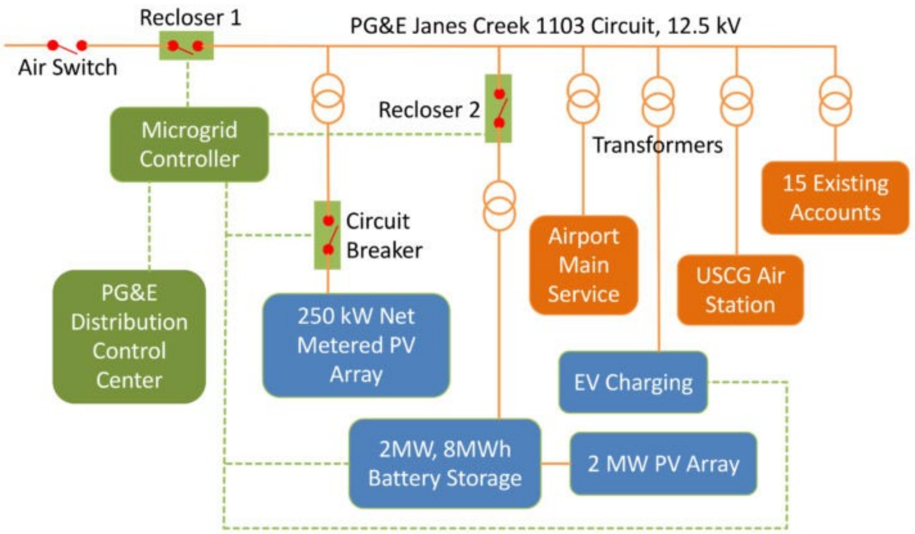
https://www.youtube.com/watch?v=KW9YAo8_pl4

https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/using-power-and-technology-to-deliver-resilience-in-hudson-yards

http://thermosystems.com/wp-content/uploads/2017/06/RAOTM-Meadowlands-HY-Microgrid_FINAL_5.19.17.pdf

Hybrid Microgrid: Redwood Coast Airport, Humboldt, CA

- Redwood Coast Energy Authority is partnering with the Schatz Energy Research Center (SERC) at Humboldt State University, PG&E, and the County of Humboldt to build a 7-acre, 2.25 MW solar array and battery energy storage system at the California Redwood Coast – Humboldt County Airport (ACV).
  - 2 MW photovoltaic array DC-coupled with a 2 MW, 8 MWh battery storage system
  - 250 kW net-metered photovoltaic system
  - Microgrid control system that will interface with the utility power distribution control center
  - Powerline reclosers with advanced control
  - Electric vehicle charging stations capable of demand response
- The County will house the airport microgrid, RCEA will own and operate the solar and battery systems, PG&E will operate the microgrid circuit, and SERC will be the prime contractor responsible for the project design and technology integration.
- Pacific Gas & Electric (PG&E) will develop engineering standards, testing protocols, and equipment specifications for multi-customer, frontof-the-meter microgrids within their distribution system. As the CCA administrator, the Redwood Coast Energy Authority (RCEA) will collaborate with PG&E to create experimental tariffs and agreements that allow for the creation and operation of this innovative microgrid project. These tariffs and agreements will become important examples to other IOUs and CCAs, and help to facilitate replication of this business model.
- This system will be the first multi-customer, front-of-the-meter microgrid in Pacific Gas & Electric's area of service. Groundbreaking will begin spring of 2020 with the system expected to be fully operational in December of 2020.
- This project is being funded by a $5 million grant from the California Energy Commission's EPIC Program, with $6 million in match funding from RCEA.



http://schatzcenter.org/docs/RCAREM-factsheet-20190618.pdf

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 3rd 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

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

Draft Agenda for Dec 3rd MGS WG Joint Mtg

- Introduction
- Presentation(s)
  - WG Member/s
  - NELHA Presentation
- Customer Microgrid Tariff
  - Review to finalize proposed approaches:
    - Tariff structure and elements
    - Interconnection Rule 14H changes
    - Grid Services & Other DER program considerations
- Hybrid Microgrid Tariff
  - Discuss prioritized issues based on Nov 21st meeting
    - Tariff Structure *(for example)*
      - Structural elements
      - Retail wheeling
      - Customer participation
    - Interconnection *(for example)*
      - Grid structural considerations to define operational boundaries
      - Operational coordination
      - Special facilities that may be required

Proposed Timeline for MGS Tariff WGs

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