Hawaiian Electric

Microgrid Services Tariff (MST) Phase 2: Working Group Meeting #5

Docket No. 2018-0163

August 9, 2022

Agenda

10:00 – 10:05	Review of Objectives & Ground Rules
10:05 – 10:40	Guest Speaker: Allan Schurr, Enchanted Rock CCO
10:40 – 11:15	Guest Speaker: Greg Barbour, NELHA Executive Director
11:15 – 11:20	BREAK
11:20 – 11:50	Case Study Evaluation Framework Discussion
11:50 – 12:00	Review Work Plan and Confirm Next Meeting

Objectives

PUC Phase 2 Objectives:

1. Continue development of the Tariff
   - ❖ Promote self-sufficiency and resiliency among microgrid project operators
   - ❖ Streamline MST
2. Enhance Tariff to support broader use of microgrids in non-emergency situations
   - ❖ At minimum, enable voluntary islanding
3. Further explore opportunities to support resilience through microgrid development
   - ❖ Encourage development of microgrids that can provide power to remote communities and critical facilities such as schools, shelters, and hospitals
4. Identify grid services that can be provided by microgrids
   - ❖ Explore ways related exchanges between the utilities and microgrid operators could happen

Working Group Objectives:

1. Coordinate and align with other Dockets to leverage resources and streamline efforts
2. Focus on resiliency
   - ❖ Microgrids and/or other tools/programs
   - ❖ “Low-hanging” fruit, with such considerations as Act 200 goals, practical implementation, “real-world” goals, technical, costs, etc.
3. Understand how the tariff could support microgrid operations in non-emergency situations
   - ❖ Existing microgrid operations
4. Keep costs to all customers in mind (cost equity)
   - ❖ Compensation (e.g., rates, standby rates, exit fees, etc.)
5. Encourage development of grid services

Ground Rules

- Members will maintain an open mind and be respectful of all views
- Members will review meeting agenda in advance and complete any pre-reads prior to the meeting
- Discussion will be kept on agenda topic

Guest Speaker:

Allan Schurr

CCO, Enchanted Rock

Topic: Better understanding barriers to microgrid development

Enchanted Rock

Resiliency Microgrid Development

Allan Schurr, Chief Commercial Officer

August 9, 2022

33MW - City of Houston, TX

ENCHANTED ROCK BY THE NUMBERS

276 Operational Microgrid Sites

11,245 Hours of Utility Outages Covered

569 MW Commissioned

705,853 Unit Run Hours

259 MW Under Construction

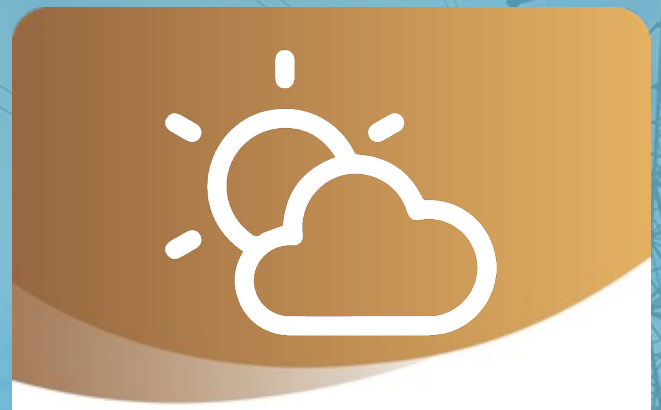
99.9998% Combined Reliability

FRAGILE AND COMPLEX: THE U.S. ELECTRIC GRID

Our dependence on the grid has historically been absolute—yet it's increasingly prone to failure.

ADVANCED AGE

In many parts of the country, the U.S. electric grid is more than 50 years old—and in desperate need of an engineering overhaul.



SEVERE WEATHER

More frequent heatwaves. More crippling cold snaps. More powerful storms. Climate change is placing unprecedented strain on the grid.

DIGITAL AND PHYSICAL THREATS

From ransomware assaults to cyberattacks to civil unrest, we've seen increased incursions on our country's vital infrastructure—and they've revealed critical susceptibilities.

ELECTRICAL RESILIENCY: CONSIDERATIONS & SOLUTIONS

Businesses need to consider multiple variables when electing to install a back-up power solution:

Considerations

- Performance
- Cost
- Emissions/ESG Goals
- Footprint
- Noise

Solutions

- Diesel Generator
- Solar + Storage
- Fuel Cell
- Natural Gas Generator

RESILIENCY SOLUTION TECHNOLOGY COMPARISON

Standalone Technology Providers / Integrators

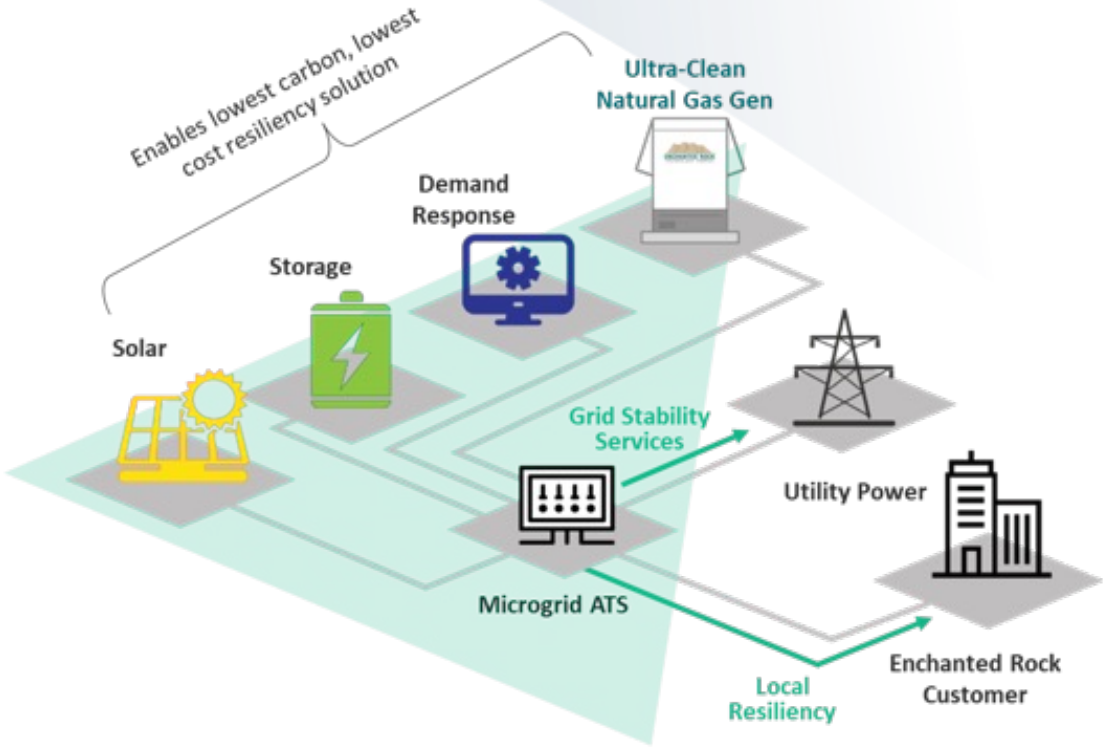
	ENCHANTED ROCK™	Diesel	Solar + Storage	Fuel Cell	Traditional Natural Gas Genset
Utility-Grade Power					
Outage Duration					
Emissions					
Footprint					
Cost	$	$$	$$$$$	$$$$	$$$

OUR DUAL-PURPOSE MICROGRID

Enchanted Rock microgrids solve two issues:

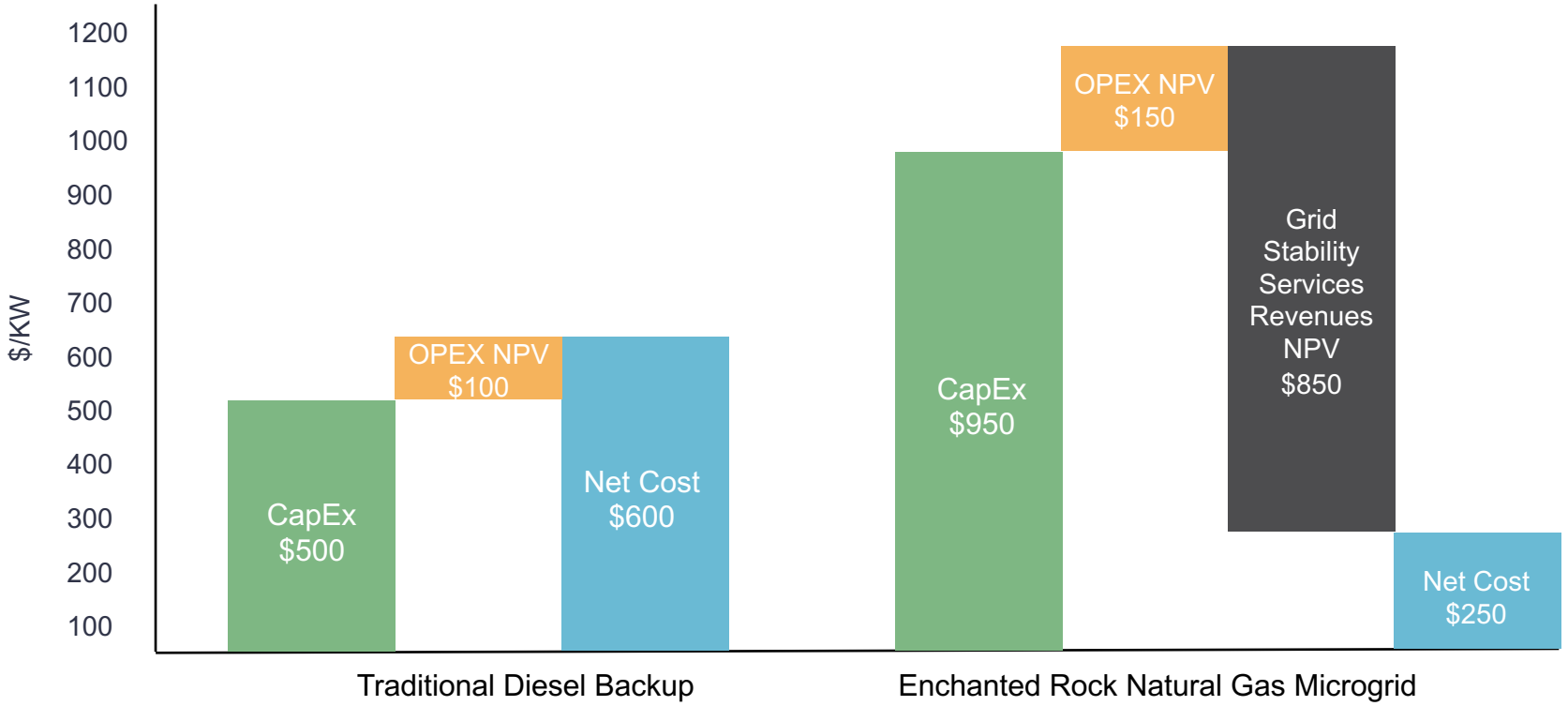
1. **Electrical Resiliency:** Long-duration (>24 hrs.) power for customers during grid outages.
2. **Grid Stability:** Energy is sold back to the grid to augment variable solar and wind-generated power.

Our systems integrate renewables, demand response and battery storage to enable the **lowest cost and lowest carbon-footprint resiliency solution** in the industry. Enchanted Rock microgrids also reduce emissions by 10-100x as compared to a traditional diesel-powered backup.



LOWER COSTS AND EMISSIONS. HIGHER EXPECTATIONS.

Our clients experience significant cost savings and environmentally-friendly emissions.



BROAD APPLICATIONS

ENCHANTED ROCK
The Power is On.

Grocery & Distribution

H-E-B

Walmart
Save money. Live better.

STANDARD MEAT

Healthcare

Citizens MEDICAL CENTER

Texas Children's Hospital

RCM Retirement Center Management

HollyHall
A Christian Retirement Community

TRADITION

Critical Infrastructure

CWA

LID

GCWA

North Fort Bend Water Authority

Manufacturing

PEPPERL+FUCHS

abbvie

PRAXAIR

ARCANUM

SUNRIDER

Utilities

cps ENERGY

entergy

AUSTIN ENERGY

Data Centers

Microsoft

Higher Education

TEXAS A&M UNIVERSITY

Automotive

PLANET Ford

Dept of Defense

US Army Corps of Engineers

HYPERSCALE DATA CENTER

Datacenter that matches diesel technical performance but with full decarbonization (net-zero carbon)

- Fit 3MW natural gas generator cells into each diesel generator footprint
- Phase 1: 60MW total. Five 12MW colos. Each with four 3MW cells
- Phase 2: 36MW total. Three 12MW colos
- Cost comparable to diesel system
- Provides grid stability services back to PG&E and California ISO.
- RNG to provide full resiliency: reliability, grid stability, decarbonization

SAN JOSE DATA CENTER SITE

Deal Close: March 2022

Project Size: 60 MW

COD: 011/23 – 04/24

Microsoft has communicated that the San Jose Data Center is establishing a template for future fully decarbonized data center microgrid deals with Enchanted Rock

FULL-SERVICE GROCERY STORE CHAIN

Eliminate the frequent power outages from grid instability; ensure business continuity during severe weather and grid failures

- Initially, 50MW of resiliency microgrids across the Houston region
- Expanded to over 200MW across Texas

- All HEB locations protected against unplanned outages

- Sales growth due to continuous power protection

- Millions in cost-savings from preventing lost/damaged inventory

- 24/7/365 monitoring and optimization to detect problems, grid power quality thus preventing equipment damage and losses

Portfolio Size: 204 MW

Current COD: 183 MW

Under Construction: 21 MW

Enchanted Rock will install resiliency microgrids at all of HEB's Texas stores, totaling ~360 sites for ~400MW

NATIONAL SUPER RETAILER

Ensure business continuity during power outages and energy market hedge

- Initially 5 locations pilot with success
- Expanded 30 additional stores: 36MW
- Expanded 123 additional stores: 145MW + 9MW distribution center

- Accelerated deployment

- Future Proof Microgrid ATS at 60 stores

  adds power capacity and breakers for future nodes, including EV charging, battery storage, and other distributed energy asset types

Portfolio size: 197 MW

Current COD: 84 MW

Under Construction: 113 MW

Over the next 5 – 10 years, Enchanted Rock expects to install microgrids in Walmart stores and distribution centers where natural gas is available and affordable. The new installations will have the microgrid ATS.

THE MICROGRID SOLUTION

During Hurricane Harvey in 2017, Enchanted Rock powered three Buc-ee's locations for 100 consecutive hours allowing them to **stay open** and provide critical services to the community.

One location served as headquarters for first-responders and the National Guard.

ENCHANTED ROCK™
The Power is On.

MAHALO!

Q&A

Guest Speaker:

Greg Barbour

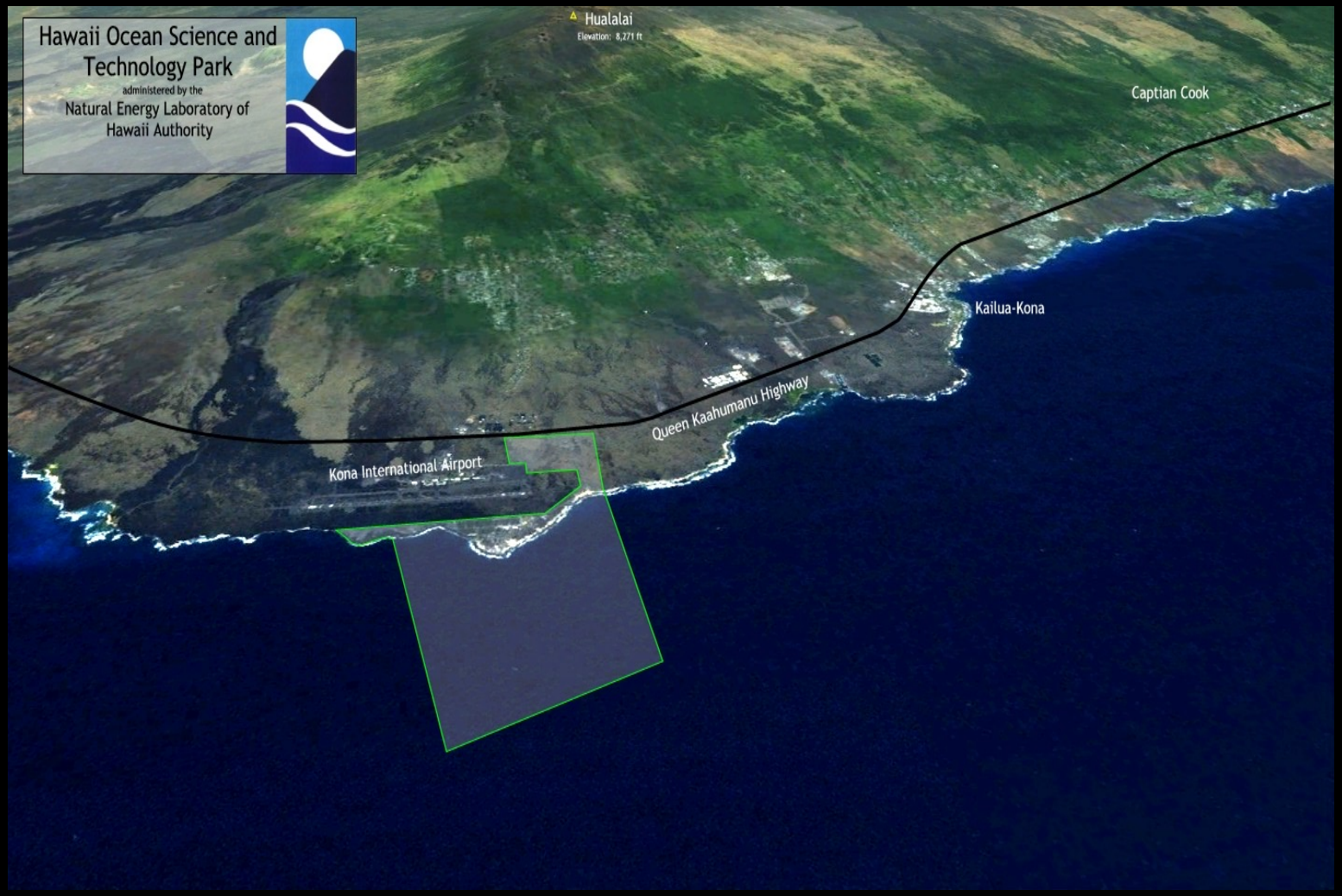
Executive Director, National Energy Laboratory of Hawaii

Topic: Better understanding barriers to microgrid development

Microgrid Services Tariff Working Group

NELHA Briefing

August 9, 2022


Hawaii Ocean Science and Technology Park
administered by the
Natural Energy Laboratory of Hawaii Authority
Hualalai
Elevation: 8,271 ft
Captian Cook
Kailua-Kona
Queen Kaahumanu Highway
Kona International Airport


Research Campus Pump Station
Kau Pump Station
55" Pump Station
Makako Bay Dr
Makako Bay Dr
Makako Bay Dr
Main HELCO Circuits (2 Lines @12.47 kV each)
HELCO Sub-Station
HELCO Station
Keahole Airport Rd
Pao'o St
Uu St
Kahilihili St
Kahilihili St
Pao'o Street
Kaiminani Dr
Kupaloke St
Laui St
Laui St
Pukiawe St
Queen Ka'ahumanu Hwy
19
19

Power Outage History for NELHA Metered Accounts

HOST Park utility power outage events 2014-2019

- Utility power outage - periods where HELCO did not deliver power for at least a 15-minute metered interval to all NELHA HOST Park metered accounts
- Two utility power outage events (green and orange) identified over more recent 6-years
- Customer Average Interruption Duration Index (CAIDI) is the average time required to restore service
- System Average Interruption Frequency Index (SAIFI) is the average number of interruptions that a customer would experience per year
- From 2015 to 2019, HELCO's normalized
  - CAIDI ranged from 66.17 to 90.87 minutes
  - SAIFI that ranged from 1.784 to 4.127 outages

Events	From HELCO meters (zero energy consumption)			
	Booster station	55" station	Farm Compound *	Research Campus
1			HELCO meter data unavailable	
2			11/2-3/16 22:45 - 05:15 (6.5 hours)	
3				
4		8/14/19 08:30 - 09:15 (45 min)		

* HELCO meter data for the Farm Compound is only available from January, 2016.

Utility service reliability at the HOST Park is considerably better than that experienced by the average HELCO customer

Backup Generation and Load Demand

Load section	Manufacturer	Rated capacity (kW)	Fuel tank capacity (gallons)	Age (years)	Approximate max load run time with a full tank (hours)	Approximate Typical Demand (kW)	2019 Peak Demand (kW)
Booster pump station	Cummins	500	1,000	14	20	40	40
55” pump station	Caterpillar	750	2,500	9	38	350	500
Kau pump station	Caterpillar	125	165	15	16	-	-
Research Campus	Detroit Diesel	1,000	4,000	12-15	51	250	400
Farm Compound	-	-	-	-	-	200	240

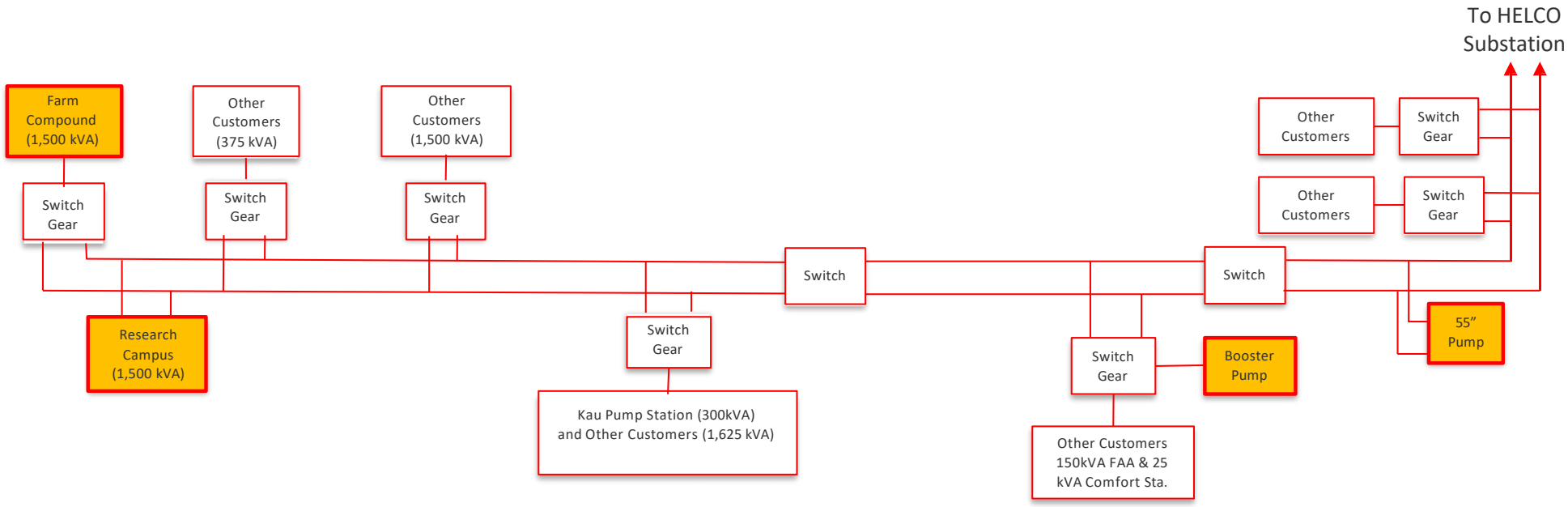

Research Campus Pump Station
Kau Pump Station
55" Pump Station
Makako Bay Dr
Makako Bay Dr
Makako Bay Dr
Main HELCO Circuits (2 Lines @12.47 kV each)
HELCO Sub-Station
HELCO Station
Keahole Airport Rd
Kupipi
Paoo St
Uu St
Queen Kaahumanu Hwy
Pao'o Street
Kahilihili St
Kahilihili St
Kaiminani Dr
Pukiawe St
Laui St
Laui St
Kupaloke St
19
19

HOST Park Microgrid Scenarios

- All four NELHA metered accounts (@ four existing service transformers) can be switched to a single consolidated microgrid for an *extended* HELCO outage
  - Three "natural" microgrids (55" Pump, Booster Pump, and Research Campus metered accounts) use their *existing* backup diesel to preserve critical loads for *short outages*
    - Enhance with existing and new PV (and BESS) in parallel with existing diesel generator
  - For *extended duration* grid outages, all four NELHA metered accounts (including Farm Compound - no backup diesel) are switched to a single consolidated microgrid
    - Leverages existing HELCO primary distribution lines that can be switched to isolate the four NELHA metered accounts, operating as a single microgrid
    - Operate more efficiently using a single existing NELHA backup generator located at the Research Campus (1 MW diesel)
    - Consolidate and use all available PV + BESS resources spread across the four NELHA metered accounts

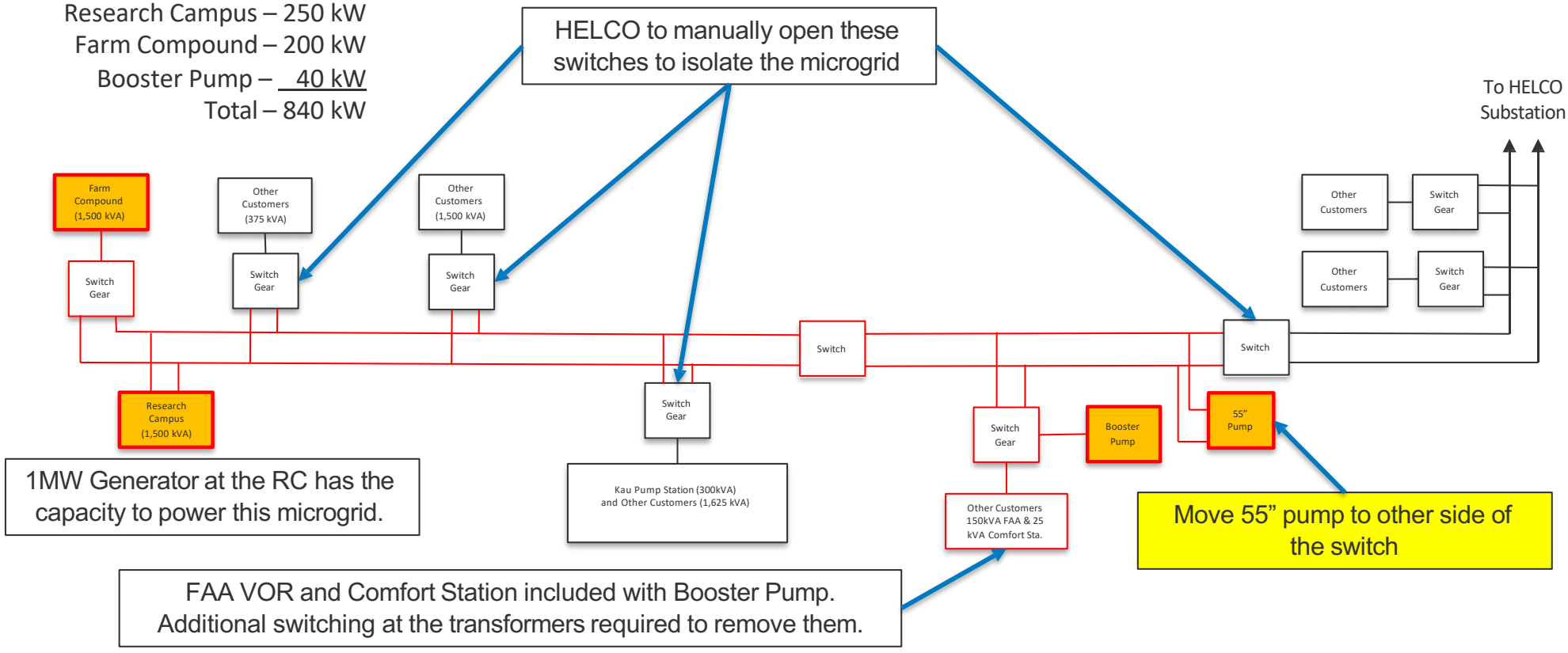
* Evaluate scenarios in which all NELHA metered loads vs. only "critical" loads are served in microgrid mode

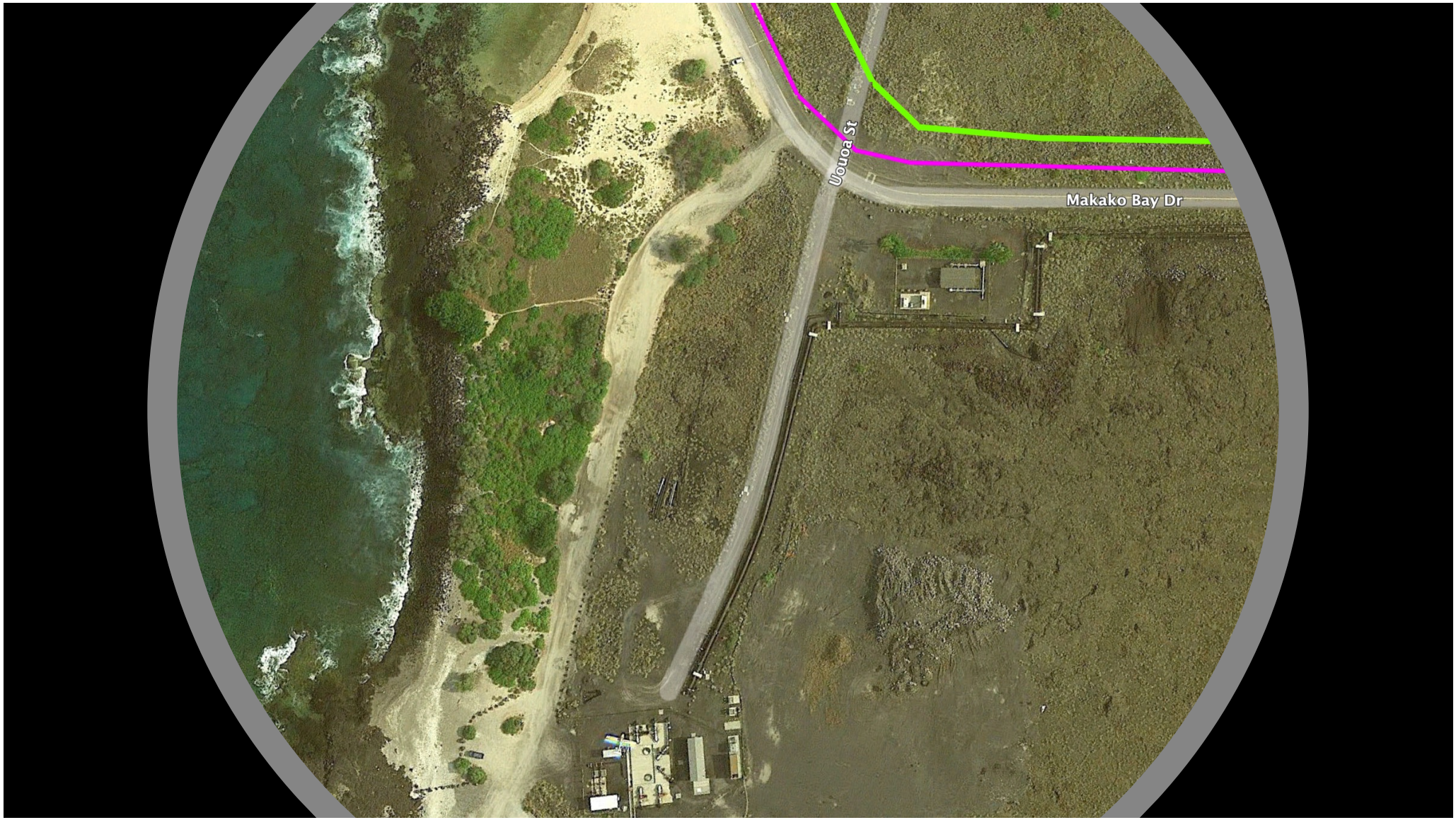
HELCO Distribution System—Normal Operation



HELCO Distribution System— Microgrid Configuration for Extended Outage

Approx. Peak Demand – All Load
55” Pump – 350 kW
Research Campus – 250 kW
Farm Compound – 200 kW
Booster Pump – 40 kW
Total – 840 kW




Uouoa St
Makako Bay Dr

Microgrid Scenarios

- Consolidate loads across the existing four metered accounts to form ***two*** new metered accounts, creating two microgrids for resiliency response
  - Research Campus **+** Farm Compound
  - 55” Pump **+** Booster Pump
- Potential benefits from account consolidation
  - HELCO bill reduction opportunity while grid connected
  - O&M cost reduction opportunity with potential elimination of capital equipment (Booster Pump station back-up generator)
  - Lower cost of additional PV (and BESS) for consolidated load profile
  - For prolonged grid outage, improved operational efficiency using the single NELHA backup generators at the 55” Pumping Station (750kW) and Research Campus (1MW)

* Evaluate scenarios in which all NELHA metered loads vs. only “critical” loads are served in microgrid mode

Q&A

BREAK (5 min)

Case Study Evaluation Framework

- Motivation for Hybrid Microgrid
  - Situational context for initiating microgrid study
  - What were the primary factors? (e.g., resilience, economics, research, other)
- Proposed Hybrid Microgrid Scope
  - Number of critical facilities
  - Number of customers
  - Disadvantaged population
- Proposed Hybrid Microgrid Design
  - Generation resources
  - Storage resources
  - Microgrid Controller (who owns, controls?)
  - Configuration
  - % load served when islanded and duration capability
- Ownership Model (examples below)
  - Private owner/operator – City/County or Customers resilience service counterparty
  - Private owner/operator – Utility resilience service counterparty
  - City/County owner/3rd party operator - Customers resilience service counterparty
  - City/County owner/3rd party operator - Utility resilience service counterparty
  - Utility owner/3rd party operator - Utility resilience service counterparty

Case Study Evaluation Framework

- Economics (as available)
  - Revenue Model(s)
    - Energy sales
    - Avoided retail tariff charges (e.g., demand charges)
    - Bulk power and distribution grid services
    - Resilience service contract between microgrid operator (third party or utility) with customers
    - Resilience service contract with grid operator (third party or utility)
  - Expenditures (lifecycle)
    - Project development (incl. feasibility studies and preliminary design)
    - Project Implementation (incl. equipment & installation, land acquisition, system testing, operational training, etc.)
    - Microgrid Operations (incl. ongoing maintenance and operations)
  - Funding
    - Project Revenue
    - 3rd Party Financing
    - Federal & State Grants
    - City/County funds
- Enabling Regulatory Mechanisms
  - Applicable tariffs, rules, markets, programs
  - Barriers identified
- Decision Considerations & Outcomes
  - Key considerations for Hybrid MG decision makers (developer/owner/off-takers)
  - Proposal outcome(s)
- Applicability to Hawaii
  - Relevant takeaways for Hawaii & MST Ph2 issues
    - Are there any tariff improvements that would further support this project?
    - Is there a benefit for voluntary islanding during non-emergency situations?
    - How could the tariff further promote resiliency for remote communities and critical facilities?
    - What grid services are being provided?

Remaining Work Plan

Meeting / Deadline	Date	Priority Issues
WG Mtg #6	Aug 30, 2022	• ***MG Compensation and Grid Services*** *(cont.)* / ***Utility Compensation/Standby charges, exit fees, and/or other charges*** – *Guest Speaker from CPUC* • ***Identifying a variety of funding mechanisms for microgrid development*** – *Potential Guest Speaker from HSEO* • Continue case study discussion on barriers and lifecycle project costs • Review draft consensus list and identify areas of disagreement
WG Mtg #7	Sep 20, 2022	• ***Identifying critical facilities*** – *Potential HECO update on Resilience Application Filing / IGP RWG Next Steps* • Discuss best regulatory framework and identify areas for tariff revisions • Review draft consensus list and identify areas of disagreement for final report
WG Mtg #8	Oct 11, 2022	• Review and discuss draft report and tariff revisions
Status Conference	Oct 27, 2022	
WG Mtg #9	Nov 8, 2022	• Finalize report and tariff revisions
Parties to file Phase 2 WG Report	Nov 23, 2022	
Technical Conference	Dec 8, 2022	

Mahalo for your time.

Any questions?

Working Group Progress - Discussion Takeaways

Priority Issue	Discussion Takeaways	Guest Speaker(s)
e. iv. Better understanding barriers to microgrid development and what would make the microgrid tariff more attractive for developers	• Barriers include C&C permitting process, supply chain issues, and **overall project economics** (i.e. avoiding high demand charges for customer microgrids) • Barriers did not include interconnection or tariff improvements	Ted Peck, Holu Hou Aiden Coyle, Ameresco
a. iii. Resilience services and compensation, including societal and environmental value, to inform development of a resilience tariff *e. ii. Identifying a variety of funding mechanisms for microgrid development. Including possible state and federal funds that can be leveraged to support pilots and/or demonstration projects*	• A **"technology-neutral" perspective may not include a MG** to get to the same resiliency objective (one size does not fit all) • MG projects will likely use a **"best-fit, most-reasonable-cost" cost-effectiveness method** • In some cases, the customer should pay for a MG; **need to determine if there is a benefit to the grid** or not (i.e. a university MG) • Infrastructure Investment and Jobs Act (IIJA) **federal funding available allocated to states** to support resilience investments	Joe Paladino, Office of Electricity US Department of Energy
e. iii. Identifying community needs *e. iv. Customer education and outreach*	• **ETIPP final report due in December 2022**, will include a map of potential sites for hybrid microgrids on Oahu under 3MW and **community outreach with HNEI** • Map inputs include existing DER, supporting infrastructure, as well as **area vulnerability, criticality, and societal impact**	Katy Waechter, NREL & Ken Aramaki, Hawaiian Electric

Open Questions

Phase 2 Priority Issue	Questions
a. Microgrid Compensation and Grid Services	• Who should get compensation and why? • Aside from resilience service, are there any energy and grid services not already available to MGs through PPA, tariff or program?
c. Customer Protection and Related Considerations	For Hybrid MGs that may island voluntarily: • Who is protecting the customer if 100% of load not met during blue-sky conditions (MGs typically are not designed for 100% of load, or long duration if renewable energy based)? • What is the benefit of voluntary islanding for customers and how does this support the original intent of Act 200 to promote microgrids for resiliency purposes?
e. ii. Identifying a variety of funding mechanisms for microgrid development, including possible state and federal funds that can be leveraged to support pilots and/or demonstration projects	• State access to IIJA funding potential for hybrid MG, what is the potential? Also, DOE's Loan Program Office funding potential. • How much funding would be needed to support Hawaii's community resilience goals (how many projects)? • Should there be a focus on disadvantaged and vulnerable communities at risk to address equity issues? • How to address preliminary engineering, implementation costs and ongoing operational costs for a third party owned & operated Hybrid MG?
e. v. Customer education and outreach	• What types of Customers are interested in Customer MGs or Hybrid MGs and why?
Overall	• What are the "low-hanging fruit" that can result in a tangible Hybrid MG project to help critical infrastructure and vulnerable communities as soon as possible?

MST Phase 2 Priority Issues (Order No. 38293)

a. Microgrid Compensation and Grid Services

i. Harmonization with other programs' grid services mechanisms
ii. Customers with existing DER/DR grid service agreements
iii. Resilience services and compensation, including societal and environmental value, to inform development of a resilience tariff

b. Utility Compensation

i. Standby charges, exit fees, and/or other charges

c. Customer Protection and Related Considerations

d. Interconnection

e. Working group coordination with related microgrid and resilience initiatives at Hawaiian Electric and government agencies

i. Identifying critical facilities
ii. Identifying a variety of funding mechanisms for microgrid development. Including possible state and federal funds that can be leveraged to support pilots and/or demonstration projects
iii. Identifying community needs
iv. Better understanding barriers to microgrid development (e.g., economic, project opportunities, technical expertise) and what would make the microgrid tariff more attractive for developers
v. Customer education and outreach

Procedural Timeline