

Climate Change Research Strategy - Energy Efficiency Solutions

Feasibility Case Study – Avondale Feedlot, Rowena

Avondale, an off-grid feedlot in Rowena, NSW was the subject of a study to assess the feasibility of replacing the existing diesel generator and tractor PTO with an electrified off-grid system comprising 100 kW solar photovoltaics, 264 kWh lithium ion battery storage and a 150 kVA back-up diesel generator.

The NSW DPI Energy Efficiency Solutions project conducted feasibility studies to assess the technical and commercial feasibility of proposals that would address the cost, reliability and sustainability of energy use on farms. Proposals were sought through public advertisements and more direct engagement with associations and networks. An independent advisory group identified ten priority proposals through a merit selection process, then an independent expert assessor was matched to each priority proposal to undertake a detailed feasibility study. This case study summarises the context, proposal and results of the Avondale Feedlot feasibility study.

Avondale Feedlot



Context

Avondale is an off-grid feedlot located in Rowena, far north east NSW. The feasibility study assessed the technical and commercial feasibility of replacing the existing diesel generator

and tractor power take-off (PTO) with electrified systems powered by an off-grid solar photovoltaic (PV) and battery energy storage system (BESS).

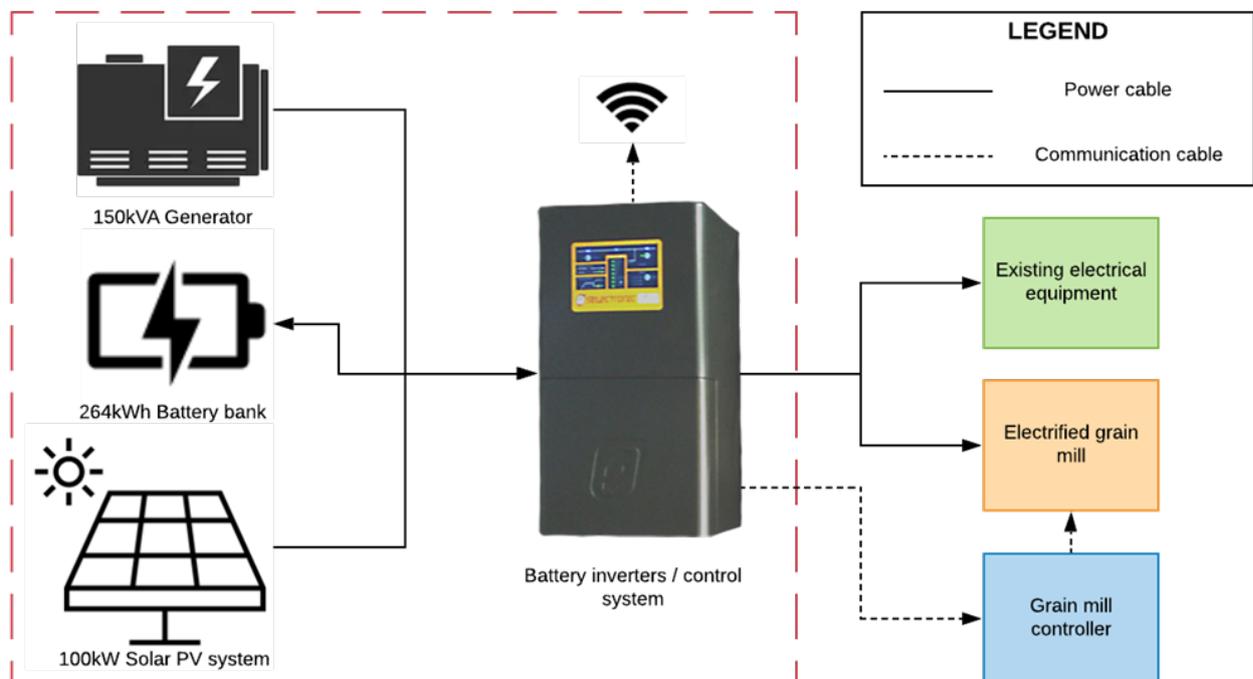
Proposal

This project has three key steps:

- **Step 1 - Electrification:** convert the grain mill drive system from tractor PTO to a 30 kW electric motor, with a soft starter, to allow for the use of renewable electricity as an energy source.
- **Step 2 - Automation:** automate the grain throughput of the mill using a variable speed drive (VSD)-controlled peg feeder assembly to vary the milling rate and mill motor loading, allowing for variable mill power usage, increased control / reliability, and greater visibility of performance.
- **Step 3 – BESS Installation:** install an off-grid solar PV Battery Energy Storage System (BESS), consisting of a 100 kW solar PV system, 264 kWh gross capacity battery and a 150 kVA back-up diesel generator, to supply power to the mill and all electrical equipment currently supplied by the site’s 40 kVA diesel generator.

An overview diagram is shown below. The BESS will supply power to all electrical systems on site, including the electrified grain mill. The output of the solar system, and hence the renewable energy available to the site, will vary throughout the day. The BESS control system will vary the milling rate of the grain mill to match site electricity demand with solar generation in real-time to maximise the use of electricity generated by the solar system.

Off-grid Solar PV BESS



Estimated costs and benefits

Project costs	\$663,550 (excluding GST)
Net energy cost savings	\$105,882 p.a. (91%)
Other operating cost savings	\$22,401 p.a. (69%)
Energy use reduction	3,209 GJ p.a. (91%)
Emissions reduction	223 tCO ₂ e (91%)
Simple payback period	5 years

Other benefits of the proposal include:

- Improved energy reliability
- Reduced maintenance
- Increased labour productivity
- Improved energy security
- Improved social licence to operate
- Increased operating capacity.

Acknowledgments

The Climate Change Research Strategy (CCRS) is an initiative of the NSW Department of Primary Industries (DPI), supported by an investment from the NSW Climate Change Fund. The Energy Efficiency Solutions project is one of seven CCRS projects. More information is available online here: <https://www.dpi.nsw.gov.au/climate-and-emergencies/climate-change-research-strategy>

The objective of the Energy Efficiency Solutions project is to help energy-intensive farms identify options to improve their energy efficiency and reduce costs. The project is led by NSW DPI, advised by a steering committee. NSW DPI contracted the Australian Alliance for Energy Productivity (A2EP) to provide management services for the conduct of ten feasibility studies. This case study summarises the findings of a detailed study that was undertaken by independent expert consultants, 2XE.



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