# Genesis Energy Insights on Biofuels

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# An active enabler of New Zealand's energy transition

## Future-gen – transitioning our wholesale position to lead NZ's energy transition

### Grow renewables

- Contract for new renewable generation
- Partner to build a pipeline of solar options

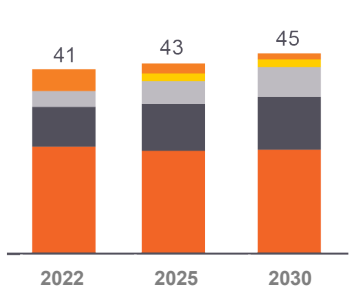
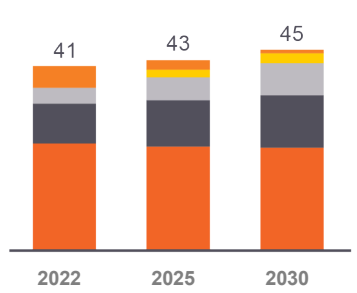
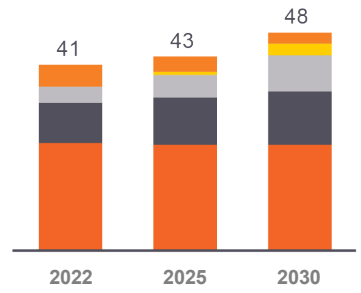
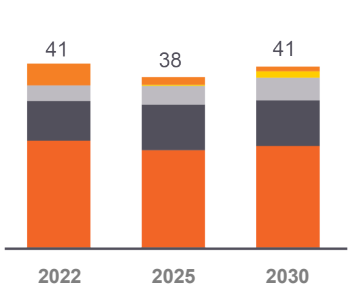
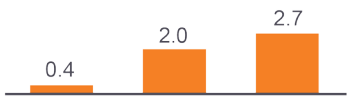
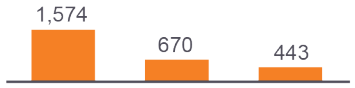
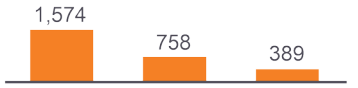
### Value from flexibility and reliability

- Contract for fuel flexibility
- Drylandcarbon partnership
- Sell contracts that support market reliability (swaptions)

### Transition Huntly

- Trial biofuels as a fuel option for Huntly
- Plan for emerging technologies (Batteries)

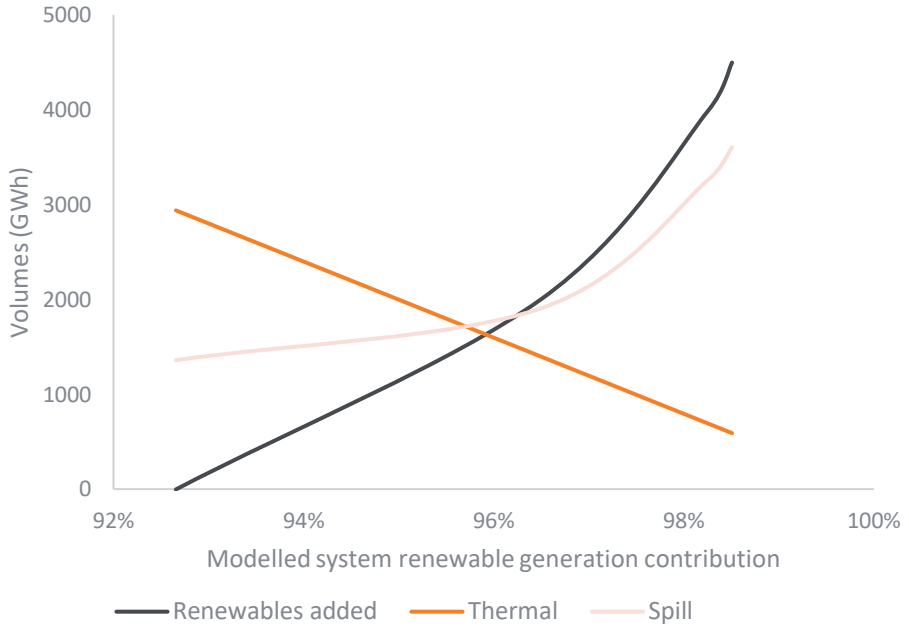
# Varied scenarios trend towards 96% to 98% renewable by 2030

| Outputs | Balanced<br>Demand growth from EV and industrials are evenly met by commercially viable renewables along with steady thermal displacement. | Regulated Renewables<br>An incentivised renewable uptake with a goal of 100% renewable leading to increased periods of over and under supply. | Pressure cooker<br>Faster than anticipated demand growth with development constraints, leads to slower renewable growth and displacing less thermal. | Oversupply<br>Tiwai closure causes oversupply of low cost energy and incentivises large scale demand response. |
|---|---|---|---|---|
| NZ renewables mix, % | 88% 95% 97% | 88% 95% 98% | 87% 92% 96% | 88% 96% 98% |
| Total market generation, TWh |  |  |  |  |
| Renewables added to Genesis Portfolio[1], TWh |  |  |  |  |
| Huntly emissions, $ktCO_2$ |  |  |  |  |

1. Mix of Power Purchase Agreements (PPA) and solar development

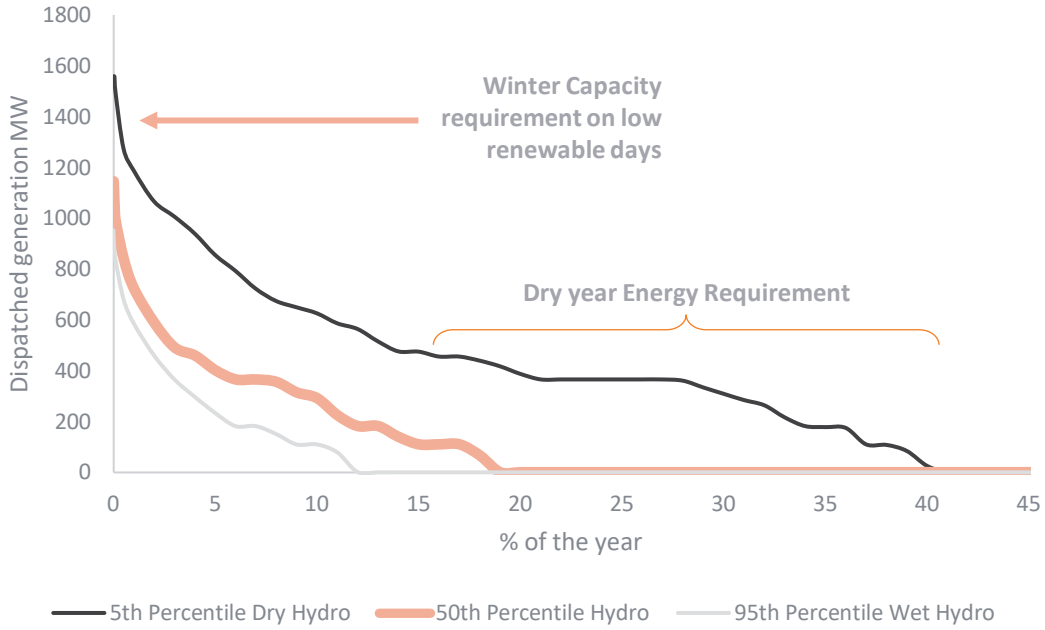
# A highly renewable market will require peaking capacity and seasonal storage

## Near 100% renewable, spill makes further renewable build a costly way to displace remaining thermal




- New renewables start to contribute more to spill than future displacement of thermal generation.
- The system can reach 98% renewable where approximately 700GWh of backup generation is used on average.

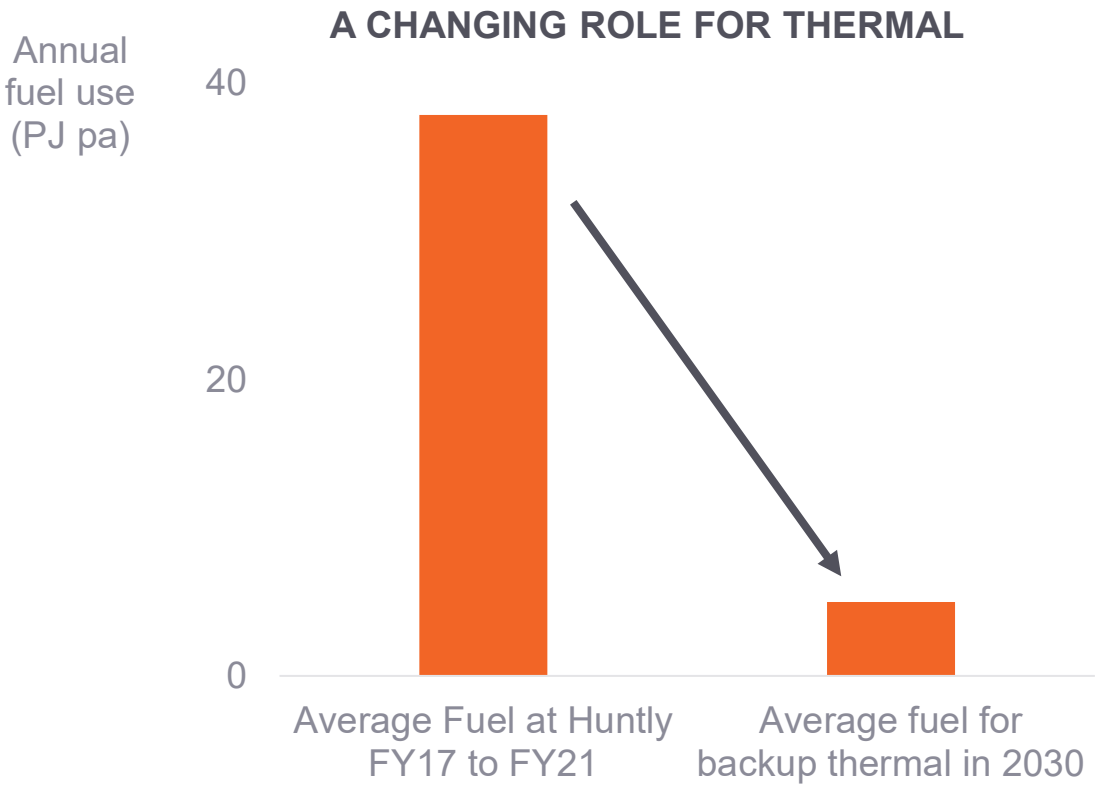
## A highly renewable[1] grid draws on backup generation to cover infrequent peak capacity needs and dry-year firming




- More than 750MW of peaking capacity is required in less than 1% of hours in typical hydrology (50th percentile) to maintain security of supply.
- 1650GWh of energy storage is drawn on 40% of the time in dry years (5th percentile) compared with 700GWh in normal years (50th percentile).

1. Simulated 2030 market conditions under 'Balanced' scenario.

# Thermal fuel  needed for backing up a largely renewable grid is small relative to what is used today




Option to use existing Huntly asset crates low risk option for solving dry-year risk, as it involves repurposing an existing asset.

Biofuel also creates the options to import energy in the event of severe droughts or other supply failures, or export energy in the event of excess energy caused by industrial exits.

This helps to maintain an open energy market, connected to the world.

Biomass at Huntly (and the associated domestic supply chain) could be net positive in employment terms.

# Advanced biofuel at Huntly would be a low cost, low risk option to remove coal and address dry-year risk in electricity

ICCC MODELLING:

DRY YEAR STORAGE OPTIONS ANALYSIS

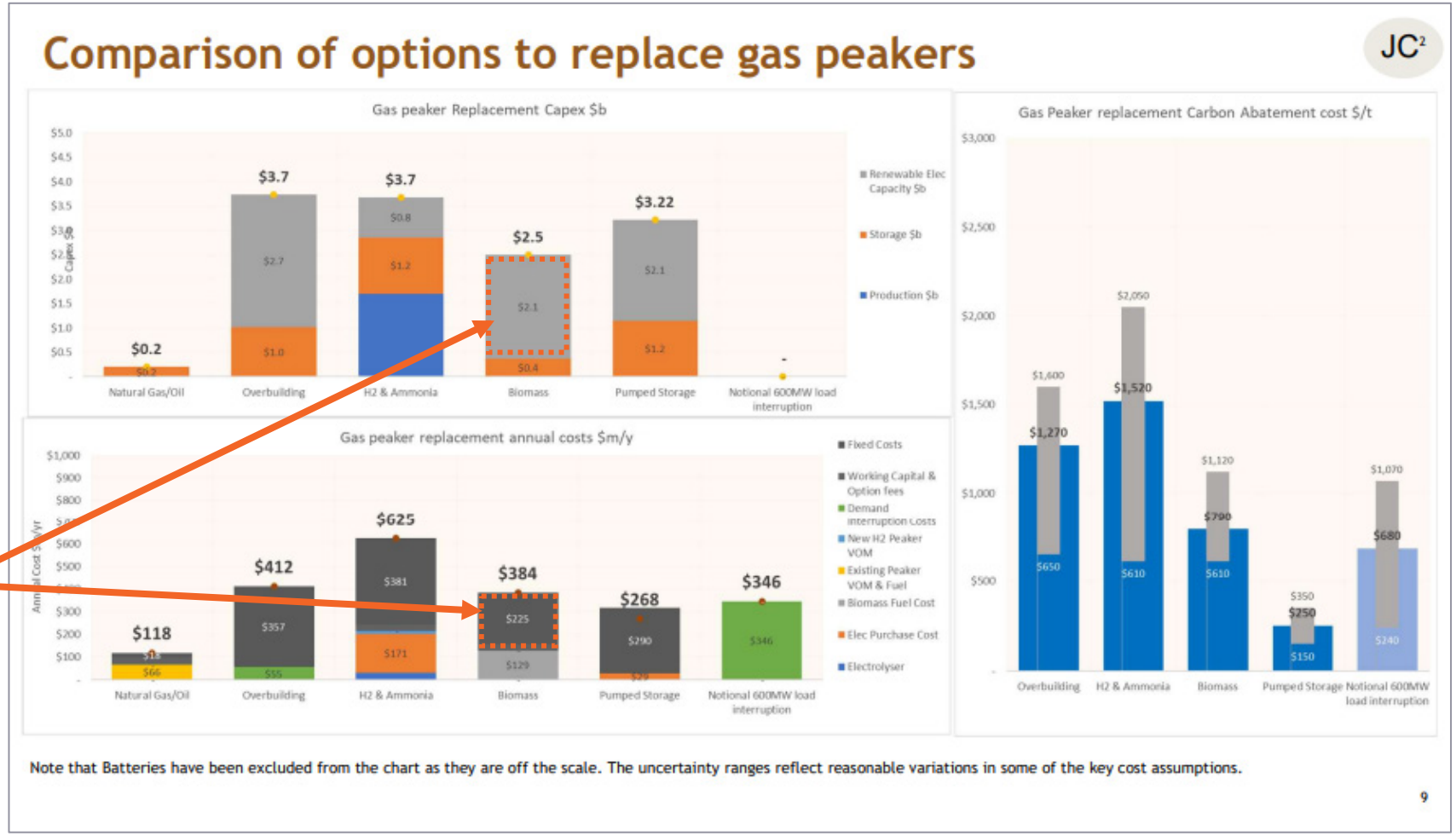
Final Report
April 2019

Report to the Interim Climate Change Committee

John Culy Consulting

https://ndhadeliver.natlib.govt.nz/webarchive/20190819081021/https://www.iccc.mfe.govt.nz/what-we-do/energy/electricity-inquiry-final-report/electricity-inquiry-consultant-reports/

Opportunity to use existing Huntly Power Station practically removes fixed costs for biomass to deliver dry-year service and brings total cost well below pumped hydro



# Biofuel at Huntly could provide a valuable seasonal storage solution, but not short notice peaking capacity

## WORK COMPLETED TO DATE PAINTS A POSITIVE PICTURE FOR BIOMASS AT HUNTLY

**Biofuels resource assessment**

- Emerging domestic industry with significant sustainable resource potential, but in nascent stage of development.
- International markets scaling up with advanced biofuels emerging which are a near drop-in replacement for coal.

**Rankine Unit lifecycle assessment**

- Opportunity to extend operational life to at least 2040 and potentially beyond at a relatively low cost vs alternatives.
- Incremental CAPEX dependent on running intensities and desired lifetime.

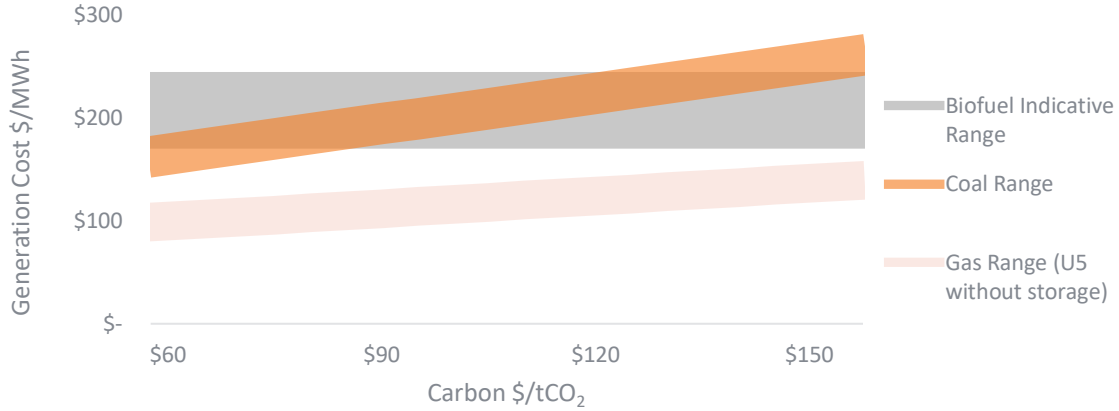
**Technical viability assessment**

- Progressing with advanced biofuel which is practically a drop-in replacement for coal (<$200k unit mods for trial).
- Improved weather resistance and reduced dust from advanced biofuels, negate the need for covered storage.

**Physical trial**

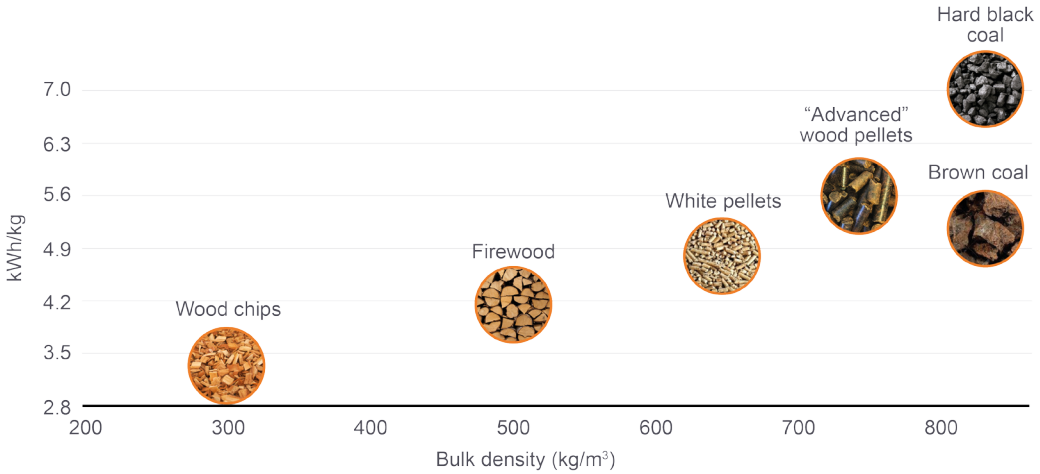
- Test plan complete
- Trial supply of advanced biofuel being progressed
- Trial burn planned for 2022

## ADVANCED BIOFUELS EXPECTED TO BE COMPETITIVE WITH COAL AT CURRENT CARBON PRICES (PRIOR TO FREIGHT)




Our analysis indicates that biofuels are a viable solution to New Zealand's 100% renewables commitment and expected to be lower cost than other renewable options

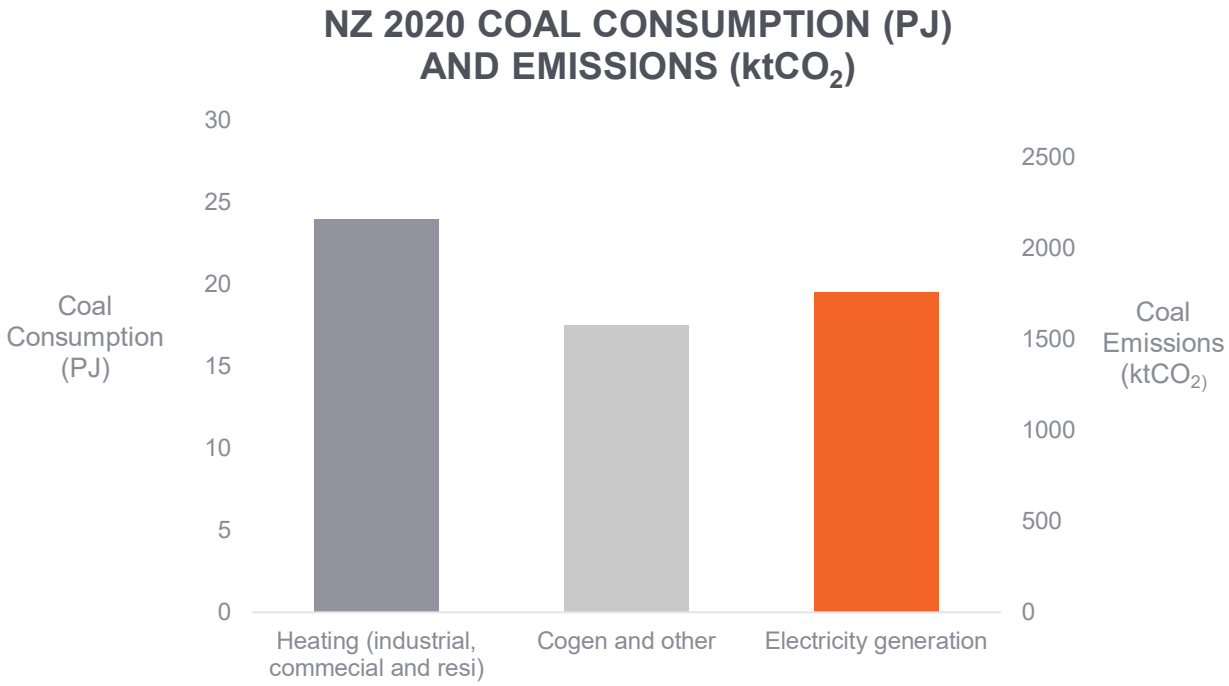
## ADVANCED BIOFUELS NEAR DROP-IN REPLACEMENT FOR COAL



# Advanced biofuel offers the opportunity to rapidly transition coal in industry and other sectors using existing equipment

## Advanced biofuels found to be practically drop-in replacement for coal at Huntly

- Energy density means that black pellets are 30% cheaper than white pellets to transport on a per unit energy basis.
- Storage and handling are easier and safer
- Existing infrastructure and equipment can be used with little to no modification.



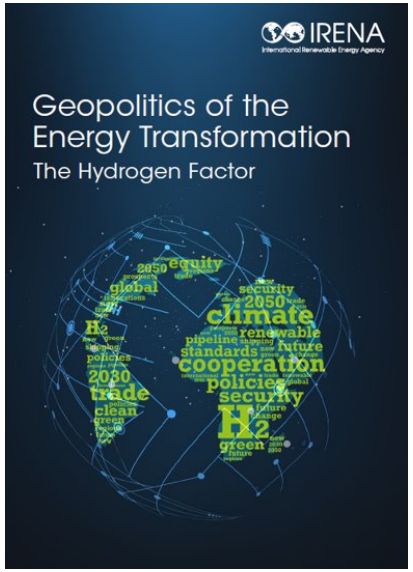

**61 PJ**

of coal used in 2020

with associated emissions of

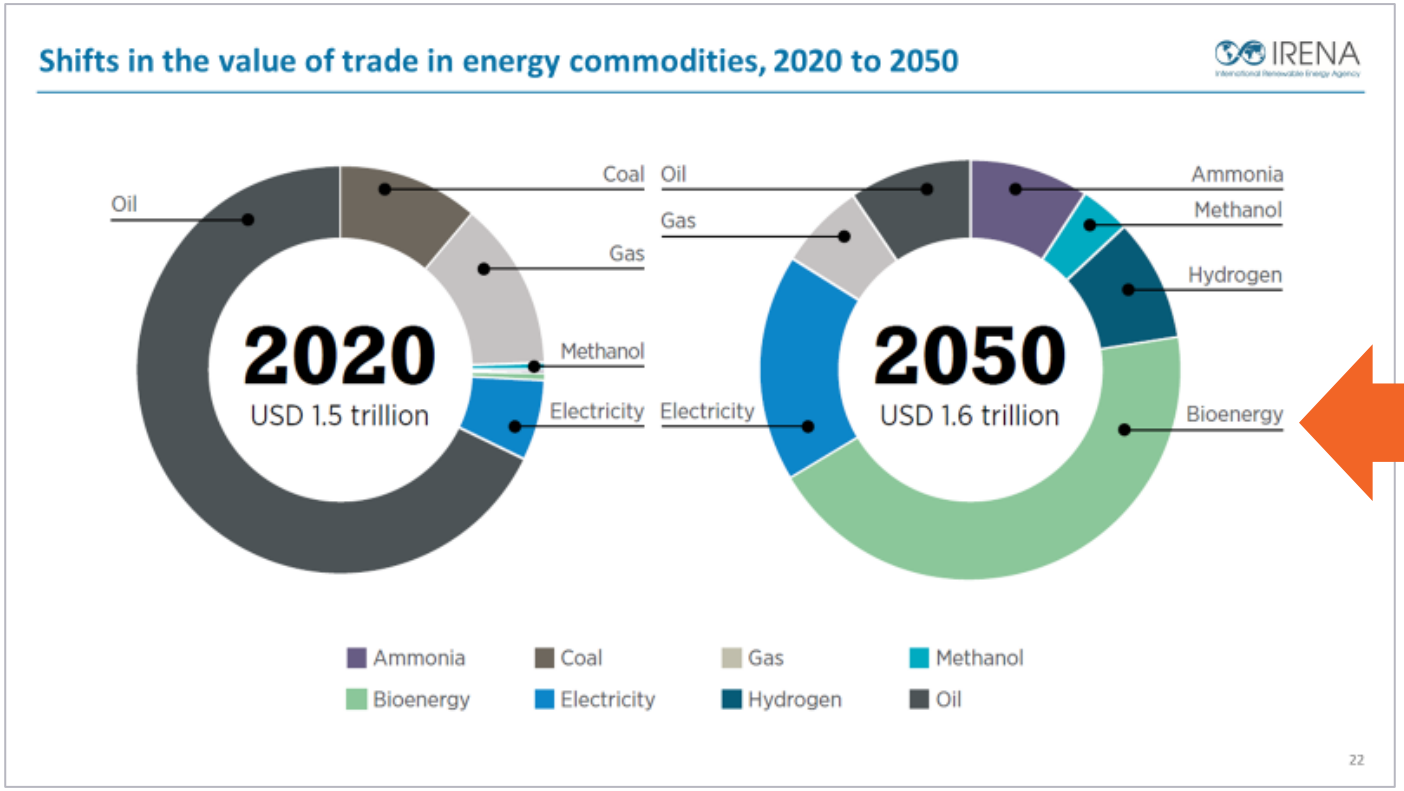
**5.5 MT $CO_2$**

# Biofuel as a global energy source could be hugely important and valuable for New Zealand




Source: Geopolitics of the Energy Transformation: The Hydrogen factor

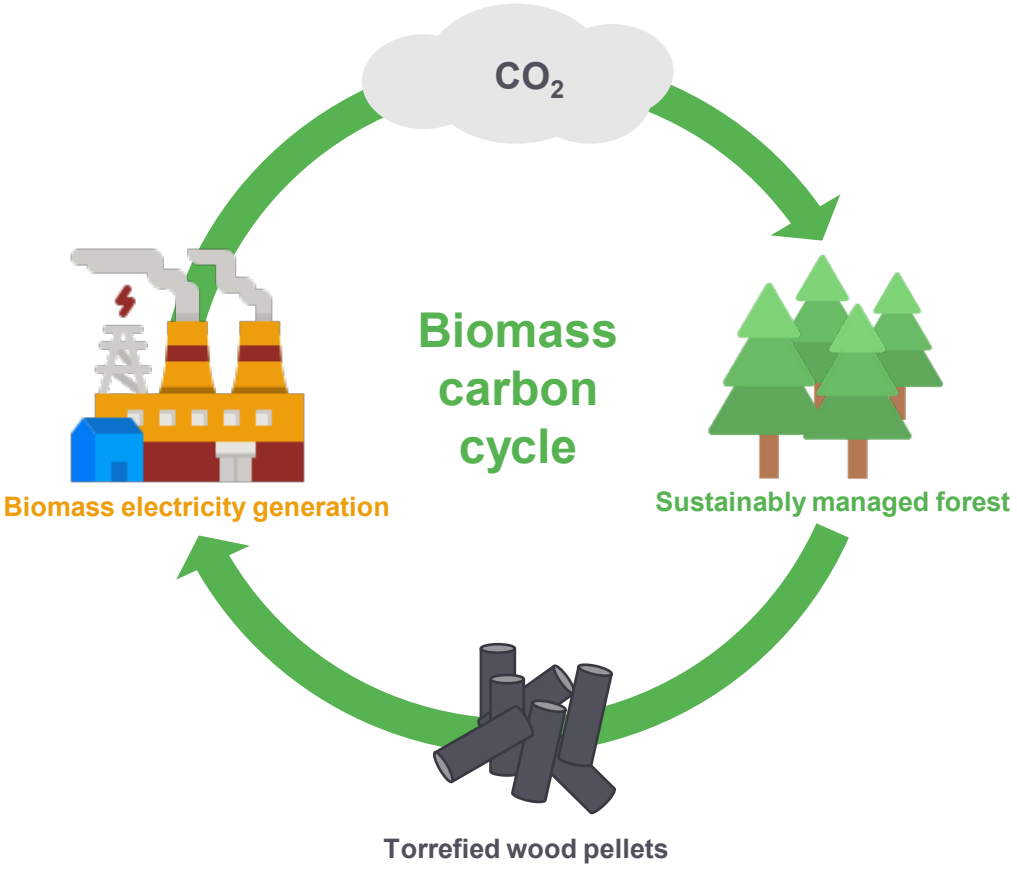
https://irena.org/publications/2022/Jan/Geopolitics-of-the-Energy-Transformation-Hydrogen

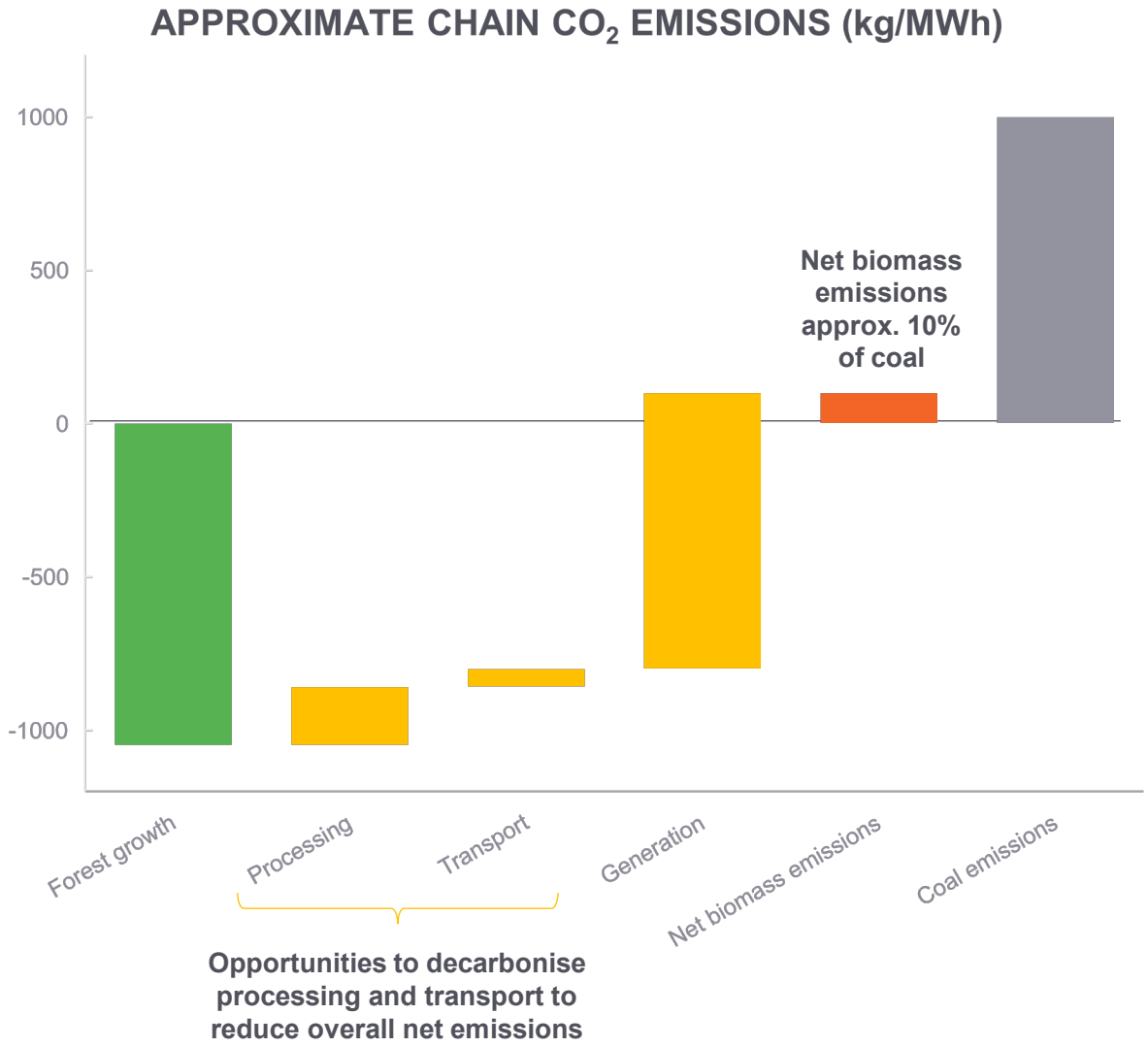



**Bioenergy expected to be significant traded commodity**

# Biofuel can be a sustainable resource in a circular economy

## Bio-resource needs to be managed so that growth matches use - domestic supply would be best



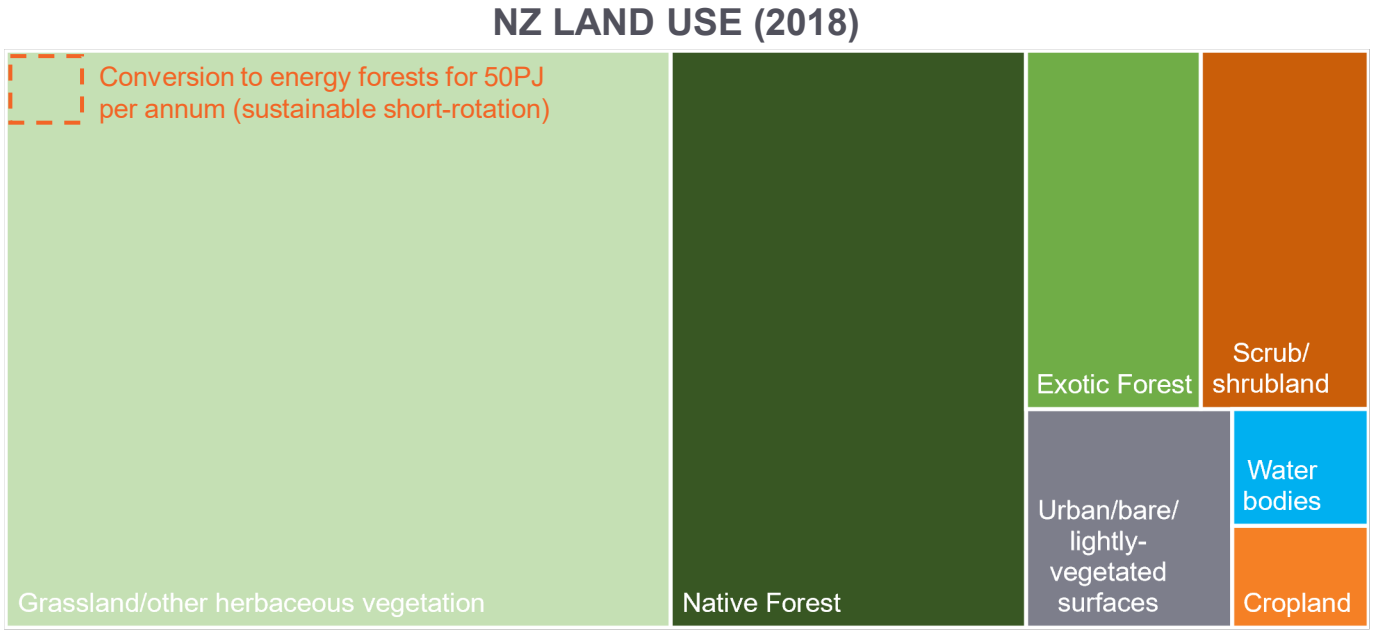
# Biofuel is an opportunity for regional communities and supports a Just Transition

**Rotational forestry can sustainably meet growing bioenergy demand whilst fuelling a Just Transition**

- Forestry can make use of marginal land that is not otherwise suitable for horticulture or dairy.
- Energy forests and related supply chain activity can create opportunities where there may otherwise be few employment or growth opportunities.
- Unlike permanent pine forests energy forests represent a productive resource that support ongoing employment as well as avoiding fossil fuels.

**~225,000 ha** of energy forest required for **50 PJ p.a**

**≈ 1.7%** of total grassland (13.1Mha)




*Source: LAWA Land Cover Data*

***50PJ =***

*conversions of all coal boilers for heat (**24PJ**) + current coal demand for electricity and cogeneration (**26PJ**)*

# The bioeconomy is nascent, but has great potential
# The government can make this happen soon

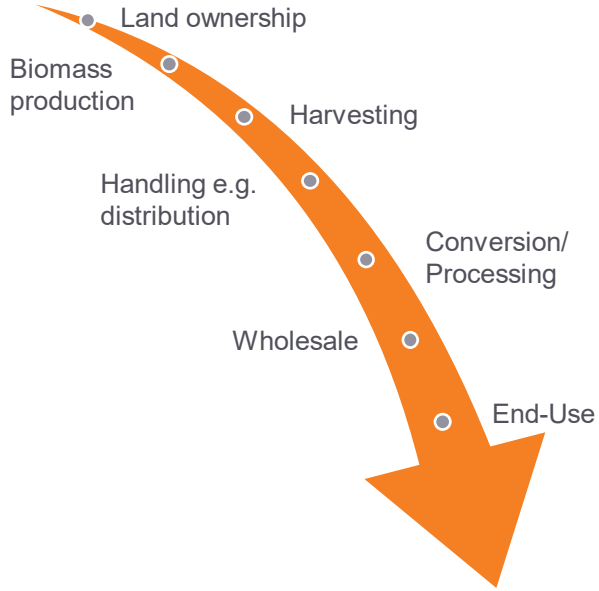
**The bio-energy economy is emerging, but the lack of scale markets creates challenges for users and suppliers**

- No standardised market and need for point to point transactions on projects
- Fuel sourcing, logistics, security of supply, cost risk all need to be managed for each individual project

**Lack of supply and demand creates chicken and egg problem**

- A report last year by Bio Pacific Partners for MBIE recommended the Government accelerate investigation of black pellets, and prioritise a full investment analysis.

*"These technologies are close to commercialisation but need support to cross to that final step. They could have a significant impact on New Zealand's carbon budget."*




**We can make this happen now with the right support**

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