SOLAR PV FEASIBILITY STUDY: KRUBI FARM

CASE STUDY, NOVEMBER 2025

The case study evaluated the financial and emissions impacts of installing a 100-kW solar PV system at Krubi Farm in Wee Waa, New South Wales.

The study showed that the internal rate of return of the project was 15.8 per cent, and the simple payback 6.2 years. This may be further improved by changing network business tariff type once the solar PV system was installed, or by finding higher value uses for excess solar PV than feeding it into the electricity grid. The potential emissions savings on electricity purchased from the grid over the 25-year life of the system was 1,665 tonnes of CO2-e.

KRUBI FARM

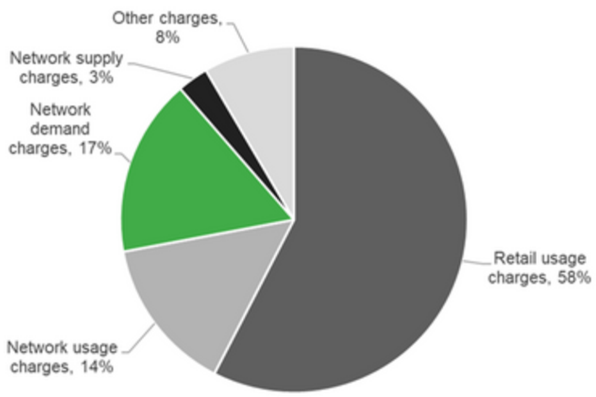
Krubi farm is in the Lower Namoi Valley at Wee Waa in New South Wales and is irrigated from groundwater sources. The farm typically grows cotton in the summer season and wheat, barley, chickpeas, and faba beans in the winter season.

The purpose of the Krubi Farm case study was to evaluate the financial and emissions impacts of installing 100-kW of solar PV on a 110 -kW submersible pump used to pump irrigation water from a 75m Total Dynamic Head (TDH). The total annual electricity consumption at the 150-kW pump was 175,976 kWh over the 12-month period analysed in this study.

Consumption was concentrated in the summer months, with limited consumption during the remainder of the year. Electricity consumption at the pump site varies year-on-year depending on rainfall and other factors.

The electricity bills included retail usage charges, network charges, and other charges. Variable usage charges were based on time of use, and the network component included so-called demand charges. A demand charge is applied to business customers consuming more than 160,000 kWh per year by Essential Energy. The demand charge is applied to the maximum demand in each period. In a recent monthly bill, network demand charges made up 17 per cent of the total bill. Over 12 months, network demand charges made up over 20 per cent of the total bill.

BELOW: Figure 1 Split of electricity bill over a recent month.



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BORE PUMP MAINTENANCE

The pump performance was not assessed as part of this case study. If the pump is underperforming or the Power Factor Correction (PFC) is low, then substantial energy savings may also be achieved through pump bore maintenance or FPC remediation.

KEY MODELLING ASSUMPTIONS

The following key modelling assumptions have been made in the analysis:

- Solar PV system: A 100-kW single-axis tracking solar PV system was assumed to cost a total of $120,000 ex-GST after subsidies and have a life of 25 years. The actual capital cost at a given location depends on the specific system installed and the location (with more remote locations potentially attracting a price premium). A generic flat plate PV in the study location with single-axis tracking was modelled and generated a total of 191,133 kWh per year.

- Electricity tariff: Net metering and five cents/kWh received for all excess electricity sold to the grid with no export limit was modelled. Limitations on grid exports may apply in certain locations and circumstances, and different feed-in-tariffs may apply between different retailers. All electricity rates, including feed-in-tariffs, are modelled to remain fixed in real terms throughout the life of the solar PV system.

- Emissions: The emissions factor for the National Electricity Market (NEM) is projected to decline over time from 0.57 tonnes of CO2-e per MWh in 2025 to 0.05 tonnes of CO2-e per MWh in 2040.

- Discount rate: A discount rate of 7 per cent was applied to the average cost over the lifetime of the asset calculation.

RESULTS

The analysis showed that installing 100-kW of single-axis tracking at Krubi Farm would result in an internal rate of return (IRR) of 15.8 per cent and a simple payback period of 6.2 years. The average cost of electricity declined from 30.7 c/kWh to 13.3 c/kWh with the installation of a 100-kW solar PV system (throughout the 25-year life of the asset).

Removing demand charges

The solar PV system resulted in electricity bill savings primarily from reduced variable electricity charges. Demand charges, which made up over 20 per cent of the total annual electricity bills, were largely unchanged. However, in the modeled year, the energy purchased declined from 175,976 kWh with no solar PV to 131,330 kWh with 100-kW of solar PV. The latter was below the 160,000-kWh threshold for mandatory demand tariffs on the Essential Energy network.

If Krubi Farm was able to switch to an alternative network tariff for small business consumers who do not exceed 160,000-kWh per year because of the solar PV installation, the IRR would increase to 24.0 per cent, and the simple payback period would decline to 4.1 years. The average cost of electricity would fall to 10.4 c/kWh.

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SENSITIVITIES

The results were sensitive to key assumptions made in the modelling. The sensitivity analysis presented below assumed no change to the electricity tariff structure. The first table shows sensitivity to capex and electricity tariff assumptions. The green background highlights the base case assumptions.

BELOW: Table 1 Sensitivity to capex and electricity tariff

Capex / electricity tariff	120,000	150,000	180,000
-2.5% pa	13.3%	9.8%	7.3%
0%	15.8%	12.3%	9.8%
+2.5% pa	18.3%	14.7%	12.2%

The second and third sensitivity tables show that grid export limits and feed-in-tariffs were also a key driver of the IRR.

BELOW: Table 2 Sensitivity to grid export limit

0-kW	25-kW	50-kW	75-kW	100-kW
5.4%	7.6%	14.3%	15.5%	15.8%

BELOW: Table 3 Sensitivity to feed-in-tariff

0 c/kWh	2.5 c/kWh	5 c/kWh	7.5 c/kWh	10 c/kWh
10.3%	13.1%	15.8%	18.2%	21.0%

EMISSIONS

The modelling showed that installing a 100-kW solar PV system reduced the electricity purchased from the electricity grid in one year by 44,646 kWh. If the amount purchased was reduced by that same amount each year for the 25-year life of the solar PV panels, this would save 1,665 tonnes of CO_2-e. The analysis considered the projected decline in emissions intensity of the National Electricity Market, but not emissions offset by export from the solar PV into the electricity grid.

CONCLUSIONS

The analysis showed that the IRR of the project under the base case assumptions was 15.8 per cent, and the simple payback 6.2 years. This may be further improved by changing network business tariff type once the solar PV system was installed, assuming energy purchased per year was less than 160,000 kWh. The potential emissions savings on electricity purchased from the grid over the 25-year life of the system was 1,665 tonnes of CO_2-e.

The results are sensitive to several factors, including capex, electricity tariff, grid export limits, and feed-in tariffs. The IRR falls to 5.4 per cent with zero grid export and 10.3 per cent with a zero feed-in-tariff. A total of 146,487 kWh of 191,133 kWh of solar PV electricity was sold to the grid under the base case assumptions, mostly during the non-summer months when there is very limited electricity demand at the pump to offset against using net metering.

If there were other potential uses for the excess solar PV electricity in the off-season this could improve the economics. There may also be benefits from sharing excess solar PV electricity as part of a virtual energy network (VEN) with other related locations, depending on the spread between the daytime consumption charges that can be offset at other locations and the feed-in-tariff available for the excess solar at the pump location.