Dairy Farm Guide To Solar PV (Panels)

- Installing Solar Panels (“solar”) can save money, add resilience, cut carbon and hedge future power price risk
- Solar operates reliably with no effort and minimal maintenance/parts replacement for an expected life of 25-30 years
- Decisions on sizing, design and supporting operational choices significantly impacts your payback

What size, cost and payback?

Illustrative examples of size, cost and payback (supplier doing all the work; farms using timers to shift electricity use to use more solar)

Herd size/ system	Size kWp	Cost $000s	Savings life $000s	Payback Year
200/ 3.5 lower energy use	20	$50	$5.3	9
400/ 3.5 typical energy use	40	$100	$10.7	9
300/ 2.5 high pump/ irrigation	80	$200	$16.9	11
600/ 3 higher energy use	80	$200	$36.8	5

Big may not be best. With bigger systems, the relative savings fall as more solar is exported for lower value delaying payback. The table below illustrates saving/day on an example 650 herd farm for its peak production day with no new changes to when power is used.

Solar Size	Generation Capacity	Daily Energy Cost @ Peak Production
No Solar		$106
20M x 10M panels	40kWp	$69
30M x 10M panels	60kWp	$54
40M x 10M panels	80kWp	$40

With changes to when power is used, a 60kW system at this farm would reduce the peak month bill to **$11/day**.

The average daily saving is significantly lower. A 28c/kWh retail cost of power and 17c kWh sell rate is used.

At a glance

- **What is the cost and payback?** This depends on the right size for your farm. The tables provide an indication.
- **Can I be more resilient?** Yes, with specific design and when there is enough sun. See next page for more.
- **What do I need to ask? H**ow they size/ design so you mostly use your own solar power. See next page.
- **Will this affect my workload?** Very little. Solar is hands-free for its 25-30 years apart from periodic cleaning of panels, grass/ weed control and c. year 10-15 inverter replacement. You may change timing of some work/ plant running to use more of your power (next page).
- **Rooftop or ground mount?** Arrays can go on a roof or framed in a paddock (ground mount). Roof arrays tend to suit smaller needs and may generate less as the roof direction or pitch may not be ideal but can cost less.
- **Can I save by doing work myself?** For ground mounts this is possible and can significantly reduce your payback time (as little as 4-5 years with load shifting and good sizing). Talk with different suppliers about how much you can do with their solution.
- **What are the finance options?** For some banks solar qualifies for their “green” loan discounts. Most installers have a pre-approved credit option. Pay as you generate (e.g. a simple cents/kWh rate) are possible as Power Purchase Agreements (PPAs) but would likely need several farmers to work with one supplier.
- **Where do I find a supplier?** SEANZ is the industry trade association and manages standards. Look for a member at www.seanz.org.nz. Local businesses that have installed on farm or at scale include Solar One and Taranaki Solar. Many national suppliers compete for larger systems.

SAVE ENERGY ON-FARM
IT JUST MAKES SENSE
Taranaki Rural Energy

Dairy Guide To Solar PV/Panels

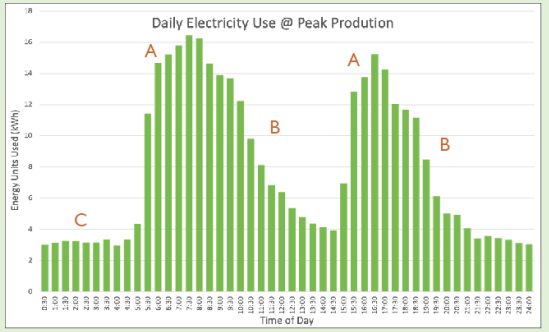
This guide is to help you check what your suppliers should talk to you about

Things to know	What you need from your supplier
Solar produces lots more energy in summer than winter so it is helpful for dairy farming.	• A design where most of your mid summer's day generation is used by your mid summer electricity use. Export reduces your payback. • You do **not** want a proposal that generates energy to match much of your annual demand (as generation and demand happen at different times).
Solar generation is highest in the middle of the day (which is not mostly when we milk). See *example 1*. Changes to when you use power can improve payback.	• A design using your smart meter data showing when you use power. This is to avoid lots of solar exported in the middle of the day. See *example 2* • A plan for what electricity use you can shift to the middle of the day e.g. water heating, chilling and pumping with timers, smart controllers, more storage/ secondary plate cooling and/or electrical/ phase reconfiguration. You may want your electrician to check or do this. See *example 3*.
Using your generated power saves on your retailer rate (e.g. c. 28c/kWh). Exporting surplus power earns less (c. 7-17c/kWh), a rate that may fall in the future.	• To know that much more of the solar generated is expected to be used (saving lots) rather than exported (saving less or costing you money at lower export rates from some retailers or in the future). • The electricity supply and export retailer rates used. Question if the export rate is high beyond 5 years ahead and the system is not close to payback.
Farm resiliency needs the right equipment to use your solar power to operate in power cuts (when the sun is shining).	• Confirmation if the system will operate during power cuts, what plant is supported and if it works with your generator. Solar generation varies through the day and with cloud cover, so only sometimes support all your needs. A small battery can help. Ask your electrician to check and explain this.
Expecting to get electric vehicles (EVs) in the near future? Solar may reduce network upgrade costs.	• Can the system be extended later or can this be provided for now at a small cost? When you get EV(s), smart controllers can charge from your solar (as well as night rates).
Technical stuff – not all equipment is the same	• Assurance why what they supply is high quality and will be supported. • Inverters are expected to need replacement in approx. 10-15 years. • Confirmation the design supports the loads across all 3 phases on you farm and/ or is balanced to support the best (long running) daytime loads.

Example 1

This typical farm's daily energy profile shows how many farms energy use peaks in morning and evening as we milk [A], chill/ pump [B] or heat water [C]).

But in the middle of the day solar produces more electricity.



Typical solar generation

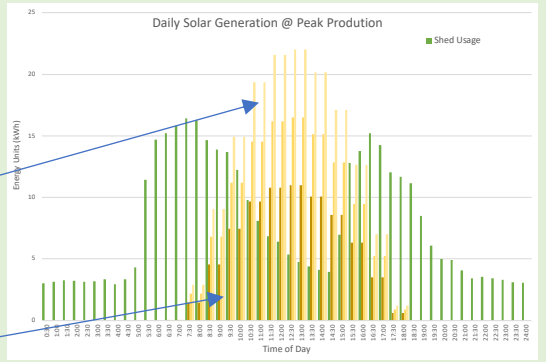
Low High Low

Example 2

This image shows the generation from 40 (brown), 60 (gold) and 80 (light yellow) kW PV arrays.

The high yellow generation is exported for only c. 7-17c/kWh reducing payback.

Most of the generation from the smaller array (brown) matches demand and is used, saving money at c. 28c/kWh for better payback.



Example 3

Here we show the benefits of moving more loads in to the day so we use more of the solar generation and export less power (that reduces payback). Combined with options where you can do some of the non electrical works yourself, payback can be significantly reduced.