Redwood Coast Airport Microgrid – *first RE multi-customer microgrid in CA*

EPIC 3 Project 11: Location Specific Options for Reliability and Resiliency Upgrades

CPUC PSPS Meeting #2

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Types of Microgrids

(1) Single Customer

Description

- Individual retail customer, seeking to remain energized in the event of a broader grid outage
- Includes customer or third party owned back-up generation and/or various distributed energy resources (DERs)

Key Drivers

- Customer Resilience
- Avoided customer outage

Examples

- Blue Lake Rancheria (operational)
- Military bases, university campuses, health care complexes
- Residential solar+storage

(2) Multiple Customers

Description

- Several retail customers closely clustered on PG&E's grid, seeking to remain energized in the event of a broader grid outage
- Grid is owned, maintained and operated by utility
- Can include both back-up generation and/or various DERs; ownership can vary

Key Drivers

- Resilience
- Avoided customer outage

Example

- Arcata Airport community microgrid

(3) Utility-Driven

Description

- Utility-initiated projects, driven by cost or operational needs
- Grid is owned, maintained and operated by utility
- Can include back-up generation and/or various DERs; ownership can vary
- Includes "remote grids" (fully islanded configurations) and "temporary" configurations where generators are brought in to avoid foreseeable outages (e.g. PSPS, planned outages)

Key Drivers

- Public Safety Power Shutoff
- Wildfire risk mitigation

Examples

- Temporary Microgrids
- Remote Grid

Image Credits: Indian Country Media Network; PG&E

Background and Partners

- Humboldt is a rural, isolated community at the end of a TX line.
- Vulnerable to tsunamis, earthquakes, wildfires and now PSPS events.
- CCA has goals to develop **local renewable energy.**
- Operate a multi-customer microgrid to satisfy **community demand for enhanced resilience**
- Demonstrate **scalable** and **replicable** processes
- RCAM project built on **established partnerships** from prior microgrid project.

Schatz Energy Research Center

STATE OF CALIFORNIA ENERGY COMMISSION

HUMBOLDT STATE UNIVERSITY

REDWOOD COAST ENERGY AUTHORITY

PG&E

COUNTY OF HUMBOLDT The Home of the Redwoods

SEL SCHWEITZER ENGINEERING LABORATORIES

TRC

TEA THE EnergyAuthority

What is the EPIC Program?

The Electric Program Investment Charge (EPIC) is a California statewide program that enables PG&E to invest in & pursue new/novel emerging energy solutions to meet California's energy goals & drive innovation in the industry

EPIC promotes building the energy network of tomorrow through innovation focused on

Increased Safety • Improved Affordability • Greater Reliability

Renewables and Distributed Energy Resources (DER) Integration

Grid Modernization and Optimization

Customer Focused Products and Services Enablement

Foundational Strategies & Technologies

EPIC Timeline

2014	2015	2016	2017	2018	2019	2020
EPIC 1 Project Deployment ($48M, 17 projects)						
	EPIC 2 Project Deployment ($51M, 19 projects)					
				EPIC 3 Deployment ($56M, 43 proposed projects)		

33 Projects Complete (16 EPIC 1 Projects, 17 EPIC 2 Projects)
Completed Project Reports: www.pge.com/EPICfinalreports

43 Projects in EPIC 3 Application 17-04-028 CPUC Approved in October 2018

Value of EPIC to PG&E & CA Policy Objectives

Our Mission

To safely and reliably deliver affordable and clean energy to our customers and communities every single day, while building the energy network of tomorrow.

EPIC Furthers PG&E's Mission

EPIC helps PG&E build the energy network of tomorrow through the demonstration of new and novel technologies that modernize and optimize the grid, and enables Distributed Energy Resource (DER) Integration and new customer offerings to ultimately improve safety, reliability and affordability for our customers

Invest in a sustainable energy future

EPIC Advances CA Clean Energy Policy Objectives

EPIC allows IOUs to learn about and demonstrate technologies and systems needed to support resiliency plans and high-DER grid

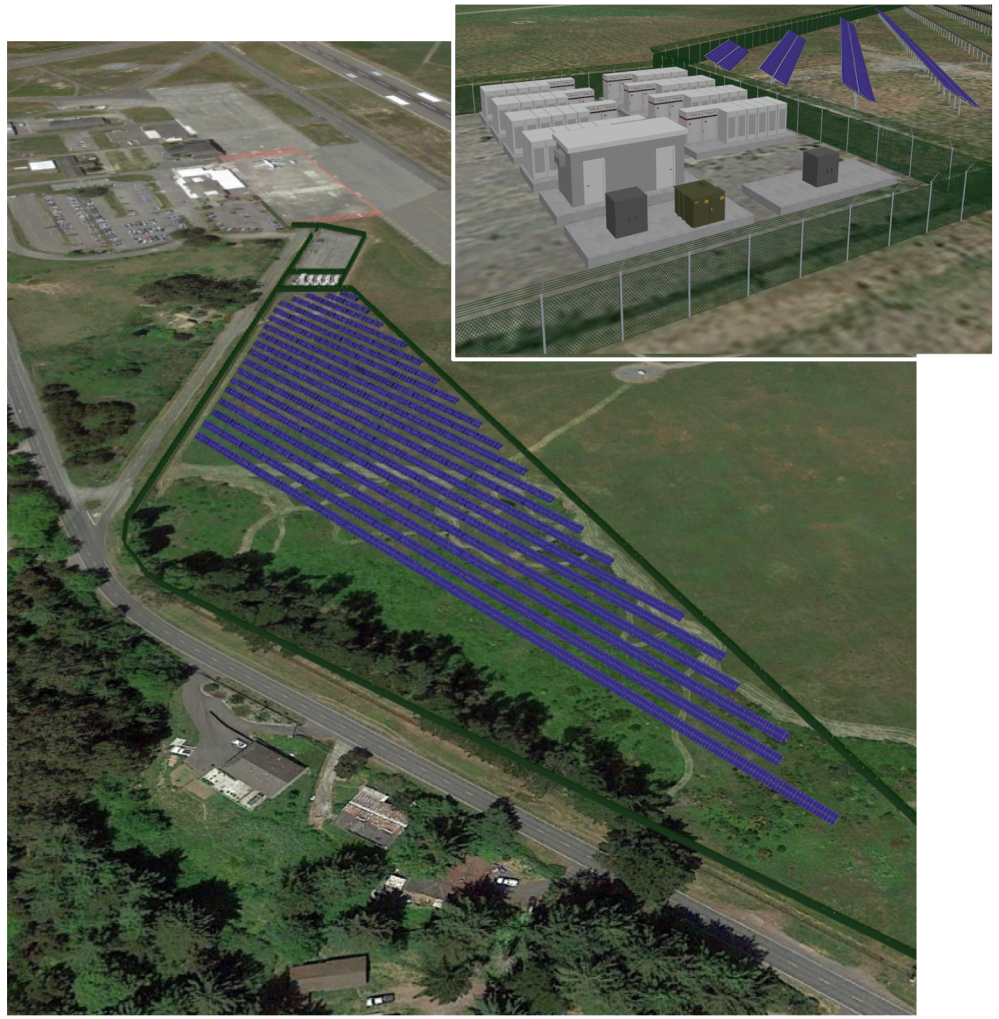
Affordability and maximizing value for our Customers

EPIC Establishes Low Cost / Risk, High Value Learnings

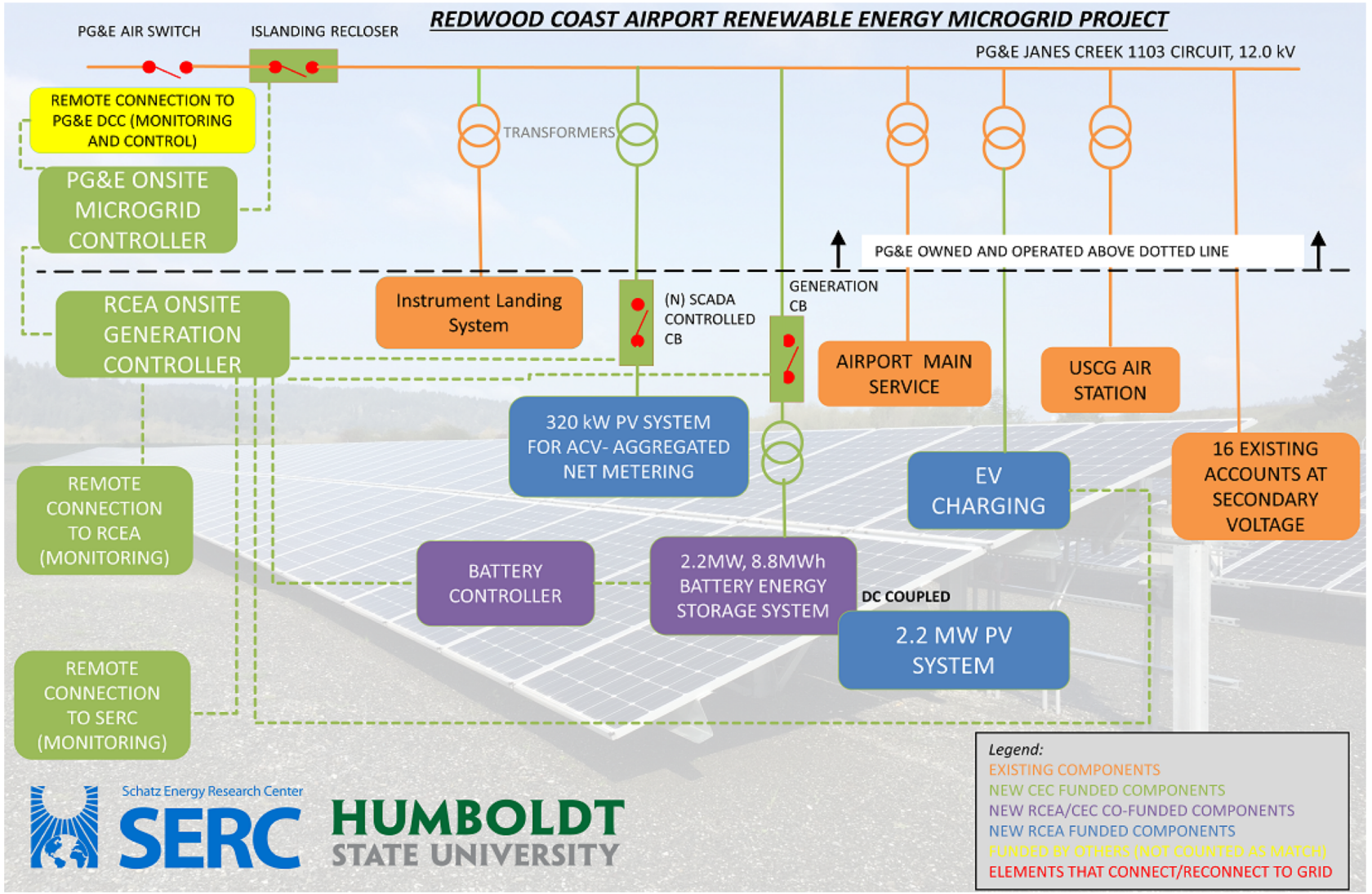
- Okay to try new things, "fail fast"
- If technology proves beneficial, streamlines Path-to-Production

Technical Details

- First 100% RE multi-customer microgrid
- Critical Facilities: Airport and US Coast Guard
- 2.2 MW PV DC-coupled to 2.2 MW/8.8 MWh battery storage; with CAISO wholesale market participation
- 320 kW_{AC} net-metered PV
- Includes 20 retail accounts - 19 unbundled CCA customers, 1 bundled PG&E customer



Simplified Circuit and Operational Responsibilities



- Dotted line represents delineation between the main and microgrid
- Replicable model for allocating operational responsibility in future microgrids
- The PG&E microgrid controller has ultimate authority and can control the Generation Circuit Breaker (on the customer side)

How to build a microgrid

Four distinct operational states

Grid-connected Mode

- Third party will control generation asset, participate in wholesale market

Island and Transition Modes

- DSO will control generation asset, third party will be compensated

INTERCONNECTION AND SERVICE PLANNING

SIS/WDT, NEM, onsite construction

DESIGN AND PROTECTION

circuit and controls design, system protection

OPERATIONS INTEGRATION

CONOPs, visibility and control at DCC

MICROGRID TESTING

controller configuration, P-HIL & RTDS

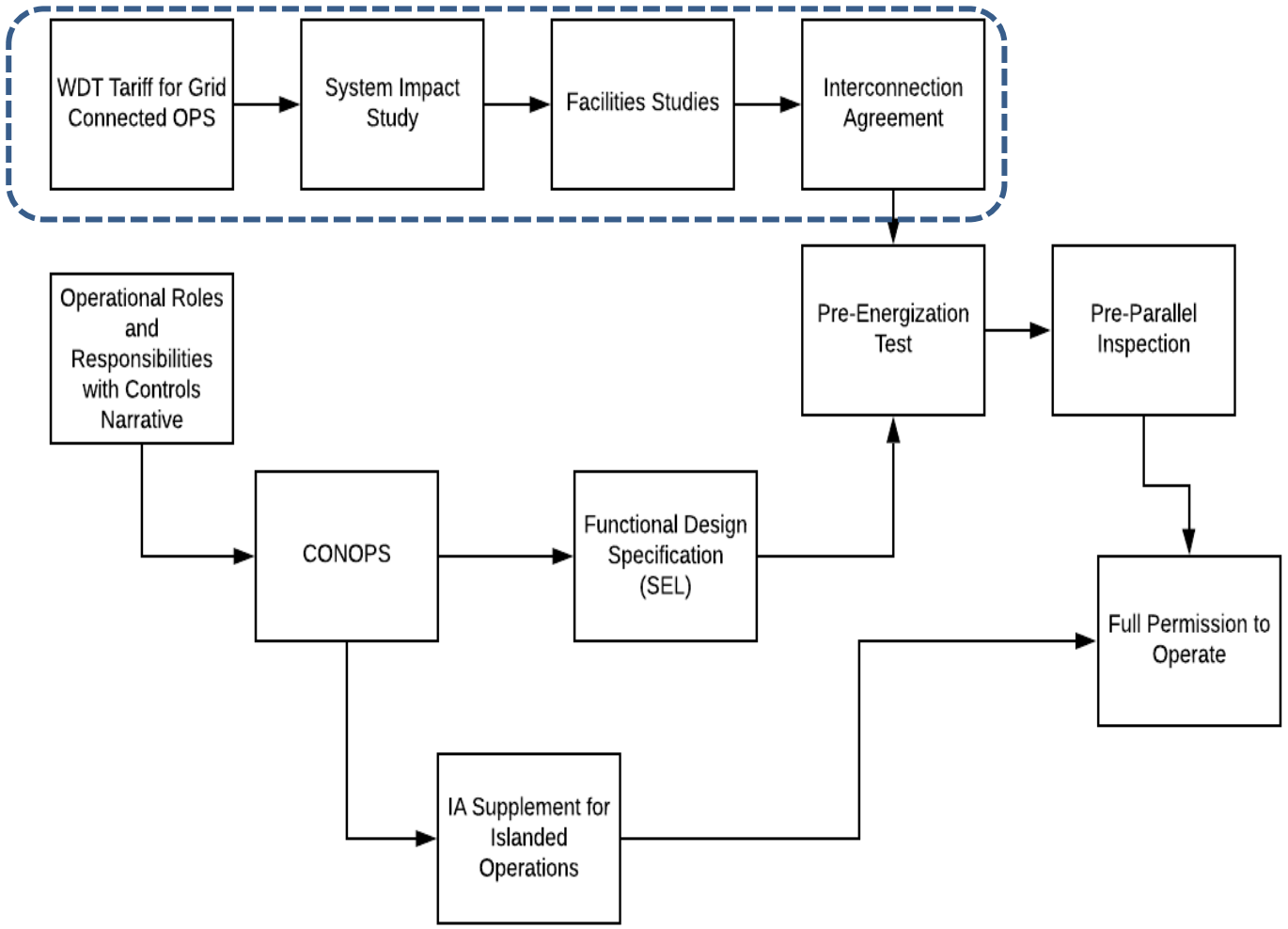
COMMS/CYBERSECURITY

network safety, resilient comms

MICROGRID TARIFFS

valuation, cost recovery tariffs

Collaborative and Innovative Processes

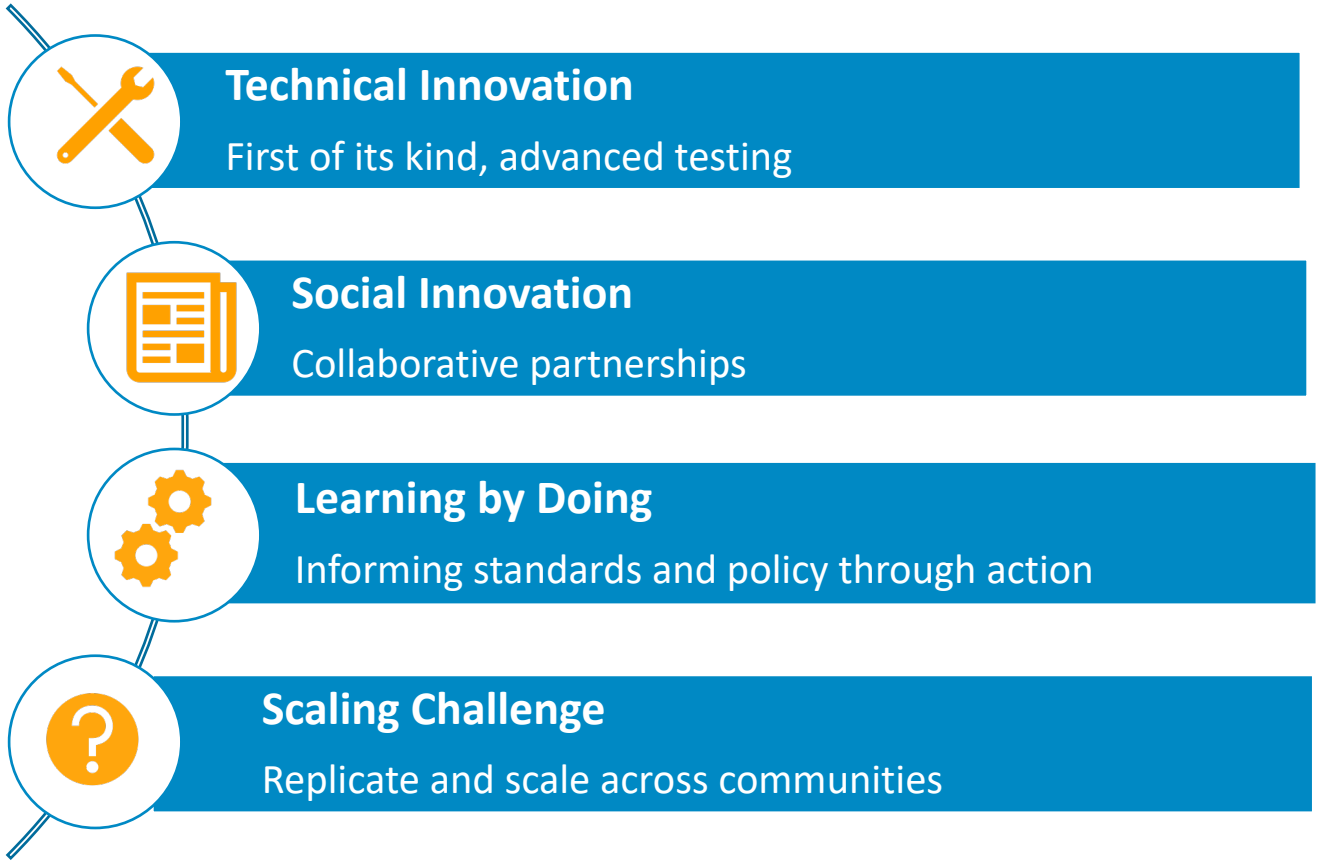


Concept of Operations (CONOPs)

- Detailed control & protection scheme; ultimate islanding control with PG&E
- Informs the design of the microgrid RTDS and P-HIL testing at SEL and PG&E

*The non-islanding interconnection of the PV-BESS can proceed independently

Innovation Opportunities and Challenges



Community Microgrid Enablement Program

Partner with communities in their resilience efforts by supporting community-driven resilience for critical facilities and vulnerable customer groups.

Thank you!

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