Photo courtesy of Valley Irrigation

AgEcon

CottonInfo

Fact Sheet

June 2018

Integrating alternative energy solutions: Comet, QLD

Aim: To find micro grid solutions that lower pumping costs and environmental impact

The farm

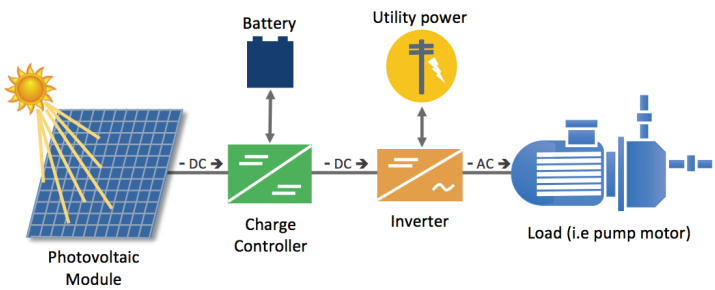
A 2600 ha broadacre farm in the Fitzroy Valley, QLD was selected as a case study site to consider the economic and environmental impact of installing microgrids to offset energy use across three key sites, all grid connected, with energy consumption on different scales;

1. Sporadic large seasonal use (river pump)
2. Uniform industrial use (centre pivots)
3. Small-scale industrial consumption (grain dryers)

Method

The sites electricity demand and pricing agreements were assessed and entered into HOMER optimisation software to design and analyse a range of hypothetical microgrid installations.

"Timing of water application is critical with cotton, so finding solutions that ensure energy security really has me interested"



Q: What is a Micro grid?
A: Clusters of generators which are operated as single controllable entities.

Policy considerations

A major factor in the feasibility results is the connectivity between Federal Government incentives, tariffs and the electricity retailers rules regarding Feed-in-tariffs (FIT) and network connection costs. For sites that don't have uniform use over the 12 months, a FIT generates revenue during periods of no consumption.
Ergon will currently only pay a FIT on a site using under 100MW pa, with a maximum inverter of 30kW. Site 3 in this study meets those conditions and achieved the highest economic returns and environmental gains. In all scenarios **the best economic returns occurred when the microgrid included photovoltaic (PV) and remained eligible for a FIT.**

CottonInfo is a joint initiative of Australian Government Cotton Research and Development Corporation, CSD Cotton Seed Distributors, Cotton Australia

Best Practice

The solutions

Solar remains the most cost effective renewable solution. Within the analysis, wind and batteries were not cost effective due to component pricing, the seasonal load profile and no prospect of a FIT.

Site 1: 330 kW river pump –seasonal use

Components: 400kW genset
Capital cost: $122,700
Payback: 5 years

The genset is used to offset peak tariffs (T62)

This solution has the benefits of energy security and reducing the average cost of electricity by 12c / kWh, however as the diesel price increases, the cost effectiveness quickly diminishes. The emissions offset are minimal. The investment has a 24% internal rate of return (IRR).

Site 2: 110 & 132 kW centre-pivot pumps supplying year-round irrigation water

Components: 225kW PV, 130kW genset
Capital cost: $380,000
Payback: 6.5 years

The PV is 'oversized' to maximise offset of peak tariffs (T62)

This solution results in over 60% of the load being met with solar power, reducing the average cost of electricity by 15c / kWh. Over the project life of 25 years, just over 2,700 t of CO2e are abated. The investment has a 17% IRR. Results could be further improved by shifting energy use into daylight hours.

GEM Energy's technical review and assistance in selecting practical on farm solutions is gratefully acknowledged.

Site 3: 37 kW fan &3 kW small augers in a grain storage and drying facility

Components: 38kW PV, 30kW inverter
Capital cost: $35,600
Payback: 4.3 years

The PV is set at 38kW to maximise FIT (T20)

38kW of solar PV (on a 30kW inverter) is the maximum connection for Ergons FIT eligibility. There are two FIT options. In this scenario the flat FIT resulted in a higher return than the time of use FIT. This solution reduced the average cost of electricity by 29c / kWh and achieved an IRR of 24%.

Larger PV systems exceeding the export limit of 30kW still showed a lower cost of energy than the grid and also reduced emissions. Where a diesel genset was included to avoid peak tariffs, carbon emission abatement was minimal. Designing optimal engineering solutions to reduce on-farm energy costs is heavily dependent on awareness of current carbon and energy policies as well as the changing landscape of demand-side management and available tariffs currently under review.

While the challenge of aligning seasonal demand with renewable energy supply continues, the cost competitiveness of solar energy remains a realistic supplementary source for grid connected agricultural loads where utilisation rates are high.

For further information:

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