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CAWTHRON MARLBOROUGH ENVIRONMENT AWARDS 2023

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JUDGES' REPORT

BUSINESS INNOVATION

KEA ENERGY WAIRAU VALLEY SOLAR POWER FARM

INTERVIEWED Campbell McMath

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JUDGES Helen Smale, Dorien Vermaas, Bev Doole

INTRODUCTION

Canterbury company Kea Energy chose the Wairau Valley in Marlborough to install New Zealand's largest solar farm because of the province's high sunshine hours and the ability to supply local customers.

When it started operating in 2021, it was New Zealand's first multi-MegaWatt solar farm. The project covers 4 ha and has generated power every day since then.

To increase efficiency, the photovoltaic panels automatically tilt to follow the sun throughout the day, and it generates power from light reflecting up from the ground and on to the bi-facial panels, as well as down from the sun.

The Wairau Valley solar farm has fulfilled Kea Energy's vision of producing environmentally friendly electricity for local use and has led the way for other companies around New Zealand.

GENERAL INFORMATION

Kea Energy is a family business owned by Campbell and Naomi McMath that began installing and operating renewable energy power schemes in 2007.

Campbell, an electrician, was a project manager and systems engineer with Orion Networks for seven years. He developed an interest in farm hydro schemes and began building turbines and installing systems in his weekends. He left Orion in 2009 to focus on Kea Energy's hydro and solar power projects and says New Zealand is well placed to develop a range of environmentally friendly generation methods - solar during the day, hydro at night and wind when it is blowing.

The Wairau Valley solar farm was their most ambitious project when planning began in 2018.

Campbell says there was an element of luck involved in selecting the site. They were looking for land in Nelson and Marlborough and his research pointed to the Wairau Valley as being very good sunshine hours and appropriate land. NIWA data confirmed the suitability. Other attractions were having a very supportive neighbour (Pinoli Premium Pine Nuts, who sold them the 4 ha site) and the high electricity price in Marlborough.

A solar farm on this scale was a new proposition for Kea Energy and the regulating authorities. There was a lot of planning and paperwork before building could start including working with Marlborough District Council on the resource consent and Marlborough Lines for connection and distribution contracts.

Kea Energy sourced and imported the components from around the world: the PV panels are made in China, the mounting gear and inverter are from Spain, the computer-guided tilting system is German, and cabling comes from Spain and Italy.

Contractors and casual labour were brought in to build the solar farm, including a 17-year-old local student and a 70-year-old retiree. A peak of 12 staff was reached.

When the Wairau Valley solar farm went live in January 2021, it was the biggest in New Zealand (larger ones have since been built).

The farm produces 2.8GWH of power a year – enough to supply the Pinoli factory next door and about 350 houses down the Wairau Valley to Renwick.

There are 3800 PV panels, most of which are set up on 14 rows facing east and west. To increase the amount of power generated, these are designed to tilt and track the sun throughout the day. An electric motor on each row operates the tilting, guided by a geo-spatial timer. There is also a fixed (non-tilting) set of panels that faces north.

The panels are a standard 2m x 1m, slightly bigger than house panels, and each one produces 450W of electricity. The life span of a panel is 35 years, but Kea Energy intends to progressively replace them as technology evolves.

Electricity generated by each row of panels is combined and fed by cable into the 2.2MW inverter. This optimises the voltage and sends it through the transformer and on to the Marlborough Lines network.

The electricity generated by Kea Energy is sold to its own retail customers and what is not used is sold on the spot market (through the NZ Stock Exchange) to other energy retailers such as

Meridian and Contact, who then sell it to their customers. Kea Energy pays Marlborough Lines to distribute the power.

Once the farm was operational, the only staff required is Campbell and Naomi who visit about once a month for maintenance checks. He is able to monitor the inverter remotely and has a flock of sheep to keep the grass down under the panels (in a system to make the most of the land, called agrivoltaics). Rain cleans the panels.

Environmental benefits of the solar farm:

- A cleaner form of energy that helps New Zealand decarbonise by reducing the country's carbon emissions and dependence on fossil fuels (alternative to Huntly's coal power).
- Avoids the environmental impacts of hydro-electric power (flooding valleys or diverting rivers).
- Quieter and less visually intrusive than wind turbines although there is some noise from cooling fans during the heat of summer.
- The power is used locally, reducing the loss of electricity through transmission lines.
- Efficient land use – provides grazing for sheep.
- Bifacial PV panels maximise efficiency by generating power from both sides of the panel.
- Panels replaced with more modern technology will be on sold to hobbyists for upcycling.

Kea Energy sold their hydro turbines in 2021 to concentrate on solar. In November 2022 they had nine solar projects under way throughout NZ.

Campbell also provides consultancy services to other operators.

The company was involved in installing solar farms in the Cook Islands and Vanuatu - projects that are enabling greater self-sufficiency and an alternative to diesel generation.

Kea Energy have found their own niche in the industry with community-scale projects to generate and sell power. They are self-financed rather than have outside investors.

The Wairau Valley project is more than just a business proposition for Campbell and Naomi. They built a series of kit-set huts as housing for when the solar farm was being installed and now use it as a working/holiday escape with their teenage daughters.

They are looking to develop solar farms to power on-site vertical farming where crops are grown indoors, stacked vertically in layers. This growing system uses hydroponics and artificial light, which is energy intensive and therefore a good fit with a solar farm. Vertical farming makes use of otherwise non-productive land close to market, reducing transport costs and increasing freshness of produce.

This sort of thinking is characteristic of Kea Energy's approach and desire to always look to evolve the model for renewable, environmentally friendly solutions.

THE JUDGES WERE IMPRESSED BY:

- Kea Energy's vision and commitment to the environment and pioneering in the complex system of energy supply.
- The range of Campbell's skills and ability to plan and execute all stages of the project, from buying the land to selling the power.
- A big project for a small company. While this is not new technology, Kea Energy had the vision and drive to put it all together, on a large scale, in Marlborough.
- The combination of sheep and solar panels – agrivoltaics – to make good use of the land and avoid mowing.
- The low maintenance and low impact on the landscape.
- Campbell's positive attitude, perseverance, and ability to see solutions – all strong traits for an innovator/entrepreneur.
- Ability to collaborate and build good relationships working with Pinoli, Marlborough District Council and Marlborough Lines.
- Continuous improvement, looking to develop future projects such as vertical farming and staying ahead of the curve.
- The development of the eco-huts on site with his teenage children, engaging them in a project for the planet as well as providing a place for family working holidays, respite, thinking time and planning future ventures.

This is a passion project that puts into action a commitment to the planet (as well as providing the satisfaction that comes from watching the power generation app and knowing less carbon is being emitted).

PROBLEMS AND HOW THEY HAVE BEEN TACKLED

- Planning and consents – Setting up a solar farm was a new proposition for Council and Marlborough Lines. There were a lot of questions to be answered and some mutual handholding as all parties learnt as they went along. Concerns about visual impact were managed by situating the solar farm near the foothills, away from the State Highway.
- Climatic conditions – strong winds can damage solar panels and mounting structures. If the wind gets above 6 m/s the tilting PV panels automatically flatten to reduce resistance. But moderate wind is good for solar power generation – cooler panels generate more power.
- Overseas suppliers - Building began at the start of Covid with lock- downs disrupting production of components and international freight. Product did not always turn up when it was expected and needed but installation plans were managed and adapted to continue making progress.
- Financial risks – exchange rates crashed when Covid hit, while interest rates and inflation went up as world adjusted to the pandemic. The electricity market also fluctuates, with

summer being more profitable. Campbell appears to have a strong understanding of electricity market forces and how to minimise risk.

SUMMARY

Kea Energy generates and sells environmentally friendly electricity and their 4 ha Wairau Valley solar farm was a pioneer project that has since been replicated elsewhere in New Zealand.

The 3800 PV panels use tilting technology to follow the sun throughout the day for maximum efficiency.

The solar farm generates power every day for local consumption and is part of an increasingly urgent push to cut carbon emissions and replace fossil fuels with renewable energy.

SUGGESTIONS

- Campbell is a warm and engaging personality. It would be good if you could share the story of Kea Energy more widely. Country Calendar may be interested in agrivoltaics.
- Make more of a feature of the Wairau Valley Solar Farm on your website. The Awards video and judges' report could be added. Content may need to be updated to reflect the company's move from hydro to solar projects.
- With increasing concerns about food security and rural land use, it would be good to encourage cropping under solar panels in New Zealand as well as vertical farming. https://nzfarmlife.co.nz/solar-vision-2/
- Consider trialing crushed mussel shells (byproduct from aquaculture) underneath the bifacial panels to increase reflection up.
- If you want to spread the word about the solar farm and off-the-grid living, put the eco huts on Air BnB. Plant up with low-growing natives and include a solar-powered hot tub.
- To inspire the next generation, host a field visit for Wairau Valley School and Renwick School (they also have solar panels).