Fonterra’s Decarbonisation Journey

February 2024

Agenda

1. Fonterra Strategy Overview
2. Projects and Technologies
3. Time Value of Energy

Fonterra Strategy

Our pathway to 2030 – we have made three strategic choices

Continue to focus on New Zealand milk

Be a leader in sustainability

Be a leader in dairy innovation and science

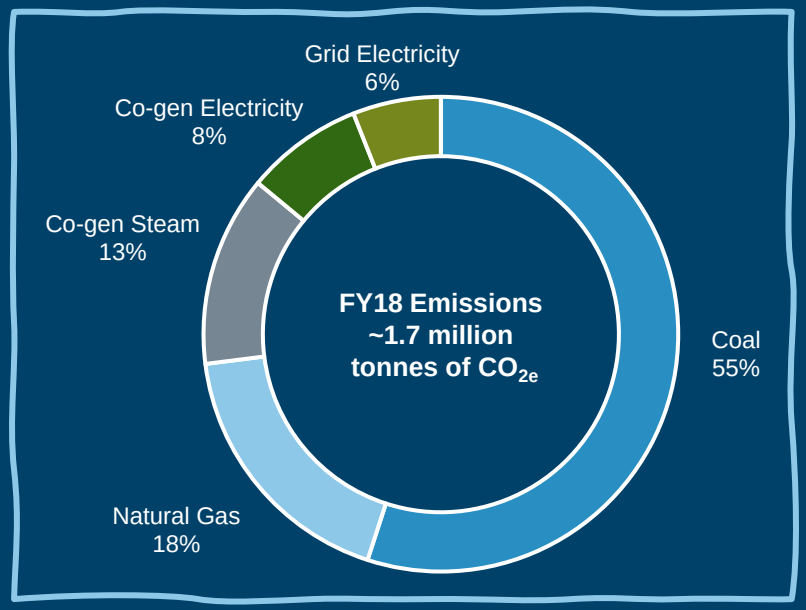
Fonterra has a national plan to transition from fossil fuels

Across Fonterra's 28 sites in NZ, there are nearly 100 boilers and air heaters, with greater than 1,300 MW of installed capacity.

Fonterra has a plan to transition the coal using sites (initially 10 with 21 assets) by 2037 – this is a phased prioritised plan to manage a range of factors, including asset condition, fuel availability, resourcing (both internally & externally), and capital allocations across the business.

This plan is reviewed annually and timing and activities will change – including adoption of new technology as part of the decarbonisation plans.

We also have our first plan to transition from natural gas.



2050: Net Zero Operations

- We will have reduced our manufacturing emissions as much as possible and will offset any emissions that remain.

2037: No Coal

- Continue to focus on fuel switching to renewable energy at our coal sites, including thermal demand reduction projects.
- Use learnings from transitioning away from coal to finalise a transition from natural gas on our way to 100% renewable energy for Operations.

2030: 50% reduction in absolute emissions

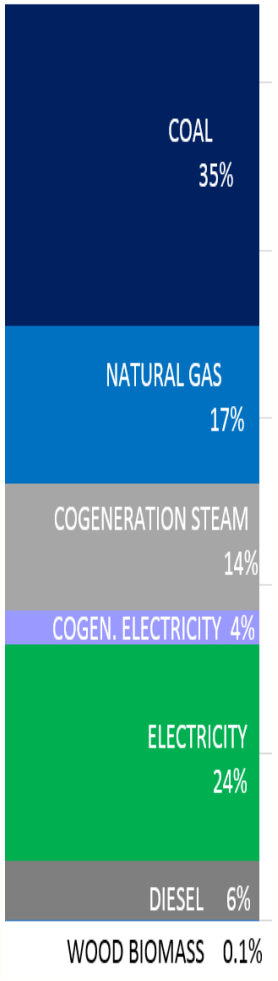
- Continue to implement initiatives to fuel switch, reduce thermal demand by improving heat recovery and energy efficiency across manufacturing sites.
- Work with internal and external partners to develop a sequenced approach for transitioning New Zealand assets out of coal. This includes assessing wood biomass, electricity, and low emission alternatives and expanding our capability in innovative solutions through technology trials.
- Accelerate electrification of our light passenger fleet and install charging stations across our sites.

2020: 20% reduction in energy intensity

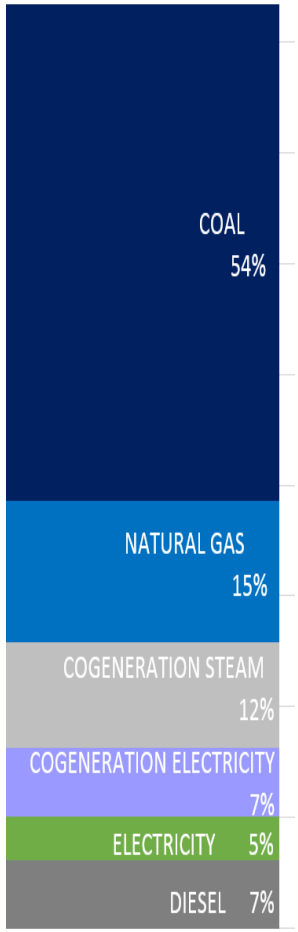
We hit our 2020 target to reduce energy intensity at our manufacturing sites by 20% from a 2003 baseline. Combined, that's enough energy saved to power all the households in New Zealand for 1.5 years and avoided emitting 3.3 million tonnes of CO_2.

Overview of Fonterra's NZ Energy Supply & Emissions
(includes supply chain and milk collection)

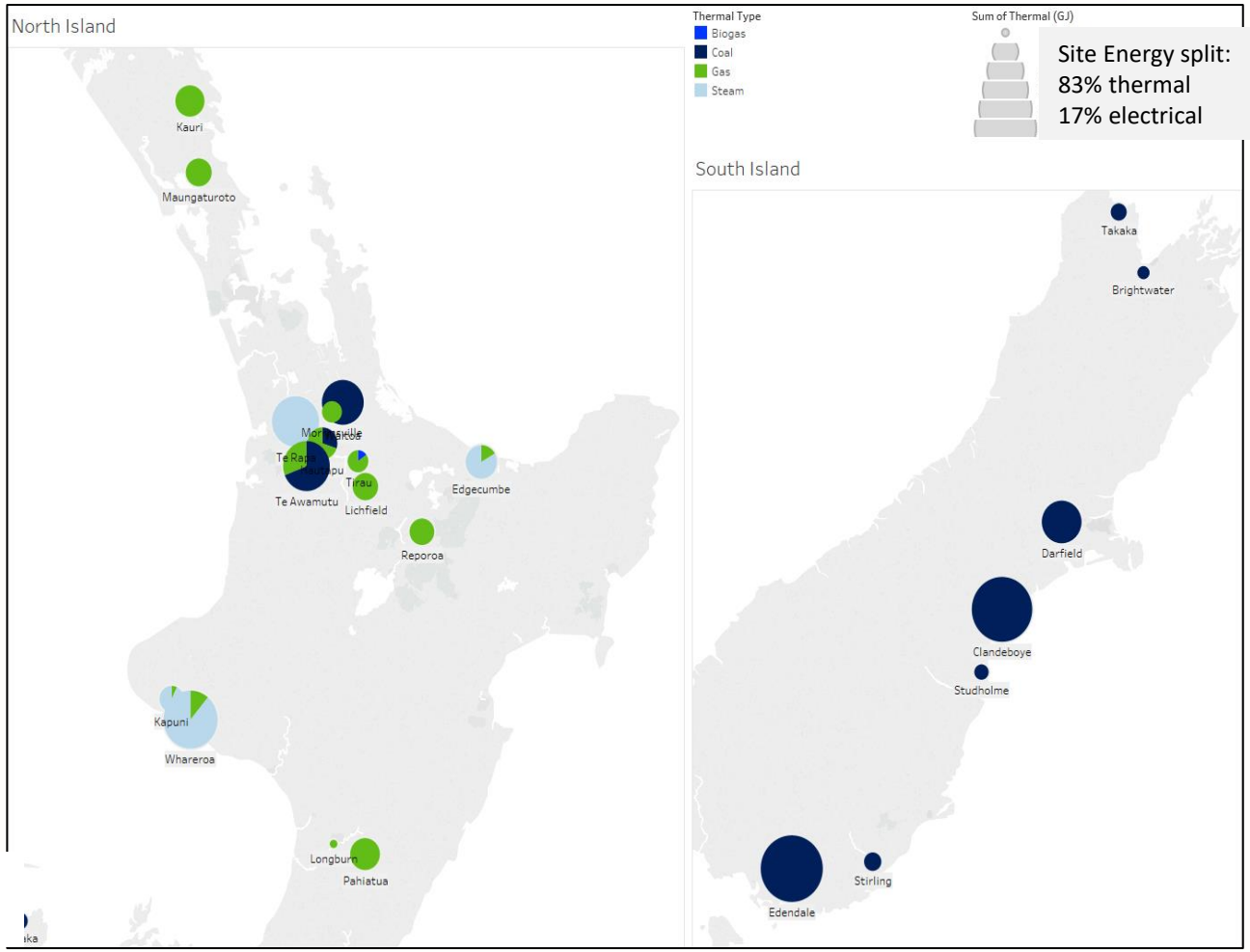
FY18 energy use
~24 PJ



FY18 Emissions
~1.7m tonnes CO_{2e}



Source and size of thermal energy supply for NZ manufacturing sites



Achieving all three parts of the Energy Trilemma is key

Projects and Technologies

Brightwater Co-firing

OVERVIEW

- In 2018, we converted the Brightwater 7MW coal boiler to co-fire with wood biomass
- Target for a 70:30 blend on energy basis
- Wood chip specification of ~35% moisture content - ~1,000 tonnes per annum
- Forecast to reduce initially reduce emissions by ~2,400 tonnes CO_{2e}/pa – actual ~1,700 tonnes CO_{2e}/pa
- Brightwater processes ~230,000 L milk a day (c.f. largest site processing ~13m L milk a day)
- Co-funding of $250k received from EECA's Technology Demonstration Fund

Te Awamutu Conversion to Wood Pellets

OVERVIEW

- In 2020, we converted the Te Awamutu 43MW coal boiler to operate on wood pellets
- Challenging construction at the start of COVID-19
- Reduced emissions but ~84,000 tonnes CO_{2e}/pa
- Co-funding of $200k received from EECA's Technology Demonstration Fund
- Wood pellets supplied from Natures Flame Taupo facility – made from local sawdust & shavings using geothermal energy - ~47,000 tonnes per annum

NEW ZEALAND ENERGY EXCELLENCE AWARDS 2021
LOW CARBON FUTURE AWARD WINNER

Stirling 11MW Wood Biomass Boiler

OVERVIEW

- We have commissioned a new 11MW biomass boiler from Polytechnik at the site
- Forecast to reduce emissions by ~18,500 tonnes CO_{2e}/pa
- This is our first 100% renewable thermal energy supplied site
- Wood chip (P45A M40 A1 as per BANZ Wood Fuel Specifications) to be supplied by Pioneer Energy via a walking floor truck into our top load system – forecast ~21,000 tonnes per annum

Waitoa 30MW Wood Biomass Boiler

OVERVIEW

- We recently commissioned a 30MW Bubbling Fluidised Bed (BFB) boiler at our Waitoa site
- Forecast to reduce emissions by ~48,000 tonnes CO_{2e}/pa – commissioning forecast November 2023
- This has replaced one of the three boilers at the site
- Wood chip (P63 M60 A3 specification) to be supplied by Wood Energy NZ

Project Hoiho

OVERVIEW

- We have installed NZ's largest heat pumps as part of the refrigeration project at Whareroa.
- 2 x 3.5MW heat pumps – these are 700x larger then your typical living room heat pump which is 5kW!
- These will reduce our annual energy use by ~120,000GJ/pa (~33m kWh/pa) and reduce our GHG emissions by ~9,100t CO_{2e}/pa – equivalent to taking ~3,800 cars off NZ roads.
- Heat pumps recycle energy, reducing overall consumption

Edendale 20MW Electric Boiler

OVERVIEW

- We recently announced that we will build a 20MW Electric Boiler (EB) at our Edendale Site
- The project will reduce emissions by 40,000t CO2e
- Electricity will be supplied by Meridian Energy
- The boiler will be commissioned in September 2024

It's electrifying! Fonterra to install its first electrode boiler at Edendale to reduce emissions

JANUARY 25, 2024 | 2 MINUTE READ #SUSTAINABILITY #SITES #NEW ZEALAND

In its next step to get out of coal, Fonterra has announced it will install a 20-megawatt electrode boiler at its Edendale site in Southland.

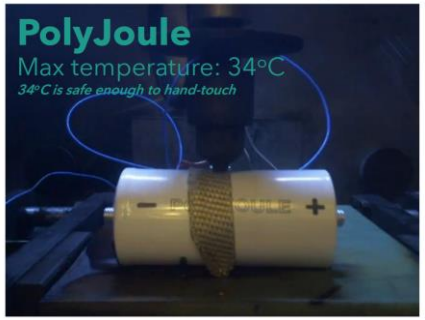
PolyJoule

OVERVIEW

- PolyJoule have developed a conductive polymer battery
- Sustainable – recyclable, non-toxic; manufactured locally; no lithium, nickel or cobalt
- Ultra-safe – no thermal runaway, electrolyte safe to touch, no restrictions on transport
- Long life – operates continuously in extreme hot & cold; 12,000+ cycles at 100% depth of discharge; no climate control required
- Te Rapa Farm: commissioned remotely October-21; 10kW Power Cell system
- Waitoa UHT: trials underway there now

POLY JOULE

Green Power and Energy for the Grid



Genesis Biomass Partnership

OVERVIEW

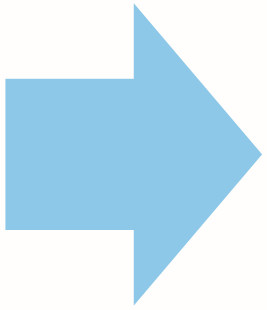
- Genesis Energy and Fonterra have signed an agreement to work together on exploring the viability of biomass as a substitute for coal including the potential for a local supply chain.
- Genesis burns coal to generate electricity at its Huntly Power Station, while Fonterra uses coal to create heat for dairy processing.
- The biomass agreement, initially for a period of two years, will see the companies collaborate to share knowledge and foster innovation.
- The project will look to bring in other industry partners to bring opportunities and ideas to life for the greater benefit of New Zealand.

MAN-ES Steam Heat Pump

OVERVIEW

- A partnership with MAN Energy Solutions, world-leading provider of engines and turbomachinery solutions, to trial the design and implementation of an industrial-scale heat pump technology to replace non-renewable energy in raising steam.
- Technical feasibility work has been completed and commercial feasibility work is still in progress
- The heat pump has an output of 30MW (6,000x as large as a typical residential unit)

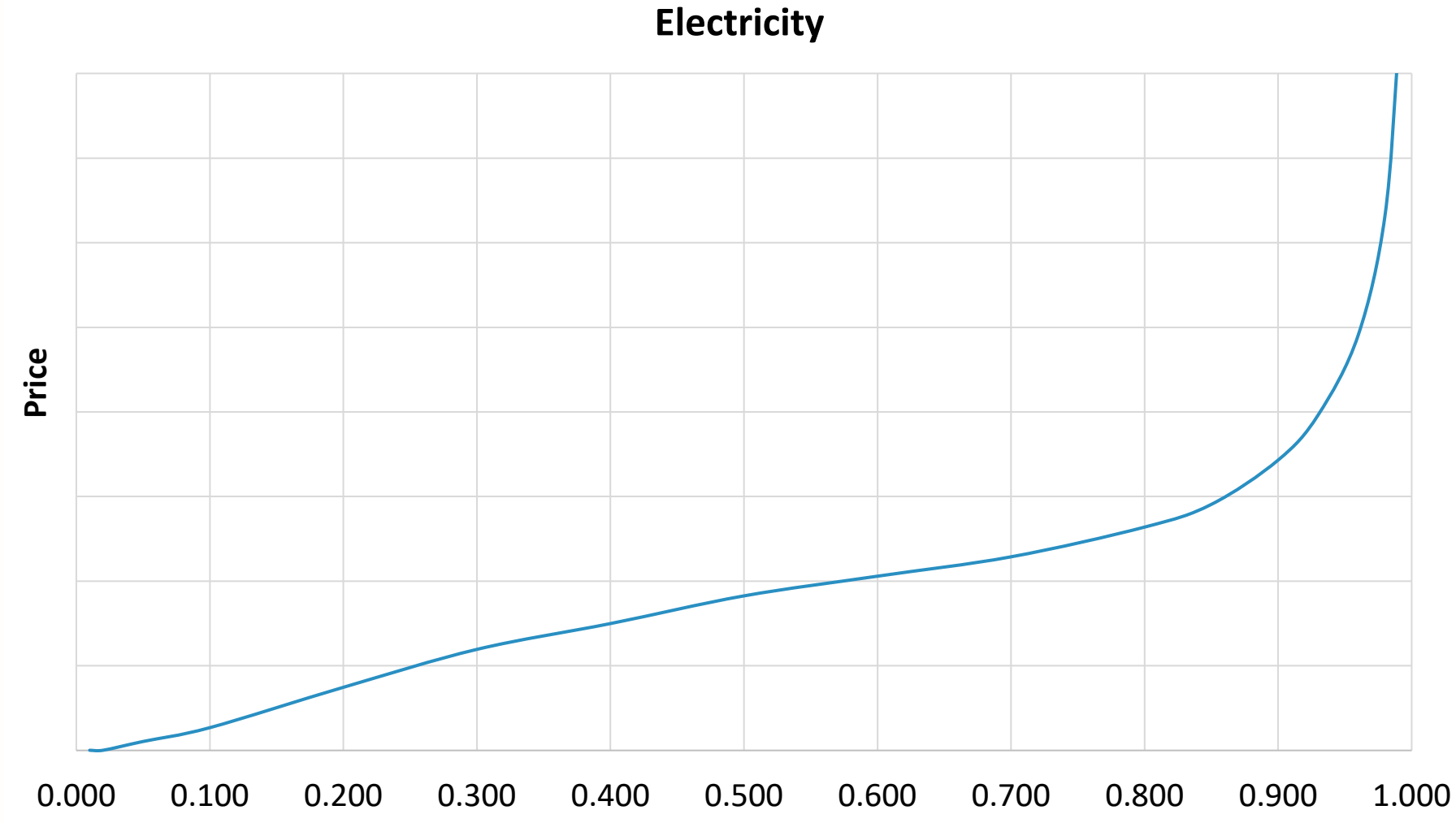
What is the Decarbonisation Solution of the Future?



What is the Process Heat Solution of the Future?

Time Value of Energy

Time Value of Energy

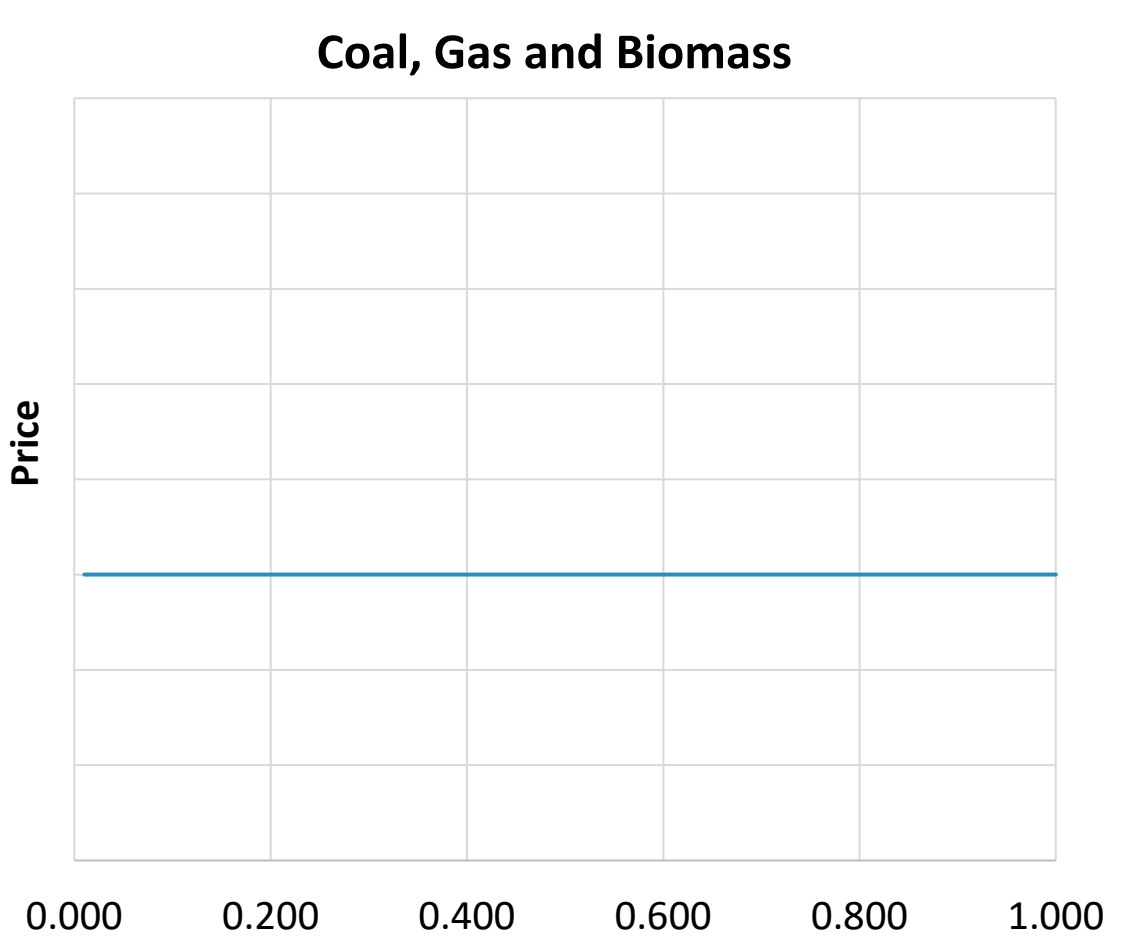


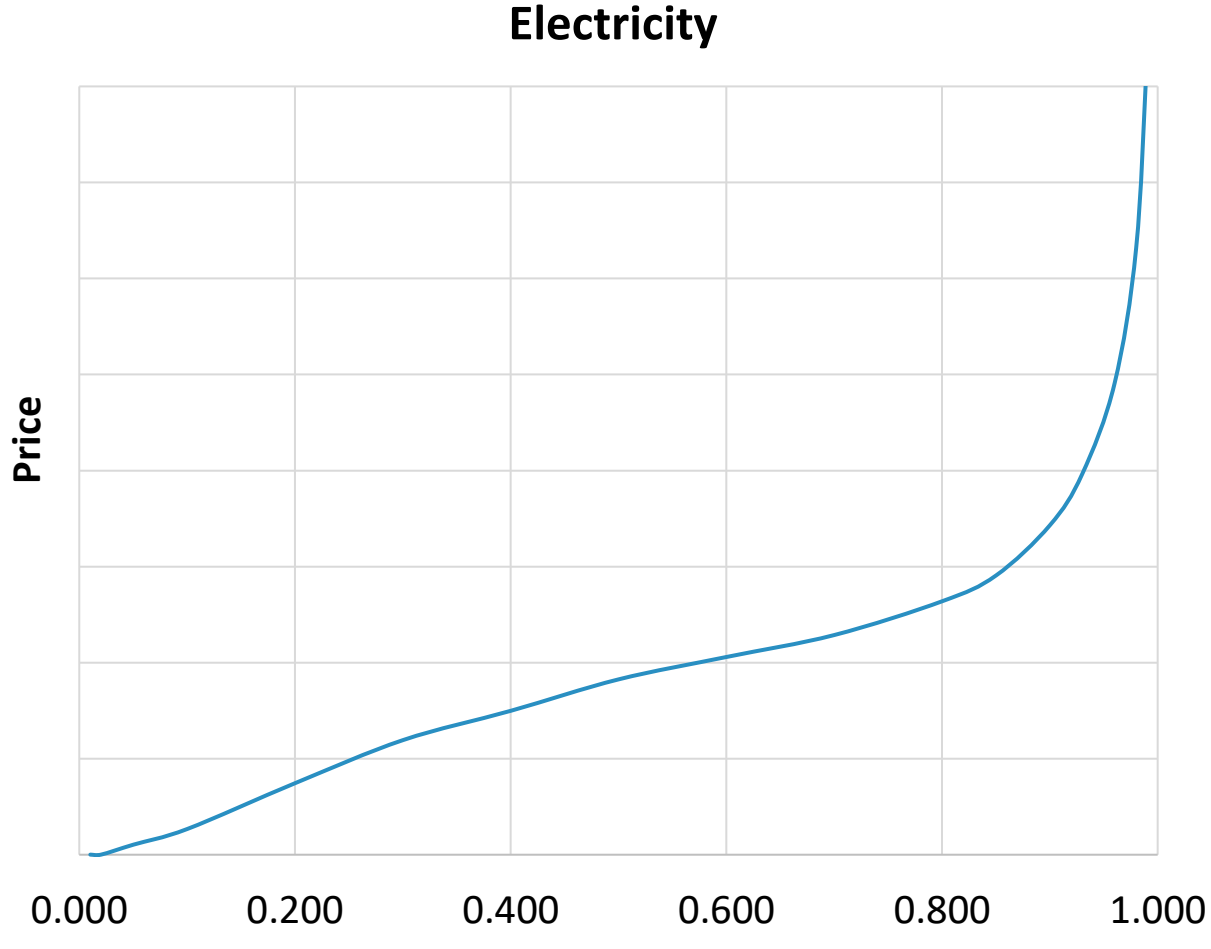
Demand Response Challenges

Could you please hold that milk for half an hour – the spot price is really high at the moment

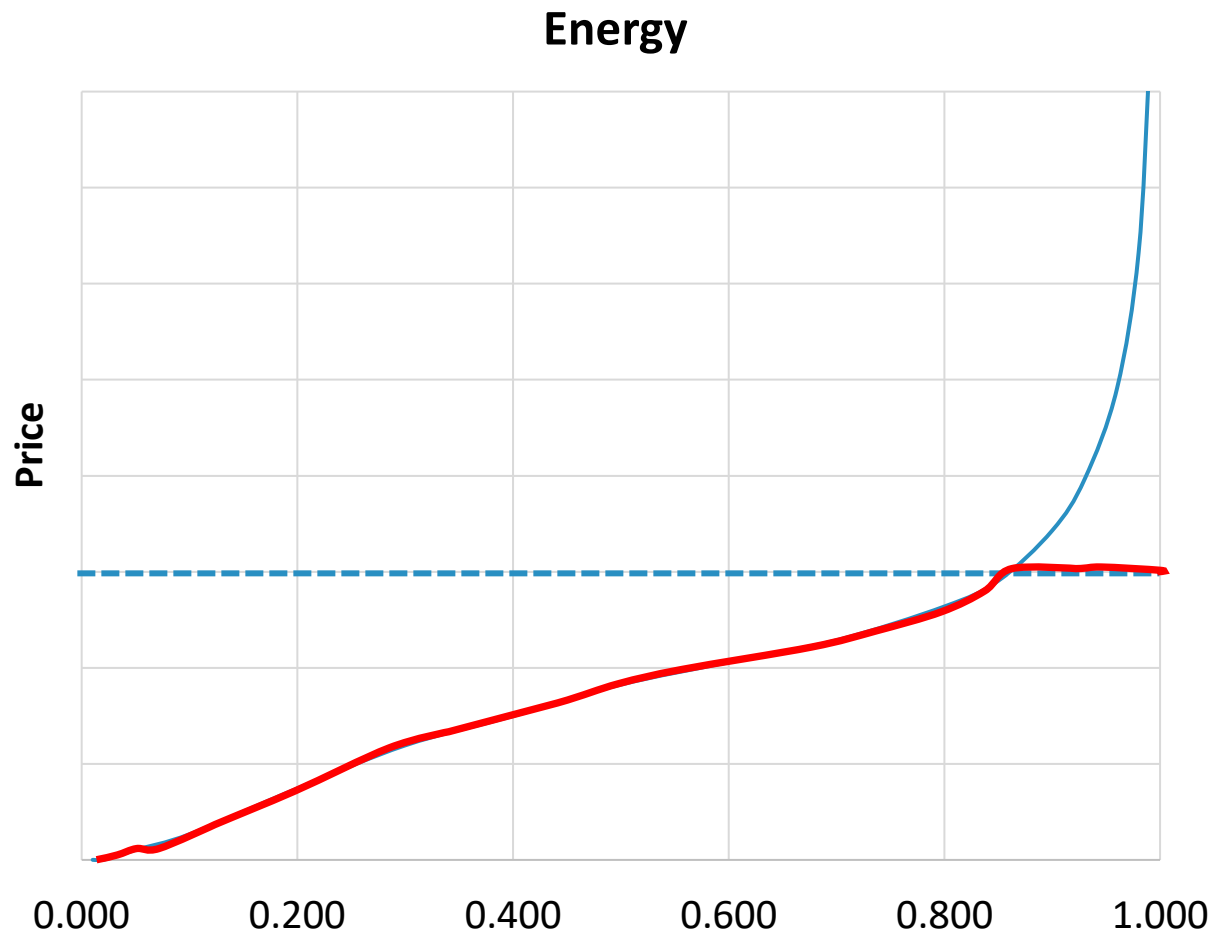
Decoupling Energy Use from Reception

Fuel Substitution





Energy Substitution



Likely lower cost, but

- Increased complexity of operation
- More commercial sophistication required
- More assets needed


Ngā mihi
Thank you
Fonterra
Dairy for life