Department of Primary Industries

Climate Change Research Strategy - Energy Efficiency Solutions

Feasibility Case Study – Farrer Memorial Agricultural High School, Calala

Farrer Memorial Agricultural High School at Calala, near Tamworth, NSW participated in a study to assess the feasibility of electrifying irrigation pumps and demonstrate a raised single axis solar photovoltaics tracking system at the school's Farrer Farm.

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 Farrer Memorial Agricultural High School feasibility study.

Farrer Memorial Agricultural High School

Context

Established in 1939, Farrer Memorial Agricultural High School is a public agricultural secondary school catering for both boarding and day students. The Farrer campus is set on 191 hectares and is located at Calala on the outskirts of Tamworth.

Farrer Farm is part of Farrer Memorial Agricultural High School and assets include a 170 hectare farm, horticultural centre and piggery. Dairy cattle, sheep and Angus cattle stud are run as part of this business venture. The largest use of energy at Farrer Farm is for powering irrigation pumps to grow hay and silage. The farm uses two diesel pumps fed from the Peel River and one diesel electric generator to power an electric bore pump. The farm also has a separate electric bore pump powered by mains electricity.

Proposal

This project involves the electrification of irrigation pumps (diesel to electric) and the installation of an Agrivoltaic raised 60 kWp[1] single axis solar photovoltaic (PV) tracking system to power the irrigation pumps. The raised Agrivoltaic system allows farmland to be used for power generation while supporting agricultural production.

Estimated costs and benefits

Project cost	$365,000
Energy cost savings	$43,000 p.a.
Other operating cost savings	$25,600 p.a.
Energy use reduction	1,416 GJ p.a. (92%)
Emissions reduction	109 tCO2e p.a. (82%)
Simple payback period	5.3 years

The project is expected to result in annual net energy cost savings of $43,000 (energy cost savings are net of revenue from solar electricity exported) due to a reduction in diesel and grid electricity use of approximately 1,416 GJ per year. The energy savings calculations in this case study assume moderate water restrictions are in place. Note however energy savings will

[1] kWp is peak kilowatts i.e. the rate at which electricity is produced under ideal operating conditions

be variable depending on seasonal weather and water restriction levels - higher irrigation rates will result in greater savings.

The diesel pumping system requires manual labour for filling tanks, operational inspections, and both external and internal labour for maintenance of the diesel engines. Eliminating the labour required on pumps will allow farm staff to work on higher value tasks such irrigation optimisation, data analysis and teaching students how to optimise irrigation systems. The annual labour costs of maintaining the three separate diesel systems is ~$27,600 per annum compared with an annual maintenance cost of $2,000 for the solar PV system, trackers and electric pumps.

Other benefits of the project include:

- Electrification of irrigation pumps will provide Farrer with greater control of their irrigation system through the AgSense irrigation management control system. This will enable Farrer to optimise and automate irrigation schedules, manage flow rates and increase water efficiency.
- Depending on the forage grown, partial shading from Agrivoltaic systems has been demonstrated to increase forage yield and nutrition, while decreasing water use and evaporation. The Agrivoltaic area, while small compared with the total irrigation area will demonstrate a working Agrivoltaic system.
- Demonstrate co-development of arable land for agricultural and renewable energy production uses.

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.

AUSTRALIAN ALLIANCE FOR ENERGY PRODUCTIVITY
Doing more. Using less.

2XE

DOC21/42671