Dairy Farm Guide To Solar PV (Panels)

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Taranaki Rural Energy

- Installing solar panels ("solar") can save money, add resilience, cut carbon, and hedge future power price risk.
- Solar operates reliably with little effort and minimal maintenance or parts replacement, with an expected lifespan of 25-30 years.
- Decisions on sizing, design and supporting operational choices significantly impacts your payback.

What size, cost and payback?

Here are illustrative examples of size, cost and payback, when the supplier handles everything, and farms use timers to shift electricity consumption to maximise solar usage.

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.

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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?** How do they size and design the system so you can maximise the use of your own solar power? See next page.
- **Will this affect my workload?** Very little. Solar is hands-free for 25-30 years, apart from occasional panel cleaning, grass/weed control, and inverter replacement around year 10-15. You may adjust the timing of some tasks or equipment use to maximise your solar power (see next page).
- **Rooftop or ground mount?** Arrays can be installed on a roof or mounted on the ground in a paddock. Roof arrays are typically suited for smaller needs and may generate less power if the roof's direction or pitch isn't ideal, but they can be more cost-effective.
- **Can I save by doing the 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 to different suppliers about how much you can do with their solution. However, strict compliance requirements mean that electrical work and network connections must be completed by a qualified professional.
- **What are the finance options?** Some banks offer 'green' loan discounts for solar, and most installers provide pre-approved credit options. Pay-as-you-generate models (e.g. a cents/kWh rate) are possible through Power Purchase Agreements (PPAs), though these typically require several farmers to partner 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.

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This guide can help you ensure your suppliers cover all the key points in your discussions.

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Things to know	What you need from your supplier
Solar produces lots more energy in summer than winter. That's helpful for dairy farming.	▸ A design where most of your midsummer day's generation aligns with your midsummer electricity use is ideal. High energy exports reduce your payback. ▸ Avoid proposals that aim to match all your annual demand, as generation and demand occur 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 that utilises your smart meter data to show your power usage is essential to minimise solar exports during peak midday hours. *See example 2.* ▸ Consider a plan for shifting electricity use to midday e.g. water heating, chilling and pumping using timers, smart controllers, increased storage, secondary plate cooling, and/or electrical phase reconfiguration. You may want to consult with your electrician for 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 a larger portion of the solar energy generated will be used on-site (resulting in greater savings) rather than exported at lower rates. ▸ The electricity supply and export retailer rates used. If the export rate is projected to remain high beyond five years and your system isn't close to payback, it's worth questioning.
Farm resiliency requires the right equipment to utilse your solar power during power cuts, especially on sunny days.	▸ Confirmation whether the system will function during power outages, which equipment is supported, and its compatibility with your generator. Solar generation fluctuates throughout the day and can be affected by cloud cover, so it may not always meet all your energy needs. A small battery can help. Ask your electrician to check this.
Expect electric vehicles (EVs) in the near future. Solar may reduce network upgrade costs.	▸ Can the system be extended later or can this option be included now at a minimal cost? When you get EVs, smart controllers can charge them using your solar (as well as at night rates).
Technical stuff – not all equipment is the same.	▸ Assurance of the high quality of their products and ongoing support. ▸ Information on the expected replacement of inverters in approx. 10-15 years.

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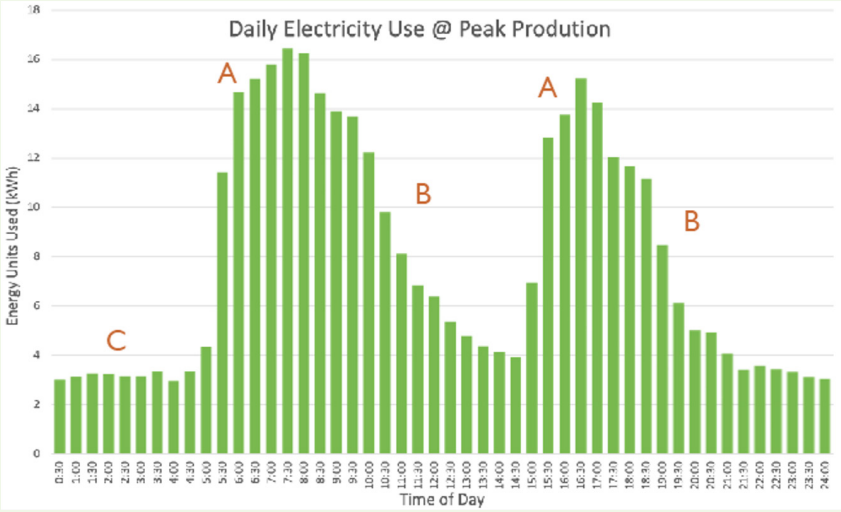
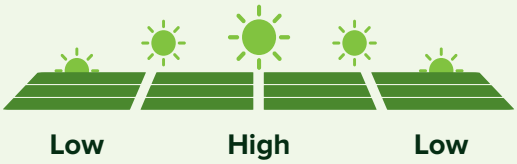


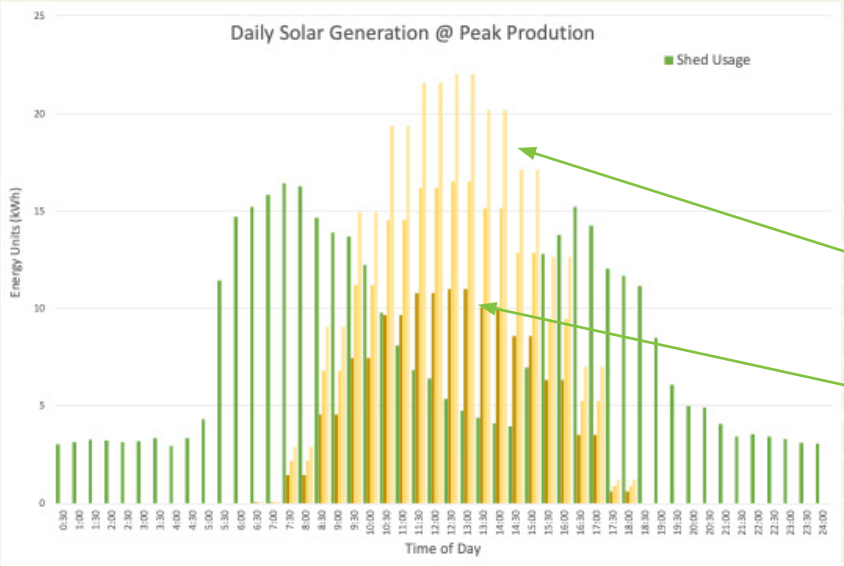
Example 1

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



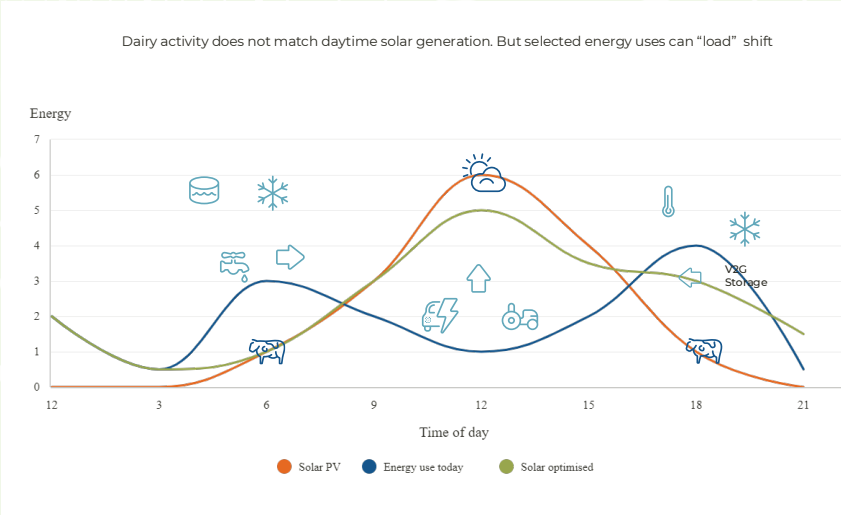


Example 2

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.