



Morning Innovation Station – Site 2

The Economics of Electrification

Mike Casey & Dr Hoani Cooper







The Electrification of Everything

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MY BACKGROUND



Ξ FINANCIAL REVIEW Δ

- Exclusive

SEEK moves to strengthen graduate offering with GradConnection acquisition



Online jobs classifieds and services business SEEK has acquired graduate job marketplace GradConnection in a move to target young jobseckers finishing up their education.

The acquisition, to be announced on Tuesday, will have SEEK buy 100 per cent of the Sydneybased start-up for an undisclosed sum. GradConnection was launched in 2008 by three New Zealanders, Mike Casey, Dave Jenkins and

MT PISA



Plant a cherry orchard

• 9300 trees (25km)



Plant a cherry orchard

- 9300 trees (25km)
- 80T of cherries at full production



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- 3.8T of sequestration



Plant a cherry orchard

- 9300 trees (25km)
- 80T of cherries at full production
- 3.8T of sequestration
- 60T of emissions from diesel



Bottom Up Climate Action

20 Machines. 60Ts of emissions.

Farm

- 2 Frost Fighting Fans
- 2 Irrigation Pumps
- Solar
- Batteries
- Golf Carts x 2
- Lawnmower
- Tractor
- Forklift
- Ute
- Car (x1)
- Power Tools

Household

- Hot Water Heat Pump
- Heat Pump
- Induction Cooktop
- Car (x1)
- Solar
- Batteries







And this generated a lot of interest...





Approximately 10,000 visitors in 3 years









Everyone loves electric tractors....



Country Calendar Appeared October 8th, 2023





Farmers are part of the solution



Farm Energy Costs





Productivity Opportunity

Expected Profit (in a good year) \$300K 30% increase in potential profit NZO Energy Tariff Expected Profit (in a good year) Savings Pre-Trial* \$300K \$50K mium \$30K \$14.5K *Winter 2024 \$0k \$100k \$200k \$300k \$400k

Can the grid handle it?



If NZ was nothing but electric cherry orchards...



We would need...

9x more electricity...



But we can be clever...

9x more electricity...

No new poles and wires were needed.



Rooftop solar benefits





But NZ really needs....

2-3x the electricity



What we must realise....

Farmers will create a significant amount.

(If we let them)



New Zealand delivered energy cost per kWh, historic and forecast.

Rewiring Aotearoa Analysis. StatsNZ Quarterly CPI History 2023. MBIE Energy Prices & QSDEP 2023. SEANZ 2023 Solar data. NREL forecast. Micah Ziegler and Jessika Trancik (2021) historic battery pricing and Our World in Data historic solar pricing adjusted to NZ prices.







WE'RE ALL ABOUT THE WIN-WIN

WE'RE ALL ABOUT THE WIN-WIN (the low hanging cherries)



New Zealand Emissions 2021: 80.8 Mt

Rewiring Aotearoa analysis, exlcudes LULUCF.

Domestic Use 38.2 Mt



New Zealand Domestic Use Emissions 2021 | 38.2 Mt Excludes LULUCE



DINNER TABLE CONVERSATIONS

The six machines to electrify homes:



SO, WHAT DO WE NEED?



SO WHAT DO WE NEED?

• Do the numbers






SO WHAT DO WE NEED?

Do the numbers Install Solar and Batteries





Rewiring Aotearoa 🧩

SO WHAT DO WE NEED?

- Do the numbers
- Install Solar and Batteries
- Demand fair export rates





SO WHAT DO WE NEED?

- Do the numbers
- Install Solar and Batteries
- Demand fair export rates
- Make sure your next machine is electric









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NES – Southern AgriTech

May 2024





NES Purpose

We believe no challenge can stop us from delivering fair power choices to our clients

Considerations around Renewables



For generation versus usage

TIME OF USE Hours of use versus generation, and storage options SIZING Usage versus capacity and excess generation

Considerations around Renewables



ON-GRID v OFF-GRID

Different types of inverters, brands and operations



TYPE OF USE

What requires power and the installations profile SOLAR AND WIND Different times for generation

Costs and Pricing

Materials

- Main costs Panels, Inverter, Battery
- Plus rails, connectors, clamps, earthing...and AC side upgrades

Style of installation – Rooftop or Ground Mount

Panels – Sizes, service length and volume (\$/Wp)

Distance and access to locations of generation and use – cabling (AC or DC)

Labour – the more complex the install the longer it takes

Costs and Pricing

Table 2: Per unit capital cost (NZD) at 2021 for 10, 100, 500 and 1000 kWp system capacities.

Size (kWp)	Cost (NZ \$/Wp)				
	Lower	Base	Upper		
10	2.08	2.6	3.12		
100	1.84	2.3	2.76		
500	1.44	1.8	2.16		
1000	1.36	1.7	2.04		

2024

- 400kW system @ \$1.57/Wp, LOCE \$0.074
- 320kW system @ \$1.75/Wp, LOCE \$0.082
- 200kW system @ \$2.11/Wp, LOCE \$0.099
- 63kW system @ \$1.14/Wp, LOCE \$0.052

NES Ltd

Demonstration case

Breeder Finisher Sheep and Beef farm, with cropping and grazing

1800 S&L, 160 Beef Cows on 520 ha (390 Dairy Heifers grazing)

Multi-generational, couple with 3 Young kids, recently started to transition ownership

Coastal, with opportunity for Hydro, Wind and Solar

Demonstration case

15kVa connection at end of the line, 20kW to 110kW PV system without network upgrades.

Add a battery to the system to manage time of use.

Start to electrify different options on the farm – replacing fossil fuels with electrical alternatives

Challenge around options to use excess energy. The neighboring farms grid entry points are less then a km away.

Lunch

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Afternoon Innovation Station – Site 2 Renewable energy opportunities on farm

Insa Errey



Renewable Energy Opportunities on Farm

Save energy on farm; it just makes sense

Insa Errey 2nd May 2024









Jamie Silk

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Aaron Pollard

Jason Hawley



Karen Orr



Rural Consulting RD37 Ltd.







Taranaki Rural Energy

The TCC is farmer-led, farmer-driven, and exists to support and empower farmers to ensure the long-term sustainability of their businesses and communities.



Today's topics

- Energy efficiency A simple three step formula
- The future today On Farm Solar
- Exploration into biogas technology
- Set your goals





What are you interested in hearing about most today?

(i) Start presenting to display the poll results on this slide.





The best farms use 1/5th of the electricity

of the highest users per KgMS



Next Moove



3 steps





Quick hits

things we can do now



Long term plan

get in the farm plan for replacement and renewals



Operating efficiency

what the team does day to day



Quick Hits – Top 5





- Speak to your current supplier
- Not happy with them, ask your neighbours/ network
- TCC has a specific solar 2 pager as it's a little new

Insulate VATs

Fonterra can advise you on your VAT type/ size

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Wrap hot water cylinder, lag pipes and fix leaks

- For cylinder wraps call your plumber (can also self wrap)
- Pipe lagging must suit temperature and pipe diameter

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Install variable speed drives and pump controllers (e.g.F60s)

- Call your pump supplier
- Check all pumps (see our advice)



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Install LED lighting

• Call your electrician

Install timers

• Call your electrician

Install solar panels (PV)

- User timers/smarts
- PV has pay-as-you-generate (Power Purchase Agreement or PPA) and other finance options
- See the solar panels guide for more on what to ask, look for and consider

Long Term Plan - Top 5

Hot water heat pumps

Heat recovery

Snap Chilling





Yard Washdown



Precision Irrigation



Primarily new builds or LPG conversions

Pre-heat how water for cleansing from waste heat (chilling, dumped wash water)

30% cooling efficiency plus heat recovery

Reduce GHG

Pay As You Save option

Water and effluent savings (high water systems)

Energy savings a by product when investing

Payback years





Scraper gate

Long Term Plan

Plan now for renewals

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Hot water heat pump to replace cylinder

- On cylinder renewal
- Heat pump most beneficial for new shed



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Estimate renewal date



Install heat recovery

• On chiller renewal



Install snap chiller

- On chiller renewal
- Check FarmSource partners
- Coolsense offer Pay As You Save and reduced greenhouse gas from refrigerants



Update your Farm Plan





Talk to supplier(s) well in advance

• Water use water

investment

- Water use, water cycle, scraping gatesTiming depends on opportunity/ related
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Precision irrigation

• If you use significant irrigation and assessing for other reasons, consider energy savings





Feeding practices

Using contractors

Herd wearables

of vehicle

Frequency, choice & care

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Rank the order of what you think will have the most impact on your farm?

(i) Start presenting to display the poll results on this slide.





VIDEO TWO ENERGY EFFICIENCY

- Farm strategy and approach
- VSDs (Varivac)
- Flow controllers (F60s)
- Snap chiller (heat recovery to 65C!)
- Positive displacement pump, PVC pipe, bacteria

Niaruo. Farms (youtube.com)



The future's arriving fast

- On-farm solar stacks up
- Farm electricity use will grow

 Electrify transport and machinery
- Electricity prices could be cheaper during sunny days

 With more intermittent wind and solar generation

Increasingly we want to think smart about when and how we use energy

- Design and Size PV for your farm's energy use
- Plan to use more energy when the sun shines
- Research your self help (DIY) options

• Consider your growth and resilience needs We get the most sun in the middle of the day



But most energy peaks morning and afternoon So design to your needs (size, panel direction) <u>and</u> rethink when we use power



Or sell to the grid cheap and buy back high later!

Design & DIY thinking



North facing Maximises total generation and in middle of the day



East/ West facing

More balanced generation through the day

So how do I use more energy when the sun shines? Think night rates

Using timers/ smarts Schedule loads across the day Build in storage capacity

Hot water, ice banks, chillers

Sizing new equipment To run long, low and slow









Solar Video

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	X
600/ 3 higher energy use	80	\$200	\$36.8	5	0

Luscombe EECA (youtube.com)

Exploration into Biogas technology

- On-farm biogas projects are old news
- New innovations within small scale digesters

• Address a waste and energy problem

Increasingly we want to think smart about when and how we use energy

What is biogas?

Waste such as animal manure, wastewater biosolids, and food wastes are fed into the tanks or ponds and bacteria breaks down the organic matter and biogas is produced..



Tank Design –

The airtight tank prevents oxygen from entering and the process of anaerobic (without air)digestion commences

What can the biogas be used for?

- Direct fire into a boiler
- Converted into electricity (benefits of heat recovery)

Extras

Nutrient-rich digestate which can be applied to land as a solid or liquid fertiliser; or combined with other raw materials to produce compost.

Exploration into advancements in technology



• Best results for Winter feed lots opposed to standard grass grazing.
Glenarlea Farm Biogas perfromance



To get value:-

- Explore if you have adequate and easy assessable 'waste' to fed into digester or pond
- Gas production follows milk production with lag
- Consider how you could use the biogas
- Biological system needs advice to ensure success







(i) Start presenting to display the poll results on this slide.

Where now

Your action cards for when you get back

At a glance guides for

Farm self help

Advisors to prompt conversations

Where next

Advisors walkthrough and action plan

Trial a toolkit for a non energy expert farm advisor, agribusiness manager or self help to walk through, identify and agree key actions

Farmers can act on the quick, line up their plans and know when to check in with suppliers or get an expert





(i) Start presenting to display the audience questions on this slide.

Afternoon Tea

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