



**Hawaiian
Electric**

North Kohala Microgrid RFP

Hawai'i Island

IGP Stakeholder Technical Working Group

September 2, 2021



Purpose and Objective

- ◆ Brief stakeholders on the North Kohala Microgrid effort
- ◆ Offer stakeholders an opportunity to provide input and comment directly to the Company on the information and data that will be used to inform the approach for moving forward with the North Kohala Microgrid effort and the development of the draft RFP



Agenda

Hawaiian Electric

- ◆ Introduction/Brief History

Entura

- ◆ Background/Experience
- ◆ Microgrid Solution
- ◆ Centralized and Distributed Storage Pros/Cons
- ◆ Procurement Approach Analysis
- ◆ Example Projects

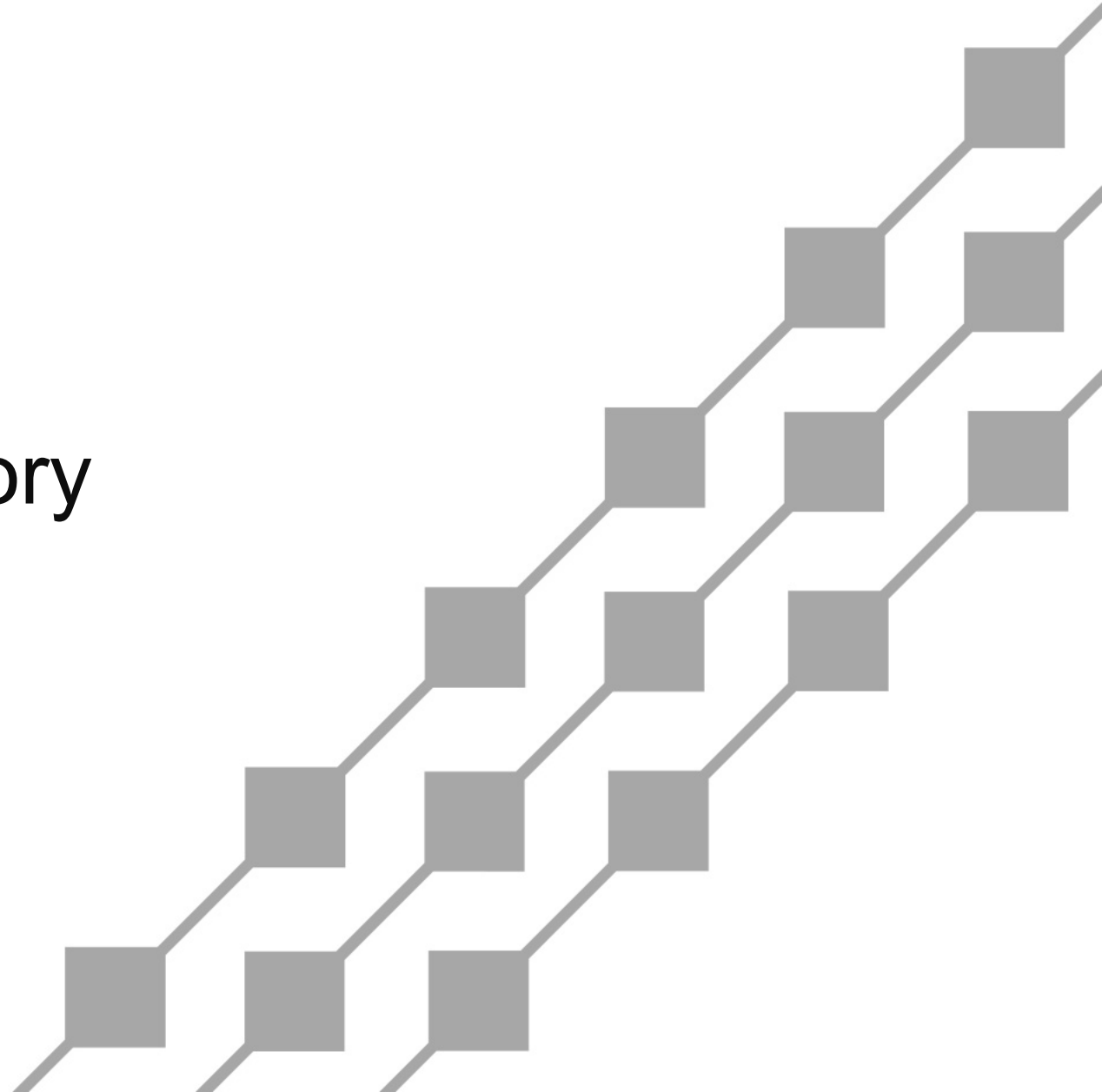
Hawaiian Electric

- ◆ History and Context
 - ◆ Procurement and Contracting Approaches Considered
- Questions?



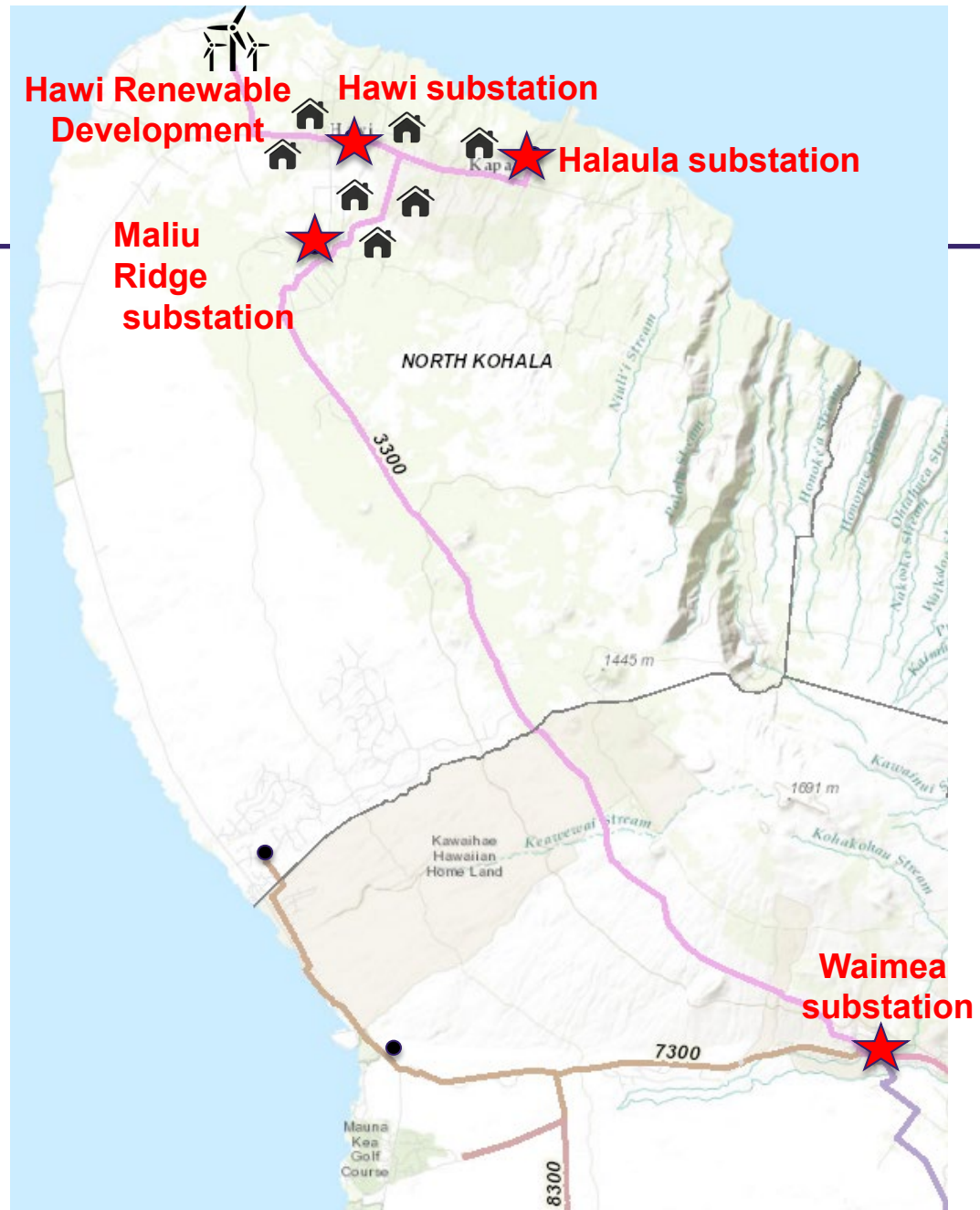
Hawaiian Electric

Introduction / Brief History



North Kohala

- ◆ Customers serviced through the 3300 Line built in 1950s
- ◆ ~24 miles between Waimea and Halaula/Hawi
- ◆ ~2,000 customers
- ◆ ~4MW peak load
- ◆ 10.5MW windfarm
- ◆ ~2.1MW DER
- ◆ Line capacity 13MVA
- ◆ Transformer capacity 10MW



Objectives

- ◆ To improve reliability and resilience for customers in North Kohala by providing energy when 3300 Line is out
 - 3300 Line Rebuild Needed (requires outage)



Measures Taken to Improve Reliability and Resilience

- ◆ Vegetation management
 - In 2019, trimmed/removed 41,000 trees in North Kohala.
Over 5,000 trees trimmed/removed in Q1 2021
- ◆ Pole maintenance (requires planned outages)
 - 40 poles in 3300 replaced in 2019;
16 poles replaced in July 2021
- ◆ Remote monitoring and control of substations (SCADA)



Options Considered



OPTION 1

- New 2nd line and transformer



OPTION 2

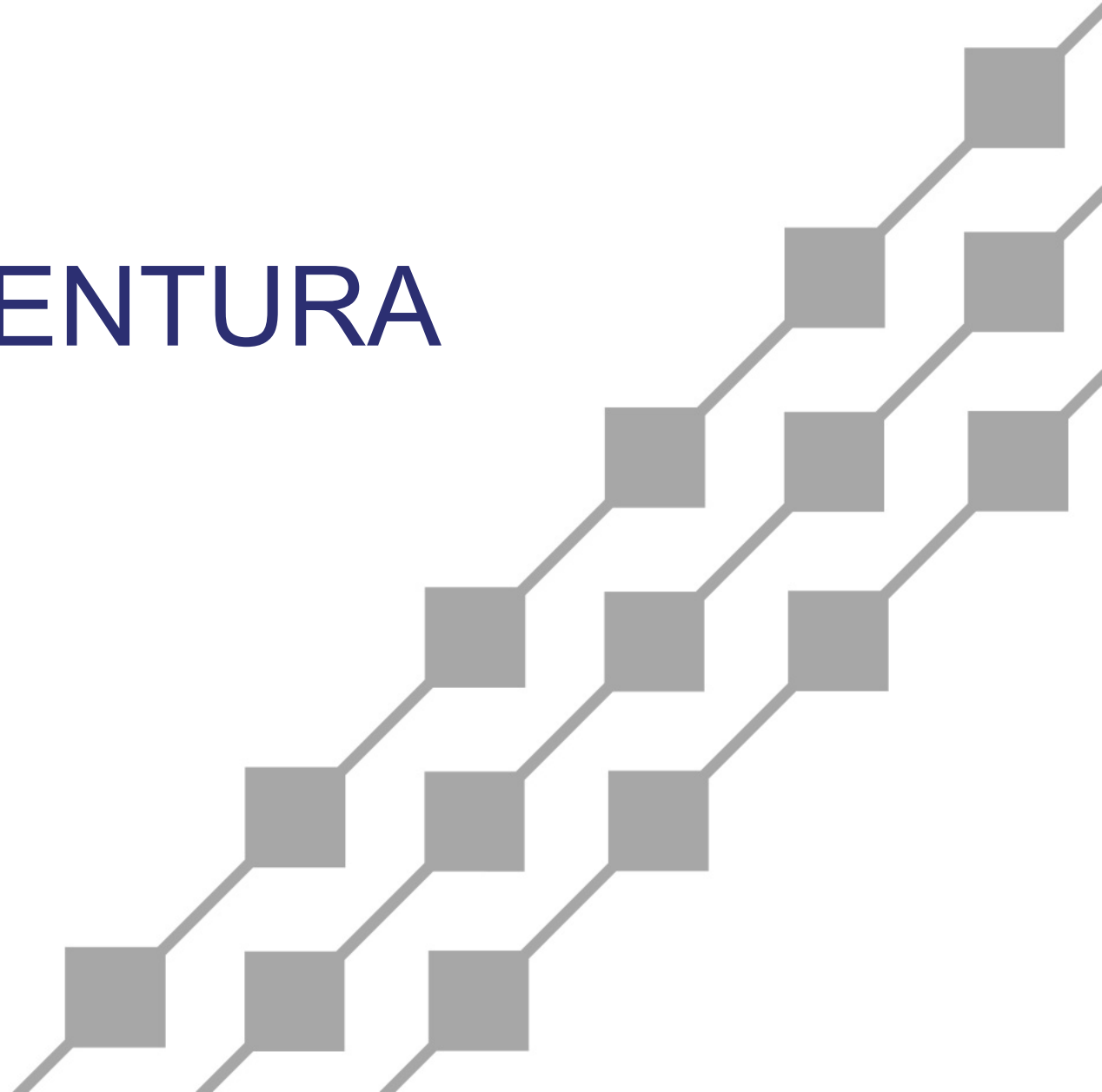
- Microgrid with Diesel Generators



OPTION 3

- Microgrid with Battery Energy Storage System (BESS)

TRANSITION TO ENTURA





NORTH KOHALA MICROGRID

Microgrid solution, centralised and distributed solutions,
procurement approaches, example projects

09/02/2021

WE OWN. WE OPERATE. WE CONSULT.



Agenda

- Entura's background and experience
- Microgrid solution
- Central and distributed microgrid resources
- Analysis of procurement approach
- Example projects



WE OWN. WE OPERATE. WE CONSULT.



Agenda

- **Entura's background and experience**
- Microgrid solution
- Central and distributed microgrid resources
- Analysis of procurement approach
- Example projects



WE OWN. WE OPERATE. WE CONSULT.

ENTURA'S BACKGROUND AND EXPERIENCE

Relevant experience:

- Asset-owner heritage
- Owner's engineering
- Power systems and grid connection studies
- Renewable Energy engineering – hydropower, wind, solar PV
- Enabling technologies – pumped hydro, batteries, flywheels, dynamic resistors
- Entura's Hybrid Control system developed on in-house projects for renewable and off-grid systems – now applied to commercial systems with control code and HMI (operator screen) design and preparation
- Front-end engineering design, including: power systems modelling, integration design and control design and interface specification.



WE OWN. WE OPERATE. WE CONSULT.

KING ISLAND RENEWABLE ENERGY INTEGRATION PROJECT (KIREIP)

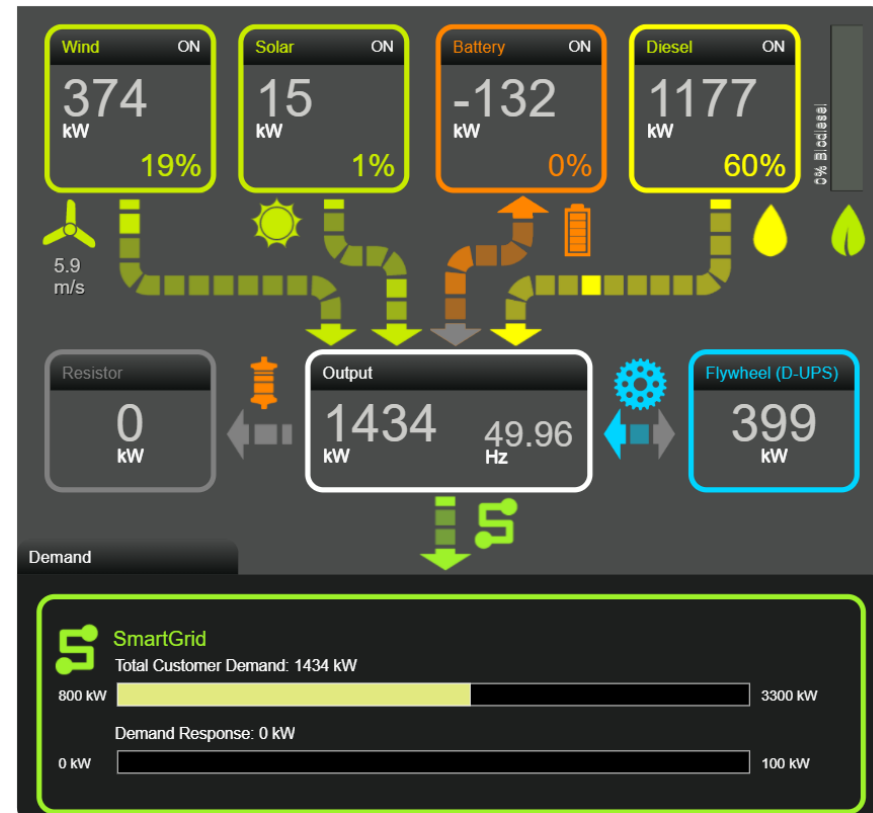
Client: Hydro Tasmania

Location: King Island, Australia

Date: 2007–2012

- The system is capable of 100% renewable operation, the **first** megawatt class off grid system with this capability **in the world**.

<https://www.hydro.com.au/clean-energy/hybrid-energy-solutions/success-stories/king-island>



WE OWN. WE OPERATE. WE CONSULT.

FLINDERS ISLAND HYBRID ENERGY HUB

Client: Hydro Tasmania

Location: Flinders Island, Australia

Date: 2014–2018

- The **containerisation approach** minimises potential impacts on customers and on the daily activities of an operational power station.



WE OWN. WE OPERATE. WE CONSULT.

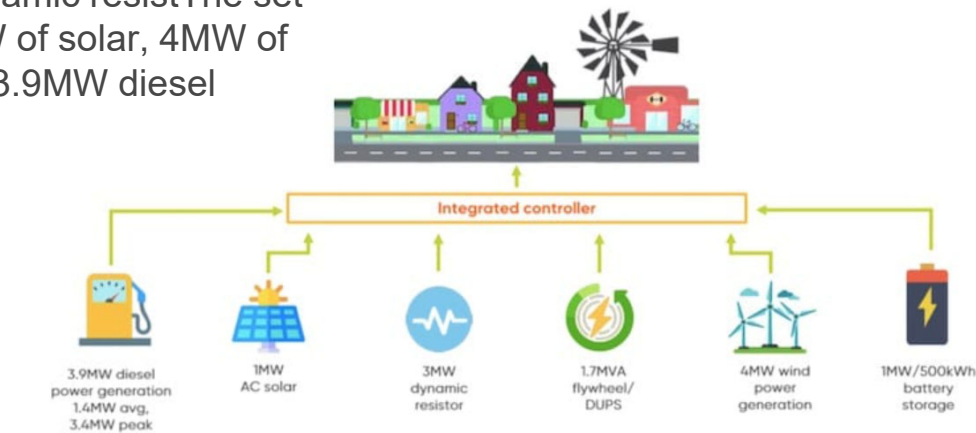
COOPER PEDY HYBRID RENEWABLES PROJECT

Client: Energy Developments Limited
Location: Coober Pedy, South Australia
Date: 2013–2018



BACKGROUND

- 1.7MVA flywheel and a 3MW dynamic resistorThe set up at Coober Pedy includes 1MW of solar, 4MW of wind, a 1MW/500kWh battery, a 3.9MW diesel generator, or.



WE OWN. WE OPERATE. WE CONSULT.

AGNEW HYBRID RENEWABLE PROJECT

Client: EDL Energy

Location: Western Australia

Date: March 2019 – October 2020

- The Agnew Hybrid Renewable Project has delivered Australia's largest hybrid renewable energy microgrid—the **first** in the country to utilise wind generation on a large scale at a **mine site**.



WE OWN. WE OPERATE. WE CONSULT.



Agenda

- Entura's background and experience
- **Microgrid solution**
- Central and distributed microgrid resources
- Analysis of procurement approach
- Example projects

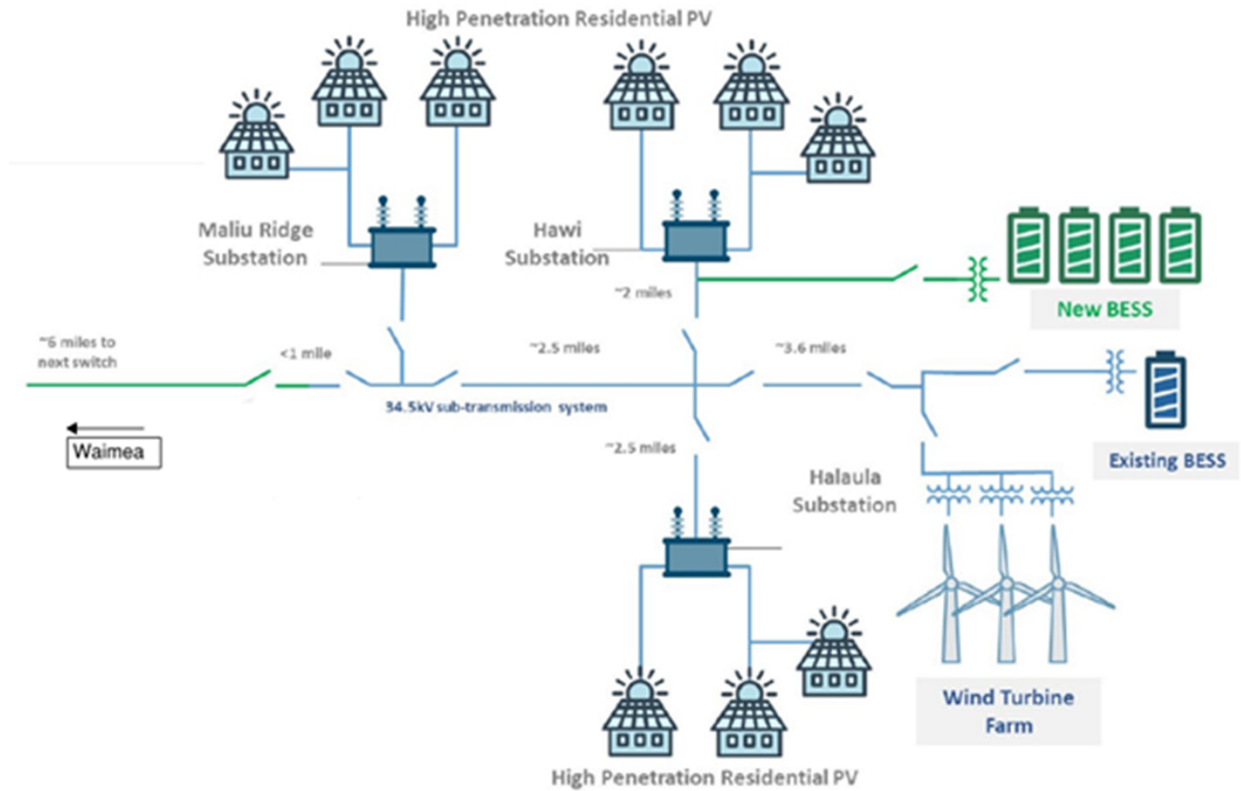


WE OWN. WE OPERATE. WE CONSULT.

MICROGRID SOLUTION

System Layout

- Maliu Ridge
- Halaula
- Hawi

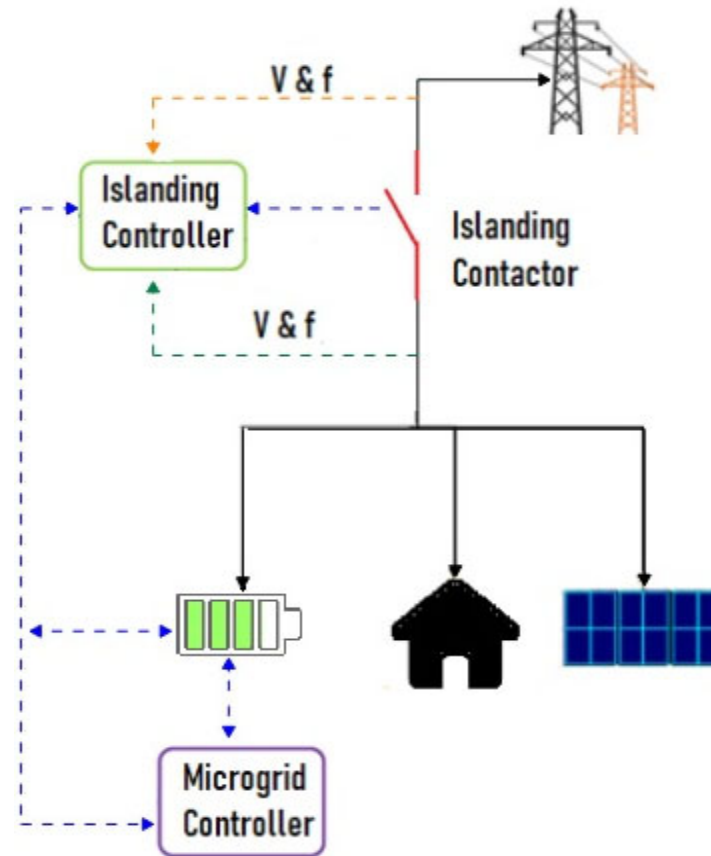


WE OWN. WE OPERATE. WE CONSULT.

MICROGRID SOLUTION

Main Components and Engineering

- Islanding Controller
- Microgrid Controller
- Islanding Contactor

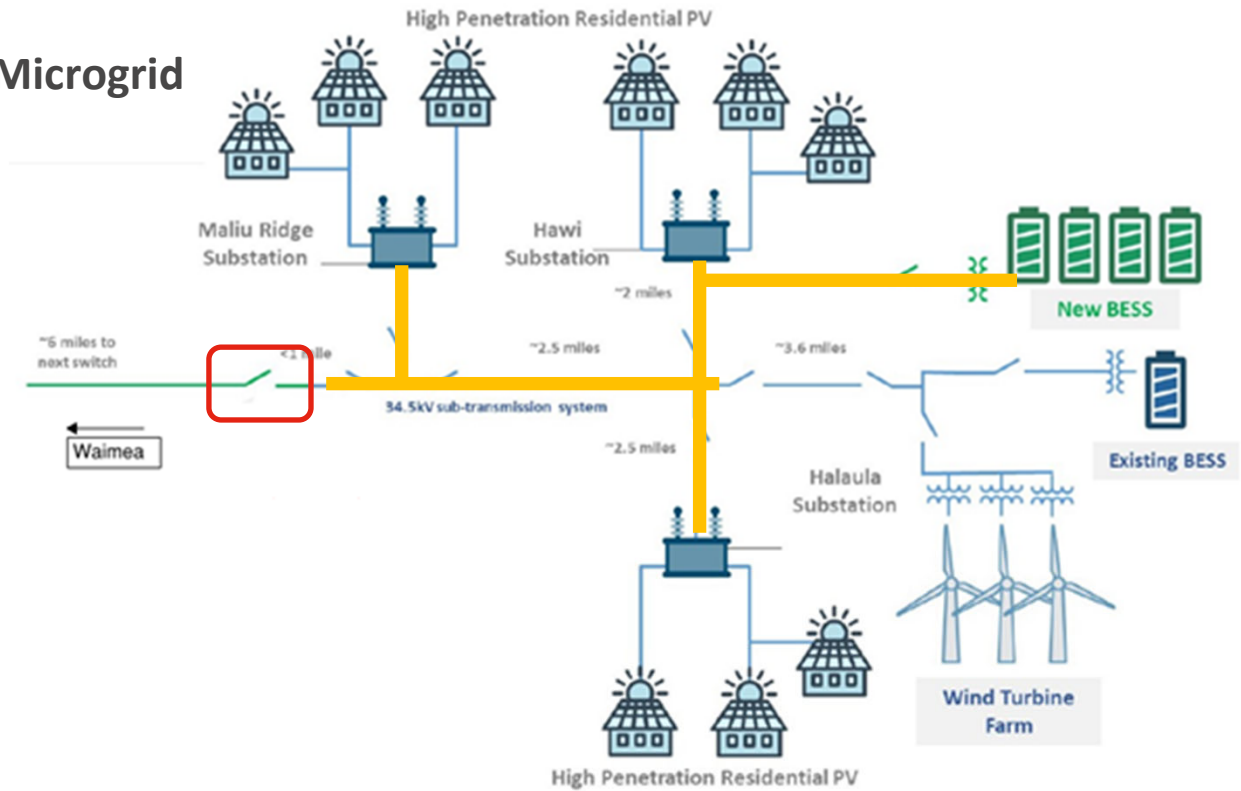


WE OWN. WE OPERATE. WE CONSULT.

MICROGRID SOLUTION

Configuration 1: North Kohala Microgrid

- Maliu Ridge
- Halaula
- Hawi

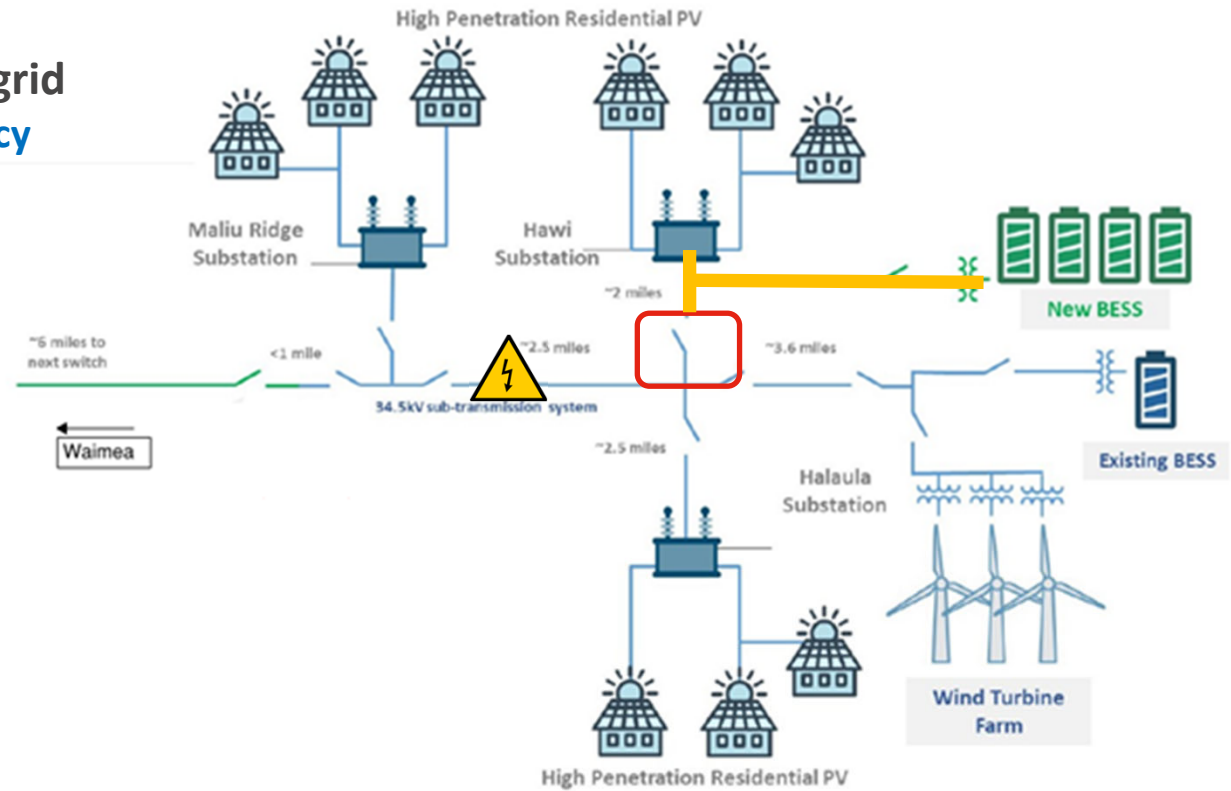


WE OWN. WE OPERATE. WE CONSULT.

MICROGRID SOLUTION

Configuration 2: Hawi Microgrid Manual Operation as Contingency

- Maliu Ridge
- Halaula
- **Hawi**



WE OWN. WE OPERATE. WE CONSULT.



MICROGRID SOLUTION

Transition

- **Planned**: seamless transition upon manual command – BESS to grid form and Microgrid Controller to isolate the system
- **Unplanned**: system to isolate and energize itself upon sustained grid loss



WE OWN. WE OPERATE. WE CONSULT.

MICROGRID SOLUTION

Remaining Power System Studies Approach

- Topics to be further investigated during detailed interconnection study after resource selected.
 1. *Active and reactive power for stable planned transition.*
 2. *Functional Description: how system must operate (input for Microgrid Controller code)*
 3. *Blackstart strategies - BESS to provide inrush current to energise transformers.*
 4. *Electrical Protection strategies for on and off grid*



Agenda

- Entura's background and experience
- Microgrid solution
- **Central and distributed microgrid resources**
- Analysis of procurement approach
- Example projects



WE OWN. WE OPERATE. WE CONSULT.

COMPARING CENTRALISED AND DISTRIBUTED SOLUTIONS

Comparing the use of a centralised solution at a substation with an entirely distributed solution at each customer premises.

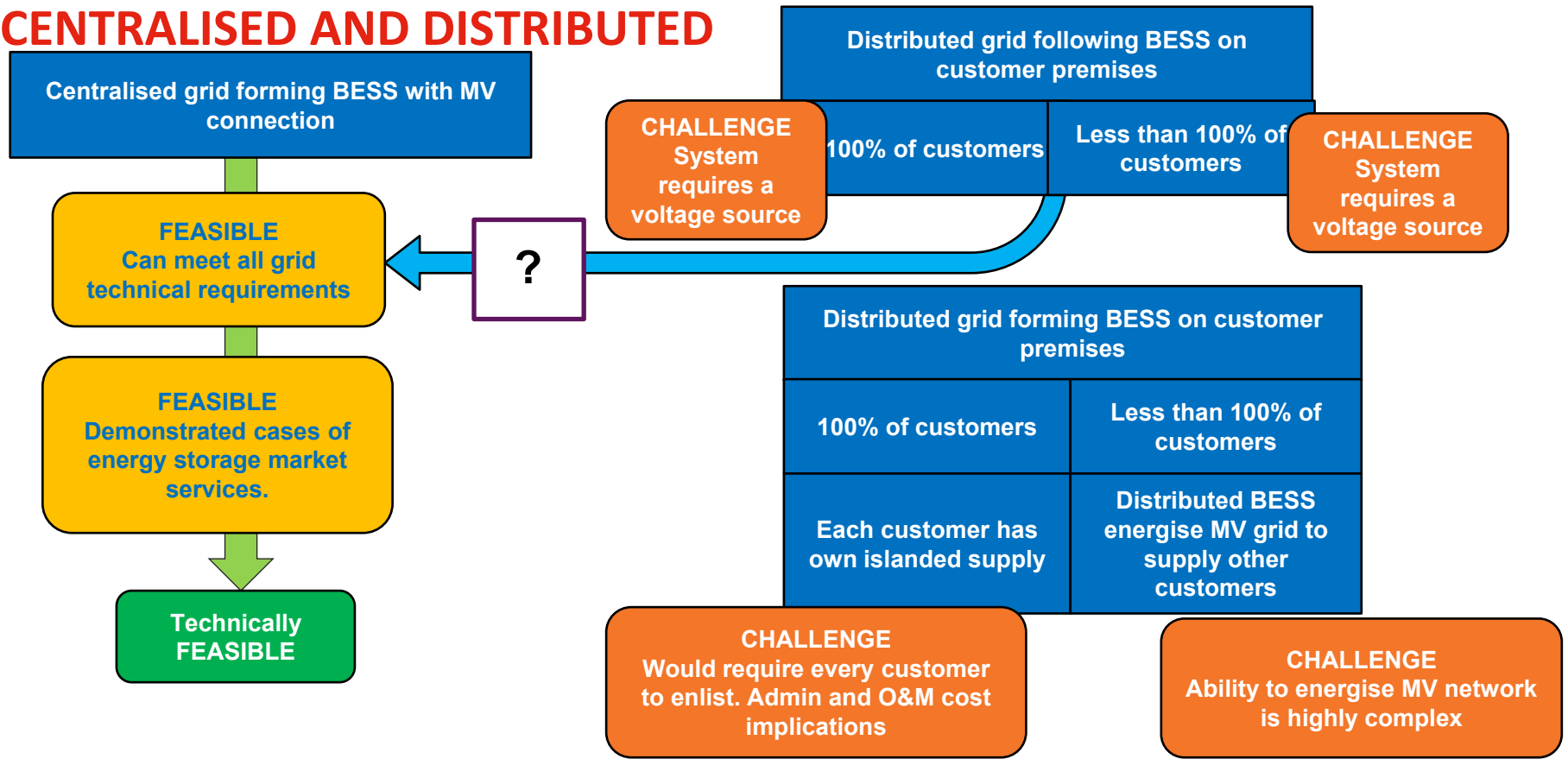
Advantages of **distributed solution**:

- Each customer could be responsible for their own consumption – particularly in times of unplanned outages

Advantages of a **centralised solution**:

- Single project means single ESSA, distributed means a contract with each customer
- Simpler implementation – specific installations at each property may require alternative capacity and designs
- Lower cost for one centralised project compared with the same energy capacity of multiple distributed projects
- Allows continued operation of existing DER in its original use case independent of DER having a BESS
- Need to determine if all customers require their own BESS – would it be mandatory?
- Cost of centralised BESS can be shared by customers - who would own and pay for distributed storage assets?

CENTRALISED AND DISTRIBUTED



WE OWN. WE OPERATE. WE CONSULT.

COMBINING CENTRALISED AND DISTRIBUTED SOLUTIONS

Could a combination of a centralised solution at a substation supplemented by a distributed service solution be possible? Some things to consider:

- A centralized resource will have to be sufficiently sized to be the “grid forming” resource and capable of energizing up to the DER service points for them to be able to provide any service back to the microgrid.
- Black starting from a DER using grid forming control and synchronizing to other segments in a microgrid is not a commercially available technology and would require a highly complex communications and control system to manage
- Existing DER in its existing use case is assumed to continue to operate in the microgrid and would already be accounted for in sizing of the energy requirement of a centralized resource. Any supplementation to the centralized resource would need to be new DER and for the dedicated purpose of providing energy to the MG otherwise it is not providing the equivalent service for planned and unplanned outages as the centralized resource.



Agenda

- Entura's background and experience
- Microgrid solution
- Central and distributed microgrid resources
- **Analysis of procurement approach**
- Example projects



WE OWN. WE OPERATE. WE CONSULT.



PROCUREMENT APPROACH – ADVANTAGES OF 3RD PARTY OWNERSHIP

- 1. Procuring a BESS as a service reduces upfront capital investment**
- 2. Third-party owner is responsible for decommissioning and recycling of the BESS components**
- 3. Responsibility for operation allocated to those best able to manage it**
- 4. Availability guarantee**



WE OWN. WE OPERATE. WE CONSULT.



PROCUREMENT APPROACH – ADVANTAGES OF OWNER-OPERATOR MODEL

- 1. Residual BESS capacity and value can be retained by the owner**
- 2. Owner-operator model increases flexibility for future changes of use of the BESS in an emerging use case**
- 3. Lower commercial administration requirements**



Agenda

- Entura's background and experience
- Microgrid solution
- Central and distributed microgrid resources
- Analysis of procurement approach
- **Example projects**



WE OWN. WE OPERATE. WE CONSULT.

ELECTRIC RELIABILITY COUNCIL OF TEXAS (ERCOT) PRESIDIO PROJECT

ETT – Presidio 2010

Location: Presidio, Texas, USA
System: 4 MW / 32 MWh NAS BESS



Reason for installation: To improve transmission reliability by improving power quality and reducing momentary outages due to voltage fluctuations.

Project structure: Owner and operator is ETT, a JV between subsidiaries of AEP and MidAmerican Energy Holdings Company.

Similarities with the proposed project:

- BESS used as a NWA to serve microgrid
- Capacity - in the event of an outage, BESS can supply 4 MW for up to 8 hours.
- Back-up - The battery system allows Presidio's electrical load to receive uninterrupted power during emergency situations.
- The battery system allowed for maintenance on the new transmission line being built to from Marfa to Presidio without loss of electric service.

Differences with to the proposed project:

- Network operator owns and operates the BESS.



WE OWN. WE OPERATE. WE CONSULT.

ARIZONA - PUNKIN CENTER, USA

Arizona Public Service – 2017
Punkin Center

Location: Arizona, USA System: 2 MW / 8 MWh
BESS



Reason for installation: NWA to rebuilding 17 miles of distribution line which had a thermal constraint on operation.

Project structure: The generator and network operator, Arizona Public Service (APS) owns and operates the system.

Similarities with the proposed project:

- BESS used as a NWA.

Differences with to the proposed project:

- Network operator owns and operates the BESS.
- Alternative to building a new line.
- Site was configured to allow for the connection of a temporary generator to the battery site's spare transformer in the event of an network outage beyond capacity of the BESS. Diesel-genset provider contracted for the delivery of a 2 MW genset to the Punkin site within a few hours' notice, should that additional capacity be required.

NATIONAL GRID - NANTUCKET ISLAND

Nantucket Island BESS 2019

Location: Nantucket Island, Massachusetts, USA **System:** 6 MW / 48 MWh BESS



Reason for installation: BESS as a NWA to defer transmission and generation upgrades. Nantucket population increases five-fold in the summer due to vacation visitors. Two subsea cables bring power from the mainland to Nantucket. Third cable option was a \$200 million investment compared to the \$81 million NWA.

Project structure: National Grid owns and operates the project

Similarities with the proposed project:

- BESS used as a NWA
- BESS available to offset outages in a cable during non-summer periods
- In the event of an outage, BESS can supply 6 MW for up to 8 hours.

Differences with to the proposed project:

- Transmission network operator owns and operates the BESS
- Alternative to building a new line.
- BESS used on a daily basis during peak summer months, not just for planned outages.
- National Grid has started exploring the possibility of using BESS for other services.



WE OWN. WE OPERATE. WE CONSULT.

BOOTHBAY, USA

Boothbay Pilot **2015-2018**

Location: Maine, USA **System:** 0.5 MW / 3
MWh BESS



Reason for installation: Expected cost of USD \$18 million to replace feeder based on demand growth predictions. Provide on-call peak shaving during summer months between 9am and 9pm.

Project structure: Gridsolar LLC was awarded rights by the regulator to develop and operate an NWA for a trial period of 3 years, and contracted Convergent Energy + Power to develop and operate the BESS.

Similarities with the proposed project:

- BESS used as a NWA.
- BESS owned and operated by third party under a contract, providing demand response and backup generation by direction from the utility.

Differences with to the proposed project:

- Alternative to building a new line.
- BESS used for peak shaving.
- BESS contract cancelled after use in 3 summer periods, due to load growth that did not materialise. It is unknown how the BESS is being utilised since.



WE OWN. WE OPERATE. WE CONSULT.

PERENJORI, AUSTRALIA

Perenjori

2018-2020

Location: Western
Australia, Australia

System: 1 MWh BESS



Reason for installation: Perenjori (population 200) sits about 150 km east of Dongara and is reliant on a long (75 km) feeder line for their power needs. In the event of a disruption to the main power supply, the BESS switches on automatically and covers the power needs of the town for between two and four hours.

Project structure: The network operator, Western Power (not the generator or retailer) owns and operates the system, carried out as a trial project at a cost of AUD\$4.5 m.

Similarities with the proposed project:

- BESS used as a NWA, to form microgrid.

Differences with to the proposed project:

- Network operator owns and operates the BESS.
- Alternative to building a new line.

KALBARRI, AUSTRALIA

Kalbarri microgrid **2020**

Location: Western
Australia, Australia

System: 5 MW / 2 MWh BESS
1.6 MW wind, 1 MW rooftop solar



Reason for installation: Kalbarri (population 1,500, 100,000 pa visitors) has a diverse generation system with wind and solar already installed, with backup from a long (140 km) feeder line. Extended outages would occur due to disruption on the line.

Project structure: Western Power (network operator) will design and manage the microgrid.

Similarities with the proposed project:

- BESS used as a NWA, to form microgrid.
- Microgrid operation allows supply from rooftop solar PV

Differences with to the proposed project:

- Network operator owns and operates the BESS.
- Alternative to building a new line.
- Microgrid operation allows supply from local wind farm.



WE OWN. WE OPERATE. WE CONSULT.

ESCRI-SA, AUSTRALIA

Energy Storage for Commercial Renewable Integration, SA 2019

Location: South Australia, Australia System: 30 MW / 8 MWh BESS

Reason for installation: Strengthen grid and improve reliability for the lower Yorke Peninsula.

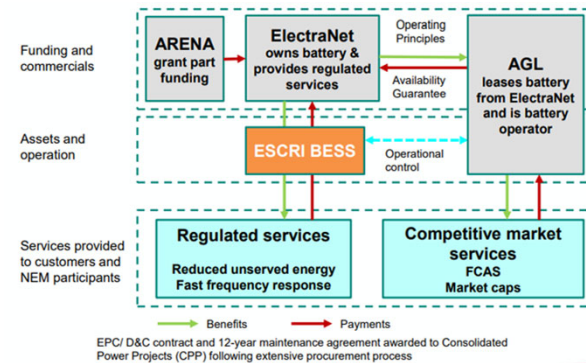
Project structure: Owned by ElectraNet (transmission network operator), leased to and operated by AGL who operate it to provide the competitive market services component.

Similarities with the proposed project:

- BESS used as a NWA, to form microgrid.
- Microgrid operation allows supply from rooftop solar PV.

Differences with to the proposed project:

- BESS used for market trading and frequency control, when not used to offset loss of supply.
- Transmission network operator owns the BESS
- First level of control operate regulated services, Second level of control for competitive market services.
- Alternative to building a new line.
- Microgrid operation allows supply from local wind farm.



GLEN INNES, NEW ZEALAND

Glen Innes

2016

Location: Auckland, New Zealand

System: 1 MW / 2.3 MWh BESS

Reason for installation: Growth in and around Glen Innes meant that the existing power supply was being put under pressure, and increased capacity was required. A grid-connected BESS was installed to perform peak shaving as an alternative to upgrading the existing substation.

Project structure: Owned and operated by Vector (network operator), cost saving of 70% cost savings (NZD\$5 million vs. NZD\$12 million of conventional upgrade).

Similarities with the proposed project:

- BESS used as a NWA.

Differences with to the proposed project:

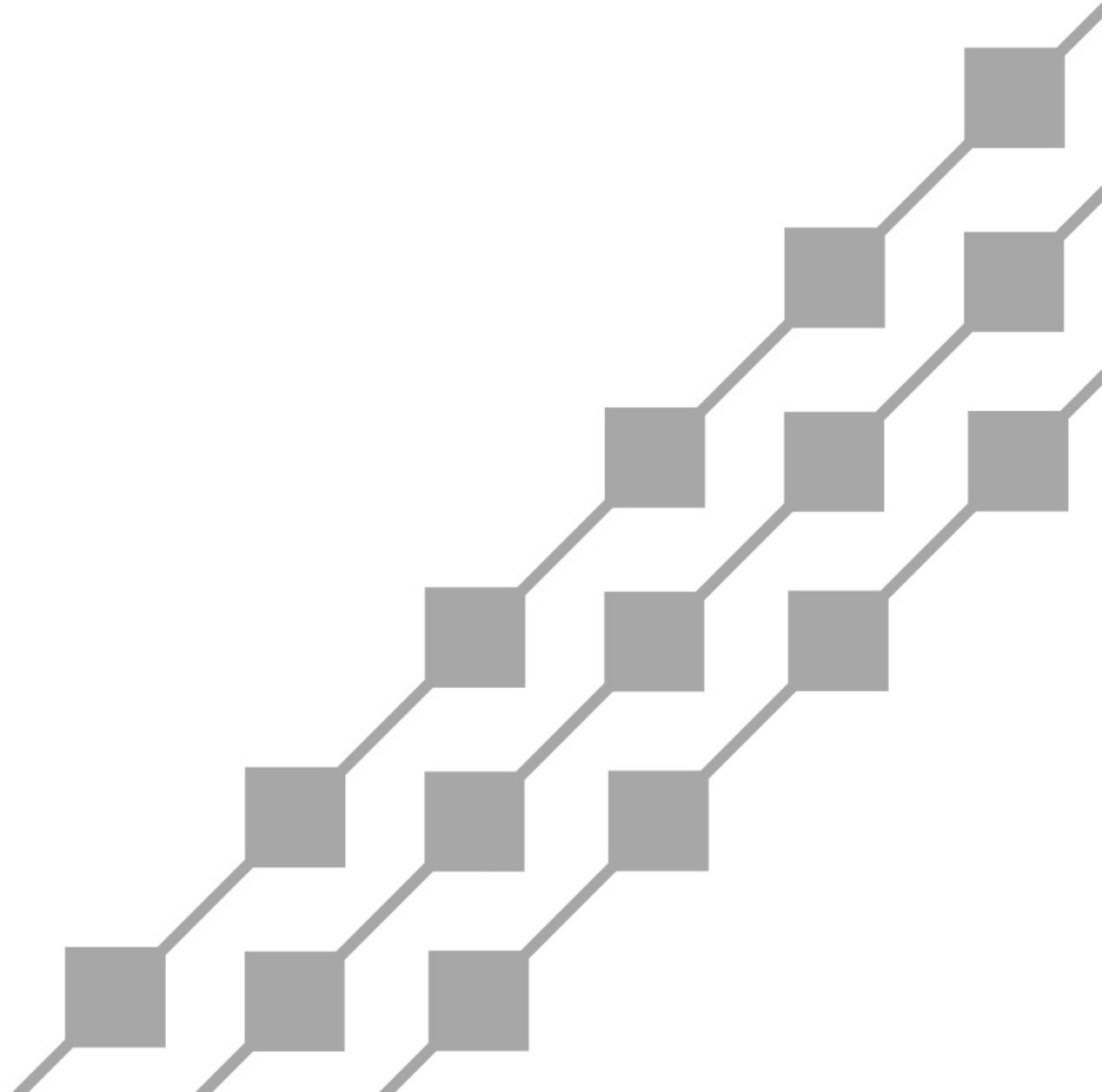
- Alternative to building a new line.
- Network operator owns and operates the BESS.
- The technology is modular and moveable, so the BESS can be relocated to another site if future growth in Glen Innes means a conventional network upgrade is required.



WE OWN. WE OPERATE. WE CONSULT.

Hawaiian Electric

North Kohala Efforts



Non-Wires Alternative (NWA) Approach

CONSIDERED OPTIONS FOR THE FOLLOWING NEED/REQUIREMENTS

- ◆ **NEED** – Rebuild the 3300 Line
 - Line is critical for operations
 - Accept power from Hawi Renewable Development (HRD)
 - Primary source of power to customers

- ◆ **REQUIREMENT** – Power for customers while 3300 Line is de-energized

- ◆ **REQUIREMENT** – Resiliency during unplanned 3300 Line outages (the area is windy and subject to wind/tree impacts on the line)



Community Outreach and Engagement



COMMUNITY

- Major land owners
- Hawi Renewable Development
- Residential and business customers
- Non-profit organizations
- Schools and churches



GOVERNMENT

- Briefings with Hawai'i Island Legislators
- Town halls with elected officials
- Focus groups with community leaders



PARTNERSHIPS

- Hawaii Energy
- North Kohala Community Development Plan Action Committee
- County of Hawai'i first responders (Civil Defense, police, fire, hospital)



EVENTS

- Resilience and Sustainability Forum
- Fairs and festivals
- Community association meetings
- Virtual community meeting



Recommendation: Microgrid w/ BESS option



Procurement and Contracting Approaches Considered



Unique Microgrid Application

- ◆ Lack of Examples in Hawai‘i and elsewhere
- ◆ Engaged with Entura to leverage their experience



Method of Procurement

- ◆ BESS and Microgrid Controller
 - RFP for storage component
- ◆ Pros/Cons



RFP Considerations

- ◆ Performance Standards are essential
 - Heavier weighting on non-price criteria
- ◆ GCOD: 11/22/2024 or sooner
- ◆ Independent Observer
- ◆ Self-Build allowed
- ◆ Centralized BESS adjacent to microgrid controller will streamline RFP
 - Company is procuring site
 - Interconnection will be standardized



Overall RFP Process Schedule

Milestone	Date
Stakeholder Meeting	September 2, 2021
Draft RFP provided	September 23, 2021
Technical Status Conference	September 30, 2021
Parties and Participants provide Comments by	October 7, 2021
Comments from PUC due	October 14, 2021
Proposed Final RFP provided	November 5, 2022
Final RFP is Issued	January 6, 2022
Self-Build Proposal Due Date	March 7, 2022 at 2:00 pm HST
IPP and Affiliate Proposal Due Date	March 8, 2022 at 2:00 pm HST
Selection of Final Award Group	June 16, 2022
Contract Negotiations Start	June 23, 2022



Contract Challenges

- ◆ Energy Storage Services Agreement (“ESSA”)
 - Different application from ESPPA used in Stage 2 RFP



Conclusion and Next Steps



Next Steps

◆ **September 23, 2021**

- A recording of the meeting will be made available for viewing
- Draft RFP to be made available for review
- www.hawaiianelectric.com/competitivebidding

◆ **October 7, 2021**

- Please provide any feedback via email:
- renewableacquisition@hawaiianelectric.com





Mahalo

Questions?