



Case Study

St George - edge of grid cotton farm

Archetype

Edge of grid (located at the end of a distribution line)

Commodity

Cotton

Background

Located just outside St George, west of Brisbane, 'Burgorah' sits at the edge of grid on the end of an 8km network feeder line. The farm flood irrigates 320 hectares of cotton, using three pumps to pump water from the river. Pumping is highly seasonal occurring 1 month per year.

The property consumes 300–400MWh of grid supplied and self-generated solar energy a year, paying approximately \$150K in electricity bills. Burgorah has 500kW of on farm solar installed and exports around 100MWh of energy a year.

However, Burgorah is beleaguered by network and retailer products and services that aren't fit for purpose. In 2021 the network and retailer gave approval to connect a new 100kW installation but not receive export payment. Network connection rules, export limits of excess solar, and the need to retain small customer tariffs meant the landholders had to divide 500kW of solar across ~20 energy meters to maximise the value of his investment.

The landholders have a longstanding appetite for energy innovation, early adoption, and independence.



Cotton harvesting at Burgorah

Feasibility findings

- The extremely seasonal and peaky energy profile from seasonal irrigation makes a stand-alone microgrid solution problematic
- A grid connected microgrid solution is viable but is dependent on the network enabling a fit for purpose export agreement
- Due to Queensland's monopolistic and regulated network retailer environment, DNSP participation is required to unlock the system's genuine value; these constraints largely do not currently exist in NSW
- The landholder sees additional value in the microgrid being used to share energy locally or produce ammonia on farm

Challenges

- Highly seasonal energy use
- Local network constraints
- Unsuitable distribution network rules and tariff schemes

Motivators

- Reliability and resilience
- Democratisation of energy
- Decarbonisation
- Hydrogen production or other uses for excess solar in non-pumping months
- Energy sharing on the farm or to local loads such as the cotton gin



Recommended solution

Grid connected microgrid with the following system components and costs:

- 500kW solar PV
- 1.01MWh chemical battery
- Controls, monitoring, integration
- Grid meter + connect/disconnect
- HV & LV electrical works
- Equipment supply + installation

Financials:

- Capex \$1,234,500 (batt \$559,500 @\$500/kWh, PV \$1.35/W)
- ~\$220K annual revenue, sell to market @\$80/MWh

Financial performance

These high-level results reflect a positive 12 year Net Present Value of \$338,093 meeting a simple payback period of ~7 years.

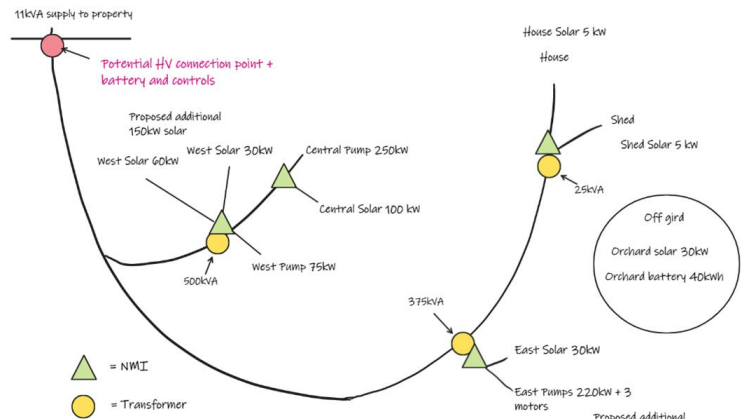
Existing solar PV investments have not been included in analysis to demonstrate total system value.

Additional value streams

- Resilience – fewer black outs from back up power
- Upgrade deferral payment from DNSP
- Local supply of renewables to nearby users
- Insurance – microgrids improve business resilience and reduce risk, so can be factored into assessments
- Emission reduction efforts are increasingly measured and valued in the cotton industry
- Local, wholesale, and ancillary energy market access

Opportunities to reduce barriers

- Rules enabling two-way energy sharing should be uniformly applied between jurisdictions participating in the NEM
- Queensland's rules limit the farmer to a 30kW export; flexible export limits (dynamic operating envelopes) would improve utilisation of solar assets
- Enable peer-to-peer trading e.g. cotton gin



Plan of recommended Burgorah grid tied microgrid

Ownership and financing options

- Owner capital investment and grant support
- Power Purchase Agreement (PPA) with DNSP or local energy users
- PPA with a builder owner operator

Next steps

- Make a connection agreement with DNSP for a grid connected microgrid and request consideration of network upgrade deferral payments for benefits that could accrue
- Gain support to trial specific market and tariff elements in AER's Regulatory Sandbox
- Explore the appetite for Ergon to trial or approve:
 1. local energy trading with the gin 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.

