Case Study

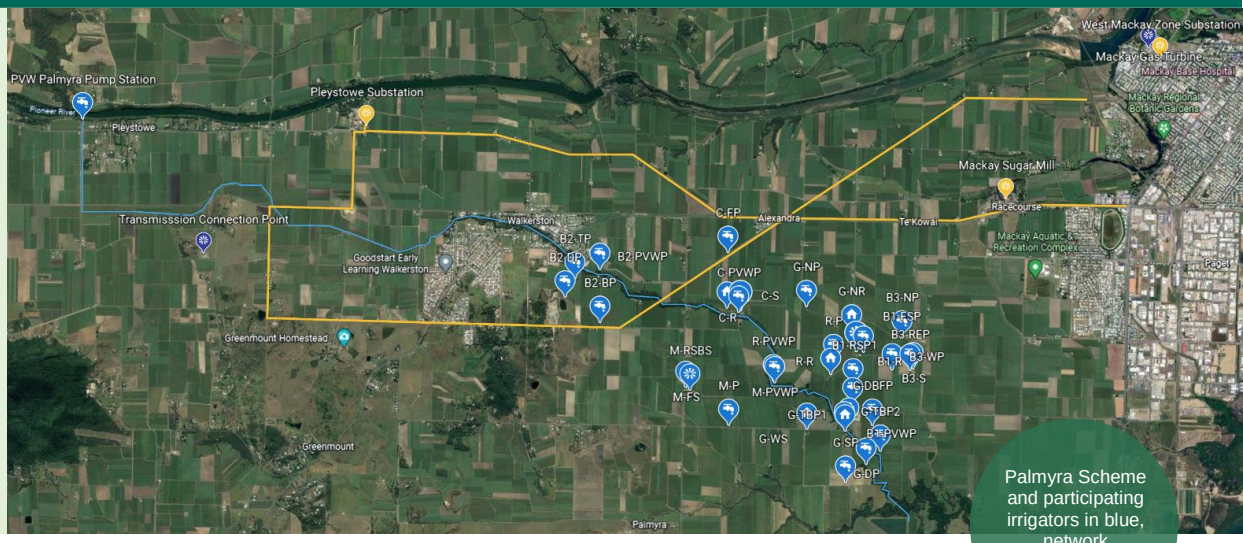
# Pioneer Valley – large microgrid for a cane collective

## Archetype

A **large microgrid** is a system that serves multiple co-located customers within a microgrid's geographic footprint.

## Commodity

Irrigated sugarcane




Palmyra Scheme and participating irrigators in blue, network infrastructure in yellow

## Background

Pioneer Valley Water Co-operative Limited (PVW) is a water irrigation service provider, distributing to water allocation holders on the PVW Palmyra Supply Scheme. The scheme is located just west of Mackay, Queensland. The project analysed a cluster of 7 sugarcane farmers at one end of the Palmyra Scheme and the PVW pumping station at the river.

Cane farming is a highly interdependent commodity where resource availability, processing, and subsequently yield, can be impacted by the practises of other local farmers. It is also a clear demonstration of how energy affordability impacts irrigation practices and therefore productivity.

A strong desire also exists in PVW to buy energy from the Racecourse sugar mill cogeneration plant which produces electricity from sugarcane waste.

## Feasibility findings

**An optimal grid connected power system would consist of:**

- 650kW solar PV
- 2.18MWh battery (located south of the feeder line)
- Grid meter, system controls
- HV & LV electrical works
- Equipment supply and installation
- **Capex $2,154,750 (batt $1,212,250 @$500/kWh, PV$1.45/W)**

Within the feasibility scope the project determined the ideal system design to be a dispatchable solar + battery system installed upstream of the farmer cluster and downstream of the substation.

A dispatchable system matched to follow the cluster's load, removes the need to pass energy through the transformer. Effectively this increases the capacity of existing network infrastructure to cope with more demand elsewhere.

The distribution of benefit is tricky in this model and is a large investment for a small consumer group.

## Challenges

- Rising energy costs resulting in reduced productivity impacts
- Network prevents irrigators purchasing energy from the mill's local cane-powered cogen plant
- Substation underutilisation + network constraints
- Brownfield microgrid installation requires technically complex solution; can resolve virtually
- Lack of space for solar at the river pumping site
- Multiple independent operator interests

## Motivators

- Desire to keep energy costs down
- Energy price certainty over multiple years for business resilience
- Distribution of energy and productivity benefit is fundamental to the viability of the sugarcane industry as a whole supply chain

## Recommended solutions

Due to the considerable costs relative to a limited and complex beneficiary arrangement, a Virtual Microgrid (VM) or Local Energy Market (LEM) is recommended.

This alternative solution design should consider:

- An aggregated portfolio of existing and new grid connected solar + battery loads across the entire Palmyra scheme;
- Virtually coordinated network that distributes locally, optimising assets, managing network impacts, and offering a price to participating consumers; and,
- Depending on appetite, the VM/LEM can trade excess energy to the local community, or in wholesale or ancillary markets.

This solution was beyond scope and requires further analysis.


**Future iterations of the VM/LEM could expand to distribute to or trade with other non-PVW energy consumers + generators eg. Racecourse mill, local villages, and other irrigators**

## Our assumptions

- Retail charges can be reduced by offsetting 'behind the meter' first
- Network charges could be reduced by operating as a prosumer with network exemptions
- A dispatchable system control logic preferences farmer loads, before energy market participation

## What's not possible?

- A large standalone microgrid containing all participants requires prohibitive investment to replicate or purchase existing infrastructure.
- Remaining grid connected and exporting electrons *only* to other PVW farmers/irrigators

## Additional value streams

- Upgrade deferral payments from the DNSP; Ergon Energy
- Ancillary markets and services: FCAS, ramping, resource adequacy, SRAS, and synthetic inertia
- Business resilience value drivers

## Ownership and financing options

- PVW operated LEM, farmer + PVW owned DERs
- Owned and operated by a new community energy company
- ARENA co-funding for a pilot
- Builder-owner-operator of LEM
- Yurika/Energy Queensland owned and operated

## Opportunities to reduce barriers

- Ag tariffs based on productivity levers
- Enable irrigators to purchase their energy from the local sugar mill
- Trial network rule exemption for Local Use Of System tariffs (cheaper if power is produced locally)

## Next steps

- Complete analysis for a VM/LEM
- Gain support and funding for a VM/LEM pilot
- Gain support to trial specific market and tariff elements in AER's Regulatory Sandbox
- Explore the appetite for regulators to trial or approve:
  1. local energy trading with the mill and other large or aggregated energy users
  2. wholesale or ancillary market participation, and;
  3. trial microgrid tariff or network charge reforms using LUOS.

## More information

For further information please visit qff.org.au/projects/microgrids or email Madie Sturgess, madison@qff.org.au.