Fonterra's Renewable Trilemma

Presentation to Sustainable Southland Conference by
Tony Oosten

7th July 2016

Key Objectives of Fonterra's Energy Portfolio

Fonterra's Energy Trilemma for Renewable energy sources

Increased Stakeholder Expectations

- There is increasing scrutiny and negative publicity regarding Fonterra's coal use.

Fonterra's Sustainability Targets

20% reduction in energy intensity by 2020

(2003 baseline)
(amount of GJ used per tonne of product manufactured)

30% reduction in energy intensity by 2030

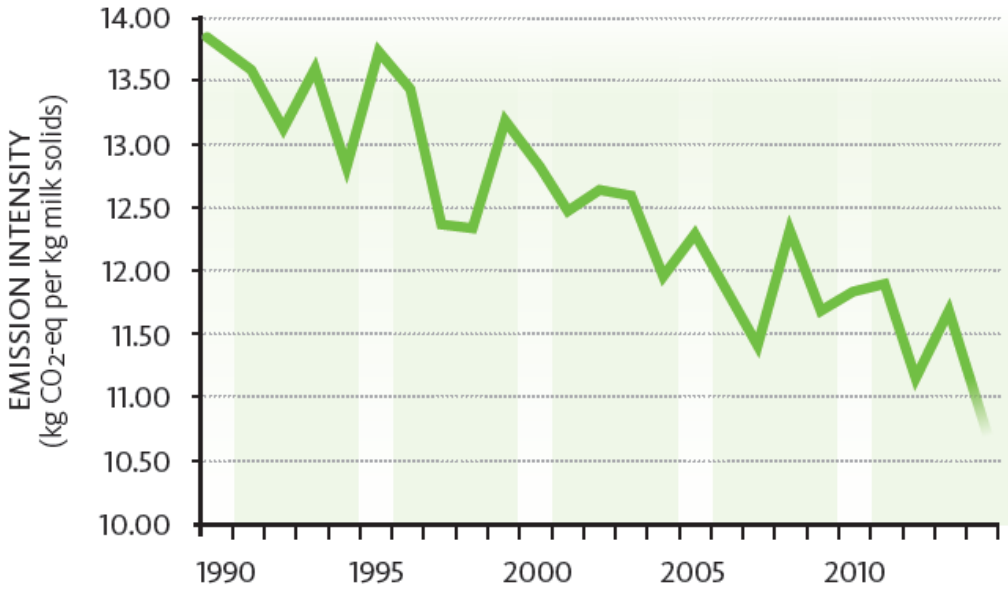
(2008 baseline)
(tonnes of carbon dioxide equivalent emitted per tonne of product manufactured)

Emissions

We are working to continue decreasing on-farm emissions intensity

- The New Zealand dairy industry's emissions of biological on-farm emissions (methane and nitrous oxide) per kgMS_2 have decreased by 21% between 1990 and 2014.

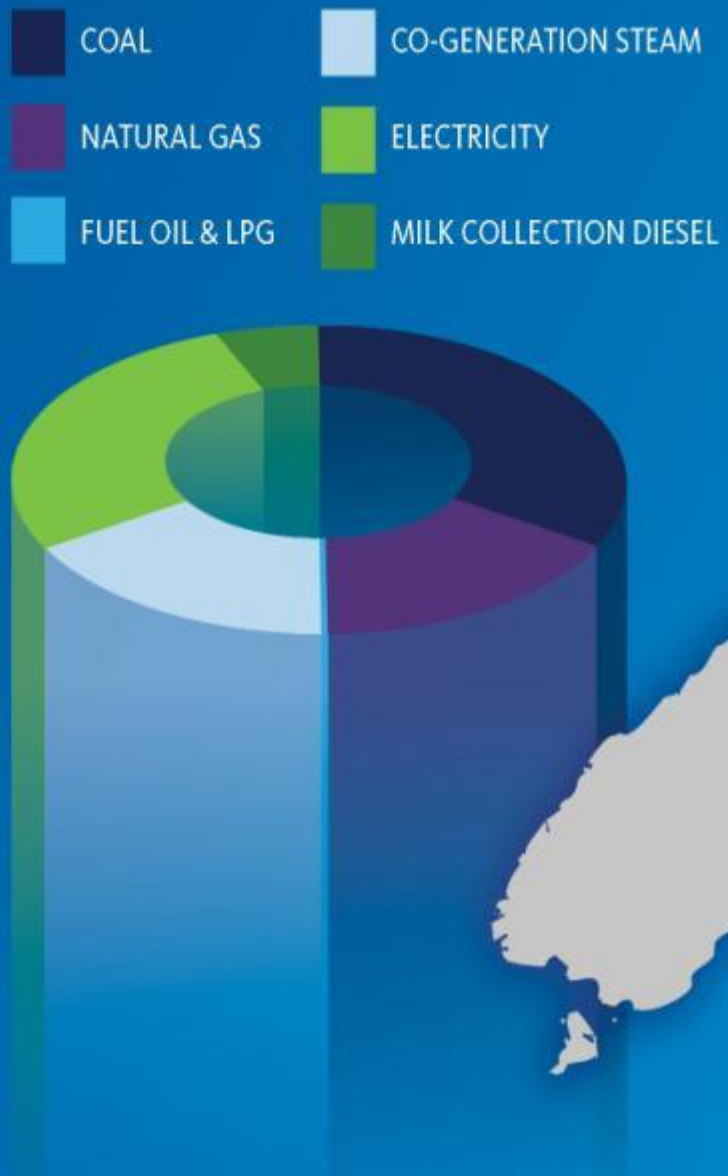
FIGURE 1: NEW ZEALAND DAIRY INDUSTRY'S ON-FARM METHANE AND NITROUS OXIDE EMISSIONS PER KILOGRAM OF MILK SOLIDS

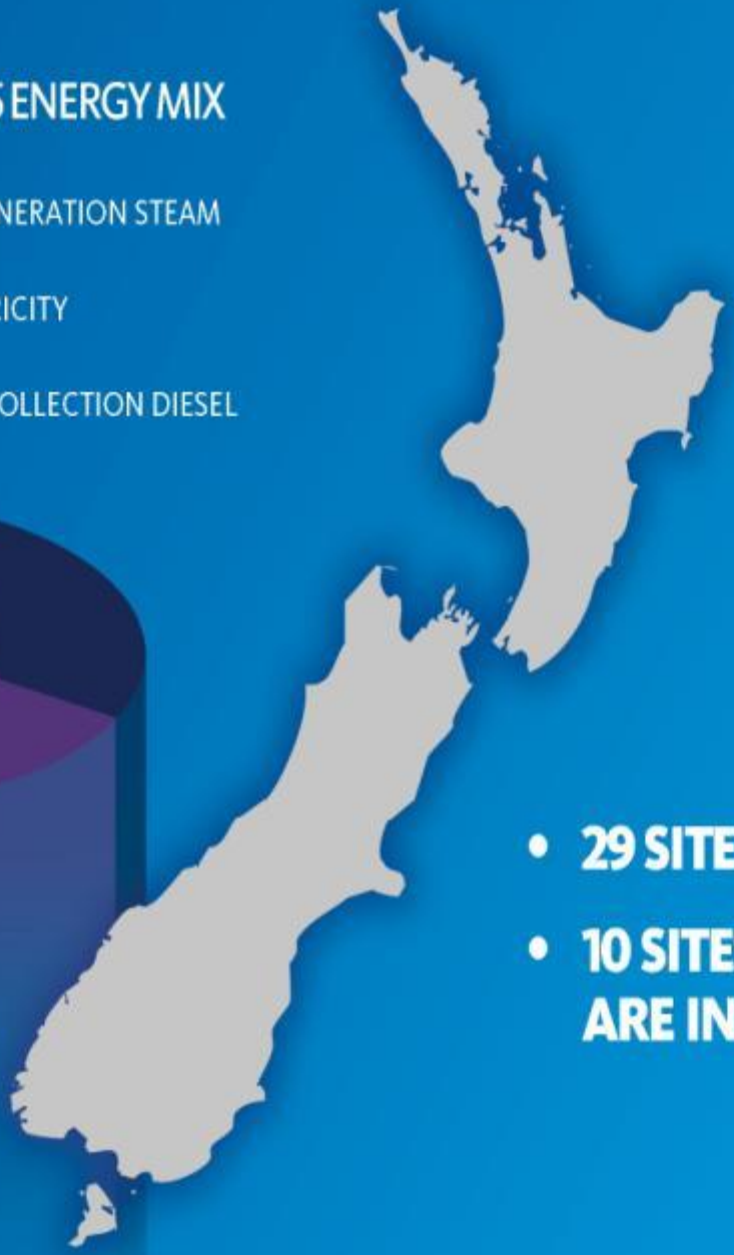


FONTERRA'S SHARE OF GREENHOUSE GAS EMISSIONS

85%	10%	5%
ON FARM	PROCESSING	DISTRIBUTION

NZ OPERATIONS - FY15 ENERGY MIX

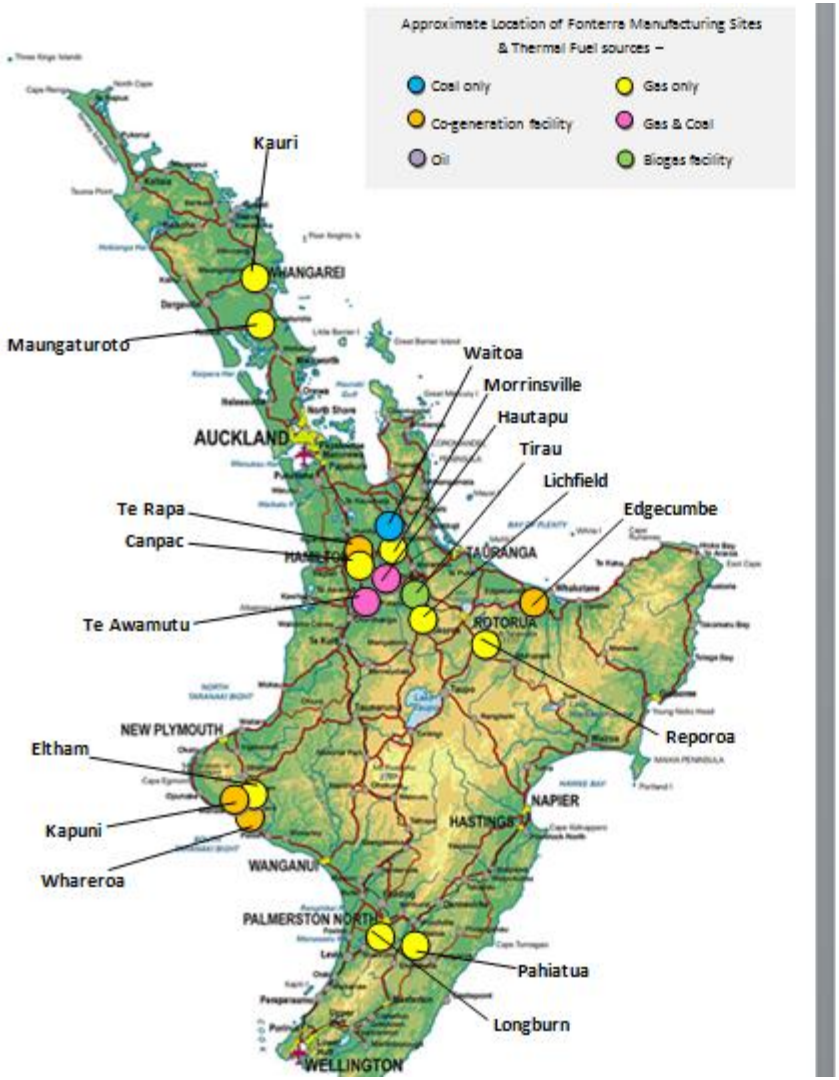




- **29 SITES ACROSS THE COUNTRY**
- **10 SITES USE COAL - 7 OF THESE ARE IN THE SOUTH ISLAND**

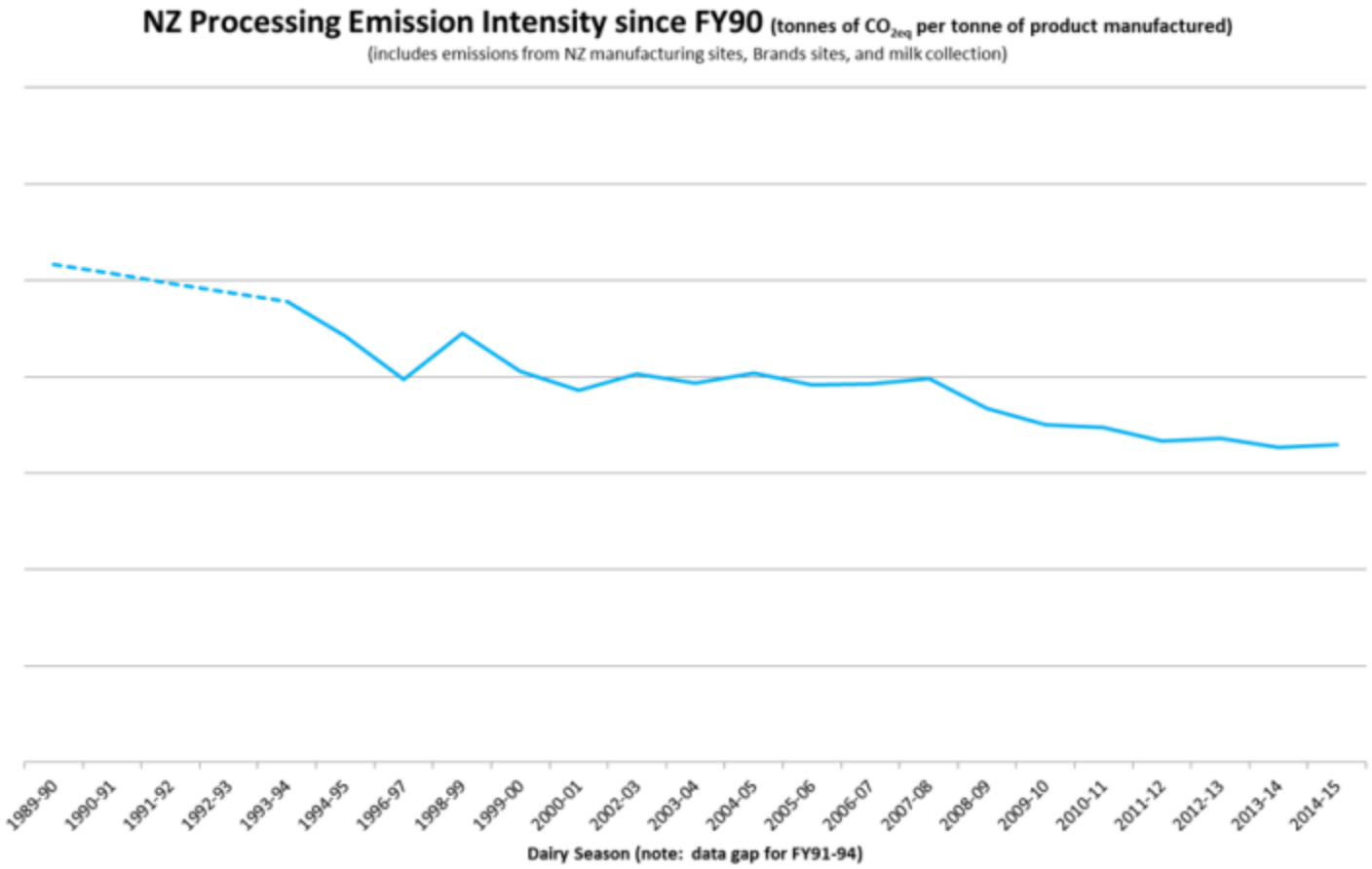
Fonterra
Dairy for life

10 of our 29 sites use coal



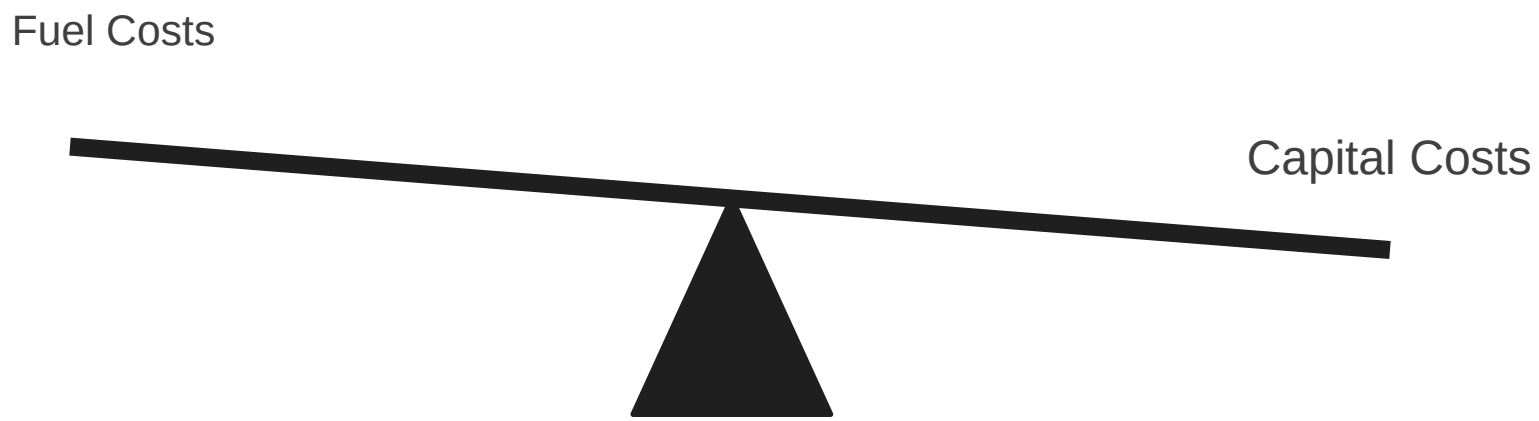
Processing emission intensity is improving

- Approximately 36% decrease since FY90, while production volumes have increased by approximately 214% since FY90



Costs

Cost is a Balancing Act



Boiler Capital Costs

Natural Gas

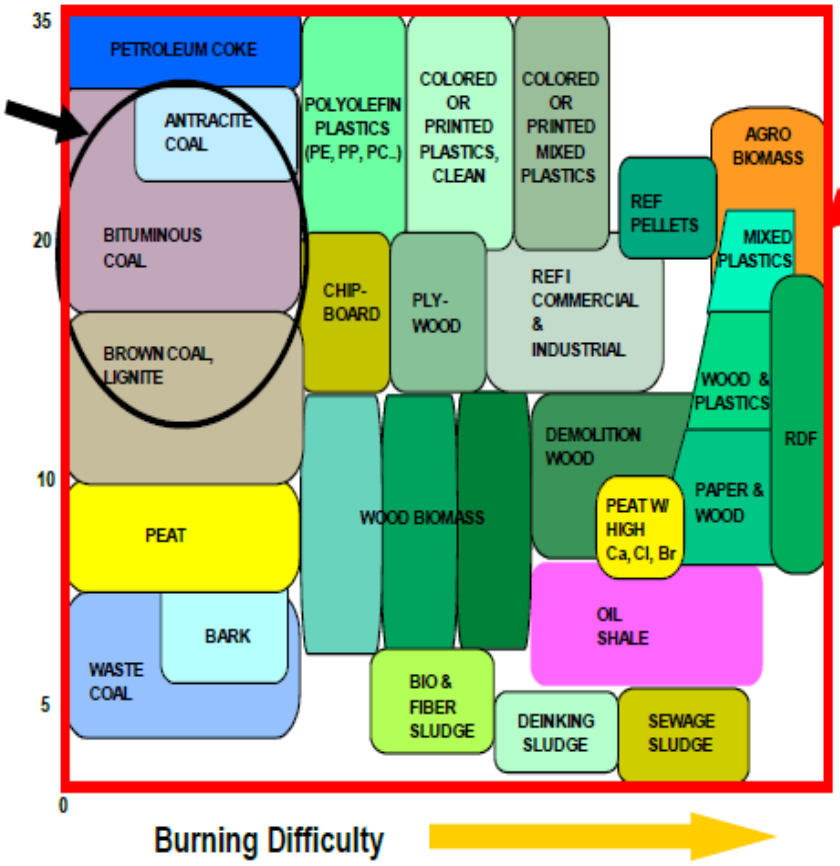
- Small footprint
- Low risk and complexity
- Capital cost: $0.2M/MW

Coal

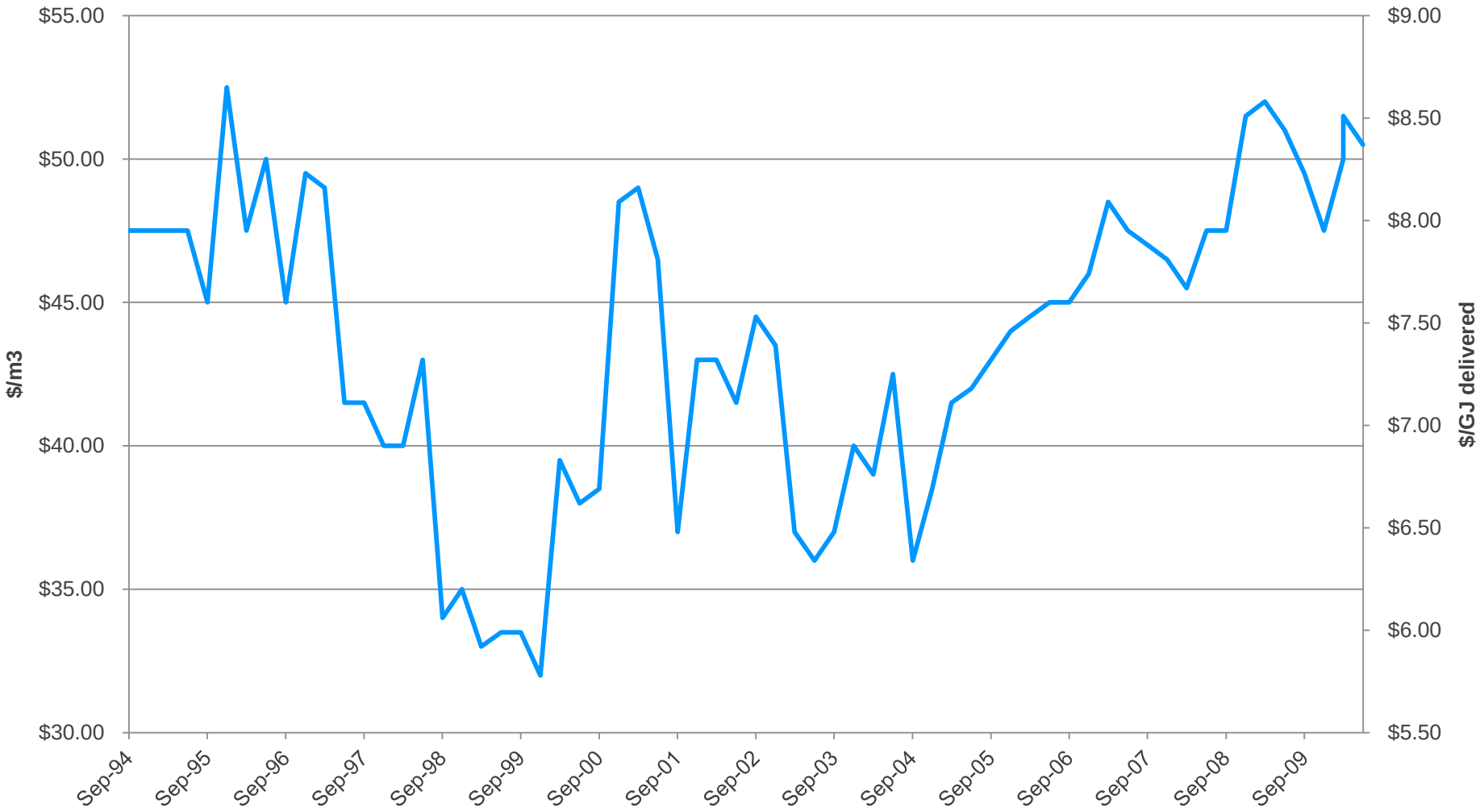
- Older technology
- Capital cost: $1.0M/MW

Wood Biomass

- Newer technology
- Capital cost: $1.2M/MW



Pulp Log Prices



MAF Forestry historic prices

Different Wood Types

Clean Uniform Wood chips
- More expensive to produce
- Less risk of combustion issues

Whole tree hogged fuel
- Cheaper to produce
- Combustion OK

Bark and branch hogged fuel
- Cheapest to produce
- Requires specifically designed boiler

Recommended range of fuels based on cost and combustion in a modern specifically designed biomass boiler

Coal Prices

Table 9 Clandeboye Price Estimates

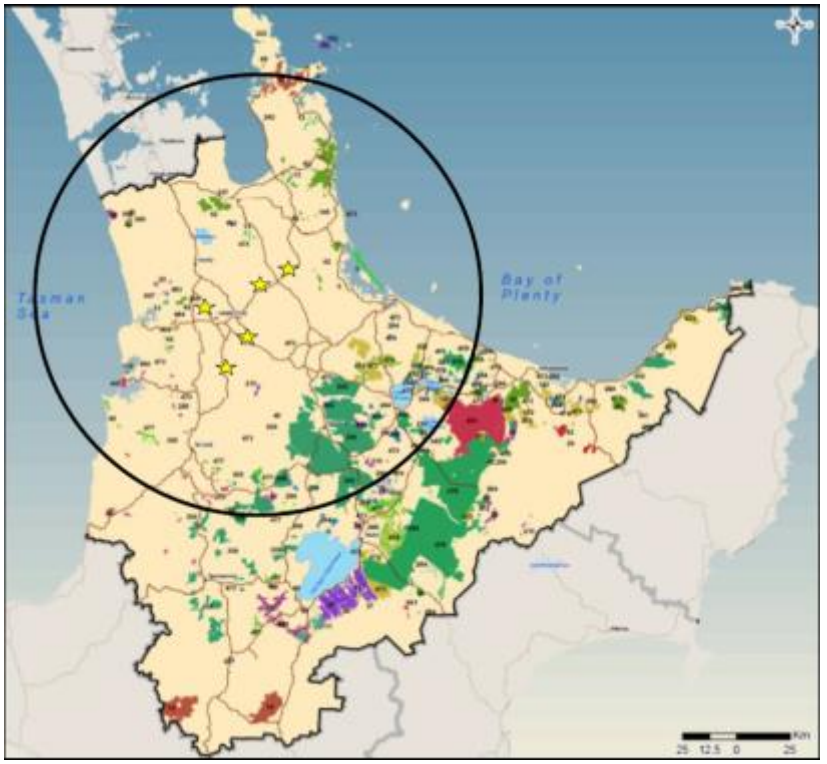
Cost element	2010	2013
Mine price ($/t)	$66.27	$75
GJ/t	19	19
$/GJ	$3.49	$3.95
Delivery ($/t)	$50	$50
Delivered ($/t)	$116.27	$125.00
Delivered ($/GJ)	$6.12	$6.58

Source: Covec 2013 coal prices report for MBIE

Transport Cost

Transportation

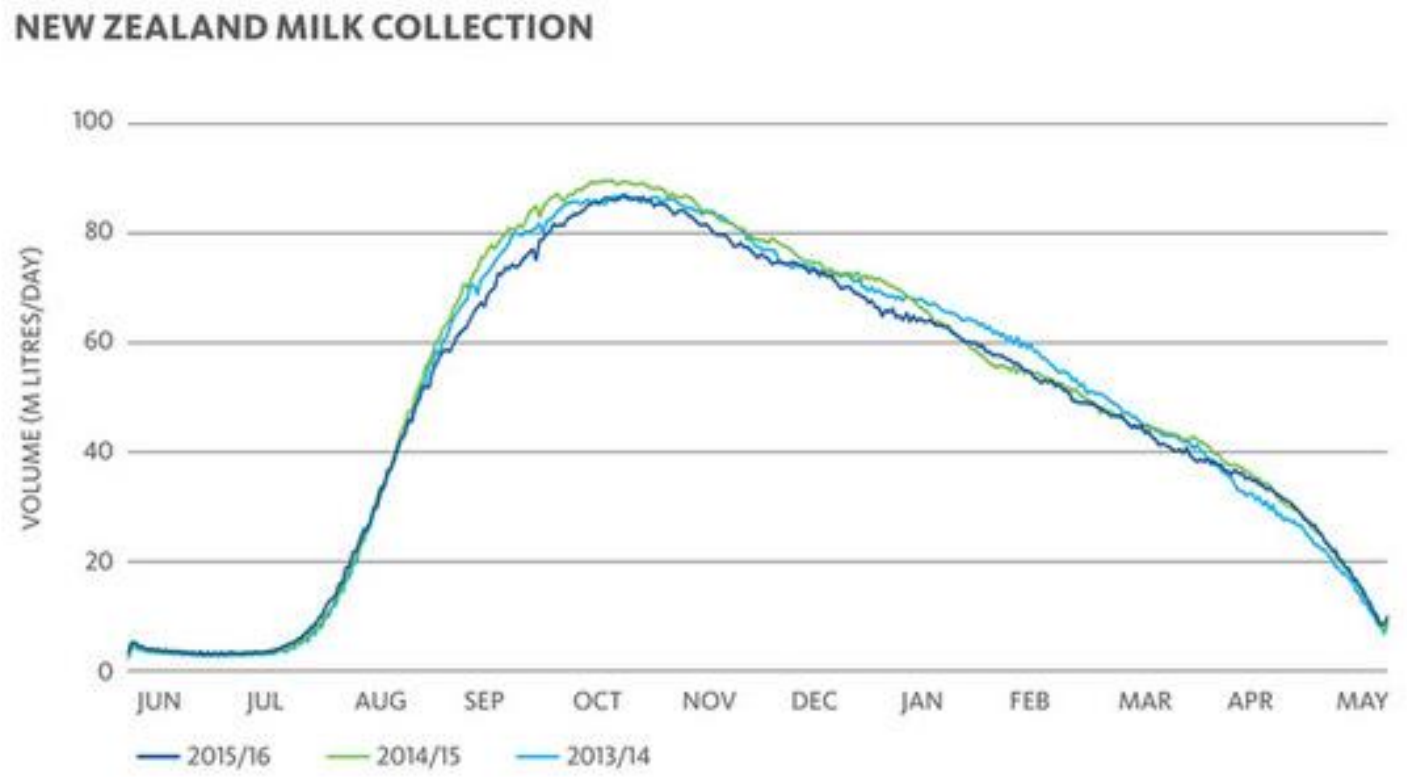
- Increased number of deliveries required
- Limited to supply within ~100km radius before transport costs uneconomic



Security of Supply

Security of Supply is Mission Critical

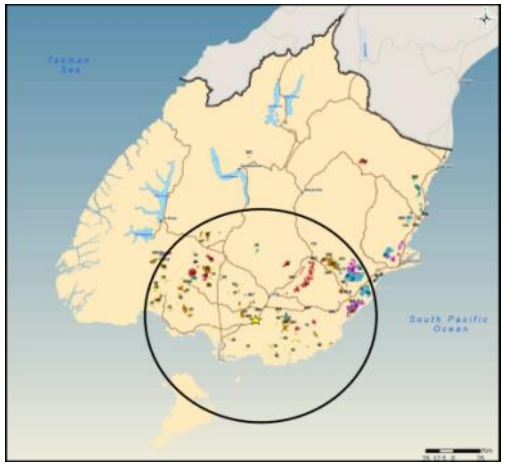
- The Cows have to be milked and the milk has to be processed into a shelf stable form within 24 hours

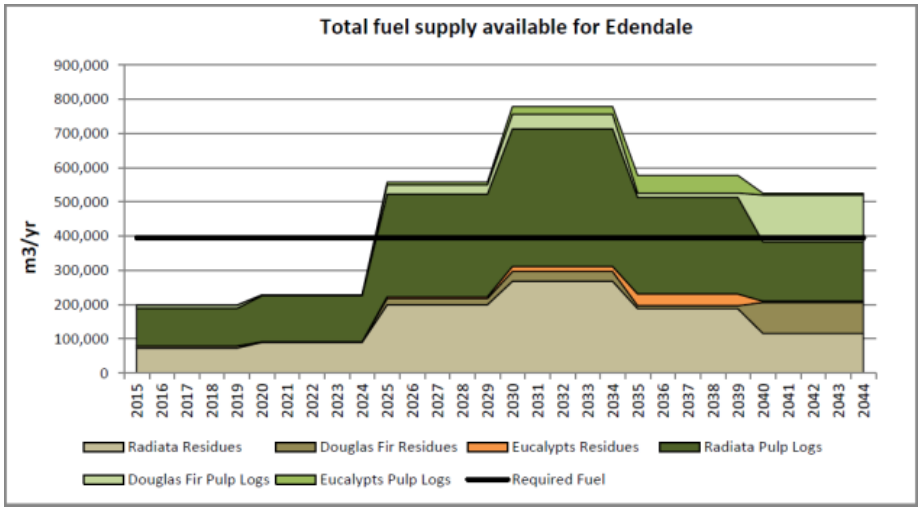


Cannot see the Trees for The Forest

- NZ exotic forest area
  - 1.8 million Ha

- Forest area required to eliminate Fonterra South Island coal use
  - 57,000 Ha if 100% of harvest used for boiler fuel
  - 286,000 Ha if 20% of harvest used for boiler fuel (i.e. residual and pulp log)



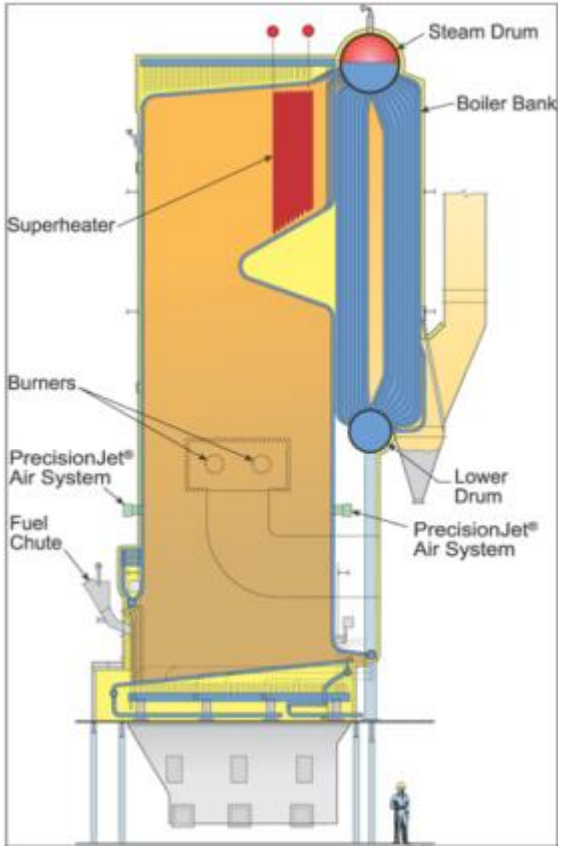


Is There a Difference in Coal vs. Wood Security of Supply?

- Coal
  - Mine collapse
  - Mining equipment failure
  - Transportation stoppage
- Wood
  - Forest fire
  - Harvesting equipment failure
  - Chipper/Hogger failure
  - Transportation stoppage

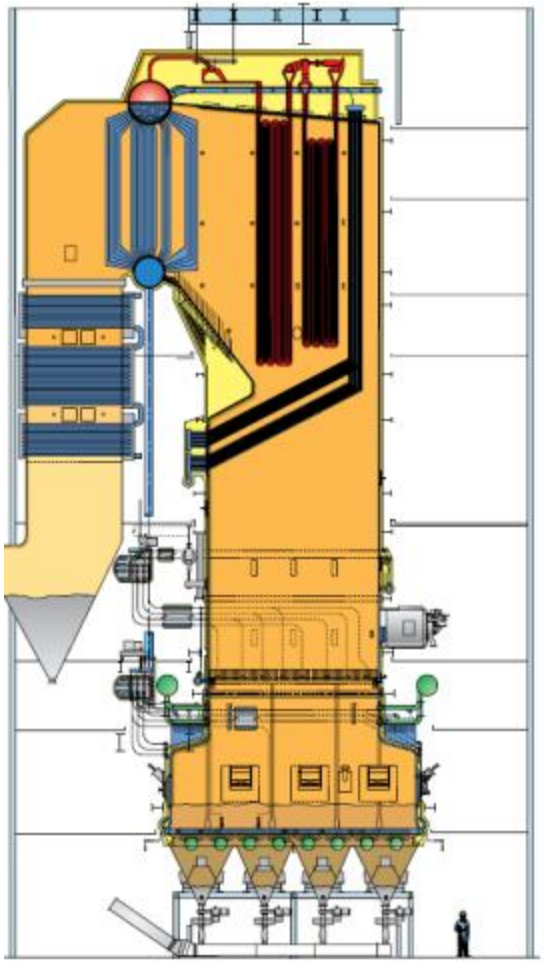
Effectively there is no difference in supply chain risk

Combustion Technology



Grate Fired

European Design



Bubbling Fluidized Bed

Renewable energy sources:
Are they a realistic option for Fonterra?

Fonterra will be dependent upon fossil fuels in the immediate future, but if a few hurdles can be overcome, sustainable renewable energy sources are a realistic option for Fonterra's future

CLIMATE AND ENERGY

Reduce energy and emissions intensity

Invest in clean technology

Adopt good management practices on farm

Build resilience to climate change

Advocate for appropriate policy

Commitment at the proposed expansion at the Studholme site

- Fonterra has committed to building a boiler capable of co-fire with coal with wood biomass in the new boiler .

This is sustainable fuel