



Dairy for life

Practical Realities of Converting Coal Boilers to Biomass

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Fonterra Carbon Emissions Overview

~ 1,686 kT CO₂-e/annum

Fonterra's Carbon Reduction Commitments



- **30%** reduction in absolute emissions by **2030** (FY18 baseline)
- No new coal boilers to be installed
- Prioritise the phase out of coal use by **2037**
- **Net Zero** emissions by **2050**, on the way to using **100% renewable energy**





Overview of our 30% by 2030 Carbon Reduction Plan



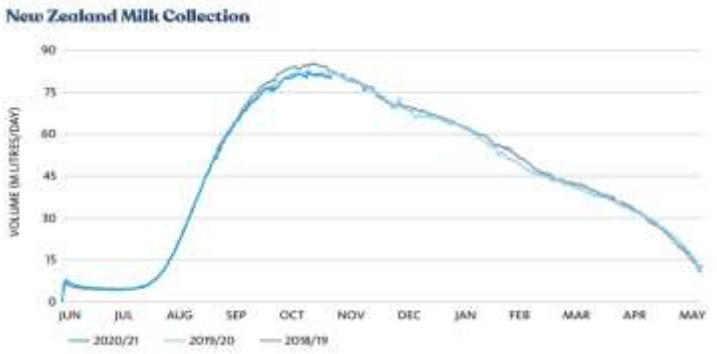
Use Less



Emit Less

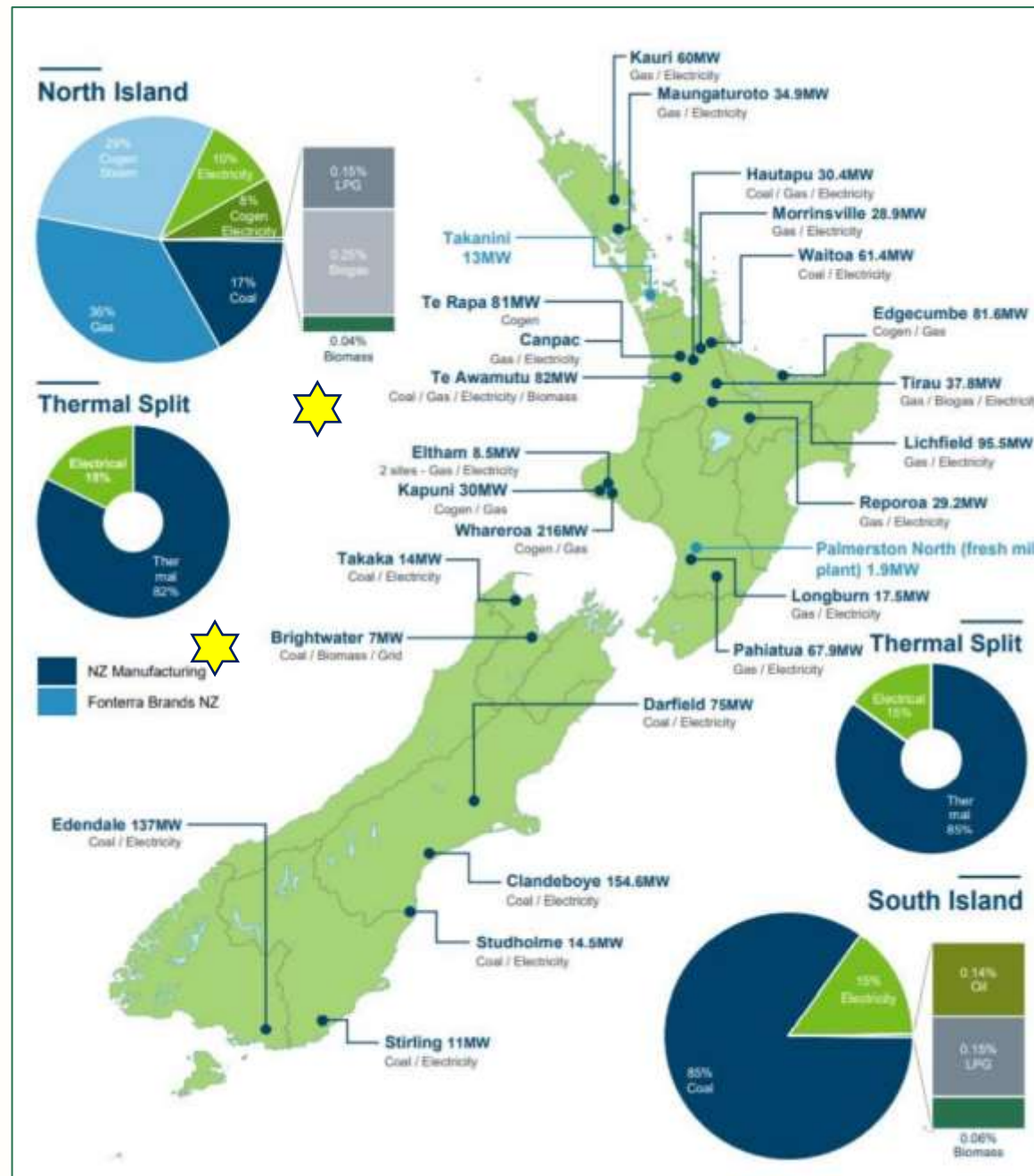
Key Considerations:

- The ability to process all of our farmer's milk;
- Ensuring the business remains economically viable in a globally competitive market;
- Long term security of supply of alternative energy sources;
- The impact of ongoing operational costs of using alternative energy sources; and
- Sustainability considerations.



Fonterra's Process Heat picture

- 27 manufacturing sites
- 24 PJ per annum
- 3% NZ's primary energy supply
- 17-18 billion litres milk
- Thermal energy from coal, natural gas, biogas or wood biomass
- 17% electrical
- 83% thermal
- 100+ boilers and air heaters
- Average age of 28 years
- 1 – 56 MW
- Total 1,300 MW






Brightwater Coal Boiler conversion to co-firing wood chips

~ 1- 2 kT CO₂-e/annum and \$1.75 M

Commissioned November 2018

Brightwater Co-Firing wood biomass with coal – Process Overview




1-2 kT



Biomass Storage



Coal hopper



Pull Floor

+



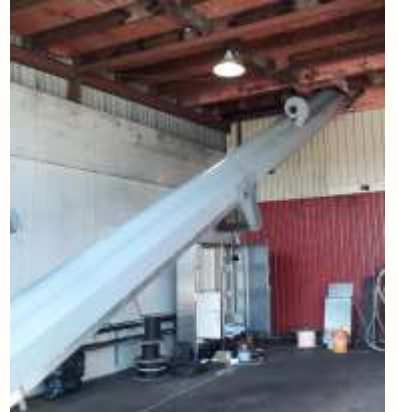
Hydraulics for Pull Floor



Biomass Tubulator



Coal and mixing screw



Coal/biomass blend Tubulator

Brightwater Co-Firing with wood chips

- Roller feeder
- Overfire air
- Opacity Meter



Risk & mitigation

Fuel supply interruption – revert to coal

Fuel supply variability
- Automation + manual moisture content checks

Fuel supply on a food processing site

Hazardous area assessment

Minimise additional work for operators (pull floor)

Biggest current issue

Opacity increases during load change

Recommend only certain boilers are looked to for co-firing

Future selves

Assess base case operation with on line data

Trial for weeks not days to see if issues evolve

Clearly demarcate project out of scope pre-existing issues

If a site has multiple boilers convert a boiler fully



Te Awamutu Coal Boiler conversion to 100% wood pellets

~ 84 kT CO₂-e/annum and \$12 M

Commissioned August 2020

Te Awamutu 100% conversion to wood pellets



Te Awamutu 100% conversion to wood pellets

- New ash bin system and lower ash volume



Te Awamutu 100% conversion to wood pellets

Top of the day bin:

- En-masse conveyor
- Silver explosion ducts
- Bag house dust collector

- In the day bin we have the risk of an explosion pentagon



Te Awamutu 100% conversion to wood pellets

Identified additional items

- Economiser
- Feed grizzly



Te Awamutu 100% conversion to wood pellets

The team that built it

Despite COVID19 the team had the project ready for commissioning in August

Equipment delays were mitigated by the project team

Local construction utilised local bubbles



Te Awamutu 100% conversion to wood pellets

The team that run it

Experienced boiler team

Other live plant during construction and commissioning

Whole team involvement and operational readiness



Te Awamutu 100% conversion to wood pellets

- Risk: Two area of plant experiencing dust - Feed Hopper and Fuel Reception
- Mitigation: Engage a Fire and Explosion expert to help identify dust issues + interim controls + engineering solution for dust control
- Future selves: Trial for weeks rather than days. Include extra contingency capital for dust mitigation



Te Awamutu 100% conversion to wood pellets

- Risk: Boiler grate heating above recommended maximum
- Mitigation: Manual addition of refractory + engineered long term refractory recycling
- Future Selves: Trial for weeks rather than days. Include extra contingency capital for refractory recycling





80-84 kT

At Te Awamutu, we're taking another step forward with our commitment to renewable energy. The site will be moving away from coal to wood pellets.



Reducing

When the full conversion is complete it will reduce carbon emissions by around **84,000 tonnes** of CO₂ per year. That's equivalent to taking **32,000** cars off the road.



Reduction Goal

This conversion equates to a **75%** carbon emission reduction at site and will contribute to **16%** of Fonterra's 2030 carbon reduction goal.



Reducing

It will reduce our coal usage in New Zealand by **10%**. At Te Awamutu we burnt **42,000 tonnes** of coal last season and we expect to burn **50,000 tonnes** of wood pellets once we have shifted away from coal.



Partnership

We know we can't do it alone, that's why our partnership with Nature's Flame our **sustainable wood pellet** supplier is so important.



Sustainable

Nature's Flame wood pellets are truly renewable and sustainable, made from wood waste, shavings, sawdust and off-cuts. They also use **renewable geothermal energy** to make these wood pellets.

Summary: Practical Realities of Converting Coal Boilers to Renewable Energy

1. Understand operating envelope and areas of risk, be prepared and resourced for continuous commissioning
2. Assess dust from a fire/explosion and health and safety perspective
3. Trial for as long as possible to see if time related issues emerge
4. Fully assess all equipment in the boiler system and factor in upgrades to project timeline and costings
5. Allocate sufficient capital contingency for risk mitigation of bespoke technology projects
6. Be aware of pre-existing issues with brownfield projects and detail all in and out of scope items



Celebrate the carbon reduction - over 85,000 tonnes in two steps!

Craig Wright & Kevin Liao

EECA

Our suppliers and engineering partners

