

Climate Change Research Strategy - Energy Efficiency Solutions

## On-farm Energy Pilot Case Study – Avondale Feedlot, Rowena

Avondale, an off-grid feedlot in Rowena, NSW has replaced its existing diesel generator and tractor PTO with an electrified off-grid system comprising solar photovoltaics, lithium-ion battery storage and a new back-up diesel generator. The project was undertaken as part of NSW DPI Energy Efficiency Solutions On-farm Energy Pilot program.

The NSW DPI Energy Efficiency Solutions Project implemented 7 pilot projects across 8 sites to demonstrate innovative technologies and practices to improve on-farm energy efficiency, energy security and productivity while reducing on-farm energy use, costs and emissions. The pilots were implemented at farms located across NSW in intensive sub-sectors including dairy, horticulture and feedlots. A rigorous evaluation process was undertaken to select proponents to participate in the pilot projects, with NSW DPI contributing 50% of total project costs. This case study summarises findings from the Avondale Feedlot pilot project.

### Avondale Feedlot



## Context

Avondale is a mixed farming enterprise located in Rowena, NSW, 130km west of Moree and owned by the Harris family. The pilot project was undertaken in the 5,000 head cattle feedlot part of the business. The property is off-grid and prior to the pilot project being implemented, the feedlot was dependant on a diesel generator and tractor power take-off (PTO) to supply power for the site. Power is required on the feedlot for activities such as pumping water, milling grain and operating the crush in the yards and running the office, kitchen and workshop.

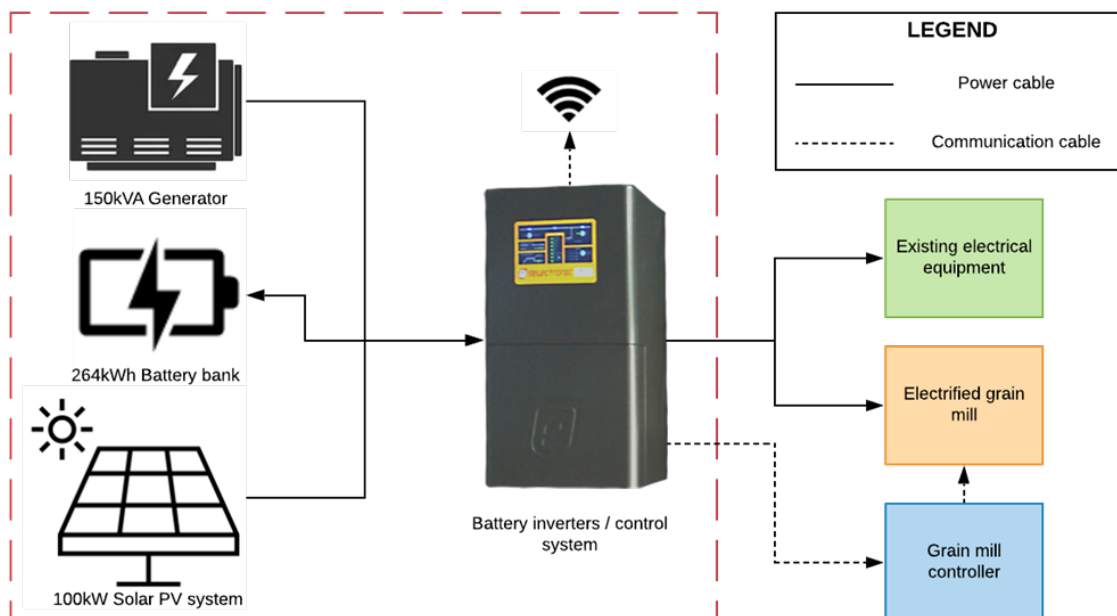
## Pilot concept and results

The pilot project involved replacing the existing diesel generator and tractor PTO with an off-grid solar battery energy storage system (BESS) and electrifying the mill. This project had three key steps:

- **Step 1 – BESS Installation:** install an off-grid solar PV battery energy storage system (BESS), consisting of a 100 kW solar PV and 270 kWh lithium-ion battery system and a 125 kVA back-up diesel generator to supply power to electrical equipment.
- **Step 2 - Electrification:** convert the grain mill drive system from tractor PTO to an electric motor, with a soft starter, to allow for the use of renewable electricity as an energy source.
- **Step 3 - 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.

An overview diagram of the system is shown below. The output of the solar PV system, and hence the renewable energy available to the site, will vary throughout the day. The BESS control system varies 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



The total cost of the project was approximately \$665,000. The benefits of the new energy system include:

- Improved energy security as energy is now provided continuously to the site. Significant cost saving and improved labour productivity have been achieved due to avoided downtime costs related to the unplanned outages that previously occurred.
- Reduced energy costs. Electrification of the mill will account for the largest reduction in diesel costs resulting from the project.
- Improved worker safety by retiring the PTO driven mill.
- Reduced labour costs related to refuelling, running and maintaining diesel engines.
- On-line monitoring portal allows remote access to data on electricity generation and consumption by load, battery capacity and state of charge and back-up generator operation.
- Reduced emissions, improving green credentials of the business
- Flexibility to expand the off-grid energy system as the feedlot operation expands.

#### Battery container (left) and backup generator (right)



Alex Ziesemer, the Avondale feedlot manager, commenting on the transition to the new energy system, said, "It was literally an overnight transition where we went from lots of labour, lots of diesel, lots of outages to all of a sudden, smooth running. And it was in the



middle of summer too, which is peak season for us energy wise, as well as the work labour force. It was pretty amazing.”

Owner Alex Harris, reflecting on the energy security benefits of the project said, “It’s an investment in infrastructure up front. One of the benefits is you’ve got it now and it’s yours and you don’t have to rely on someone to cart the diesel in or someone to bring it into the country. So, I think there’s some security benefits in the long term as well.”

A short video about this project can be viewed at

<https://www.dpi.nsw.gov.au/dpi/climate/energy/clean-energy/on-farm-energy-pilot-projects>

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### Acknowledgments

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