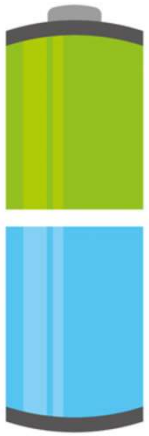
An Energy Matching Strategy for NZ

How NZ can best use its extensive renewable energy resources to meet future energy needs at least cost

- thereby also alleviating the declining gas reserves and the increasing exposure to Dry Year risk
- and simultaneously maximising GDP and providing long-term markets for under-threat exports



On behalf of the Bioenergy Association's Wood Fuel Interest Group

Please also refer to the full submission of the Bioenergy Association

25 August 2024

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The words of the Minister for Climate Change :

In the Intro to the ERP 2 discussion document, the Hon Simon Watts says :

"Climate change is an economic issue, and the future success of our country will rely on our ability to sustainably transition to a low-emissions economy".

and

"….we want to take advantage of our opportunities in New Zealand, like our abundance of natural resources and capacity for renewable energy, to ensure we minimise costs".

So our Energy portfolio must deliver cost effective and renewable energy to all sectors, whilst building our energy resilience to insulate NZ from geopolitical risk.

This presentation suggests ways in which our abundant biomass (and therefore biogas and bio-liquids) resources can form a key plank to delivering this end goal.

In Nov 2021, in response to ERP 1, we submitted this exact slide, and titled it “The Imminent Energy Emergency”

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Multiple factors are at play, providing a very dynamic & challenging energy situation :

Increasing Demand for Energy

In-fact record high demand on 30 June 2021

1. Dry years mean reliance on fossil fuels (both coal and gas)
2. Steady increase in demand from domestic heat pumps
3. Increasing electricity demand from high temp heat pumps
4. ….and now also from electrode boilers for industrial heat users
5. And increasing demand from EV’s (if 20,000/yr = c.2.5mill MWH ?)

Decreasing Supply of Energy

So even diesel ‘peaker’ is required !

6. Pressure to phase out coal (which could be replaced with bio-coal)
7. Rapidly declining natural gas resources
8. Hang-over of offshore exploration ban, so no imminent new gas fields
9. The Oil Refinery is ceasing production (so is now available for biofuels!)
10. ETS (and end-customer) pressure to eliminate coal for industrial heat

Updates to the previous slide are shown in red font

Multiple factors are at play, providing a very dynamic & challenging energy situation :

Increasing Demand for Energy

In-fact record high demand on 30 June 2021

1. **Increased severity of** Dry years means **more** reliance on fossil fuels (both coal & gas)
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Decreasing Supply of Energy

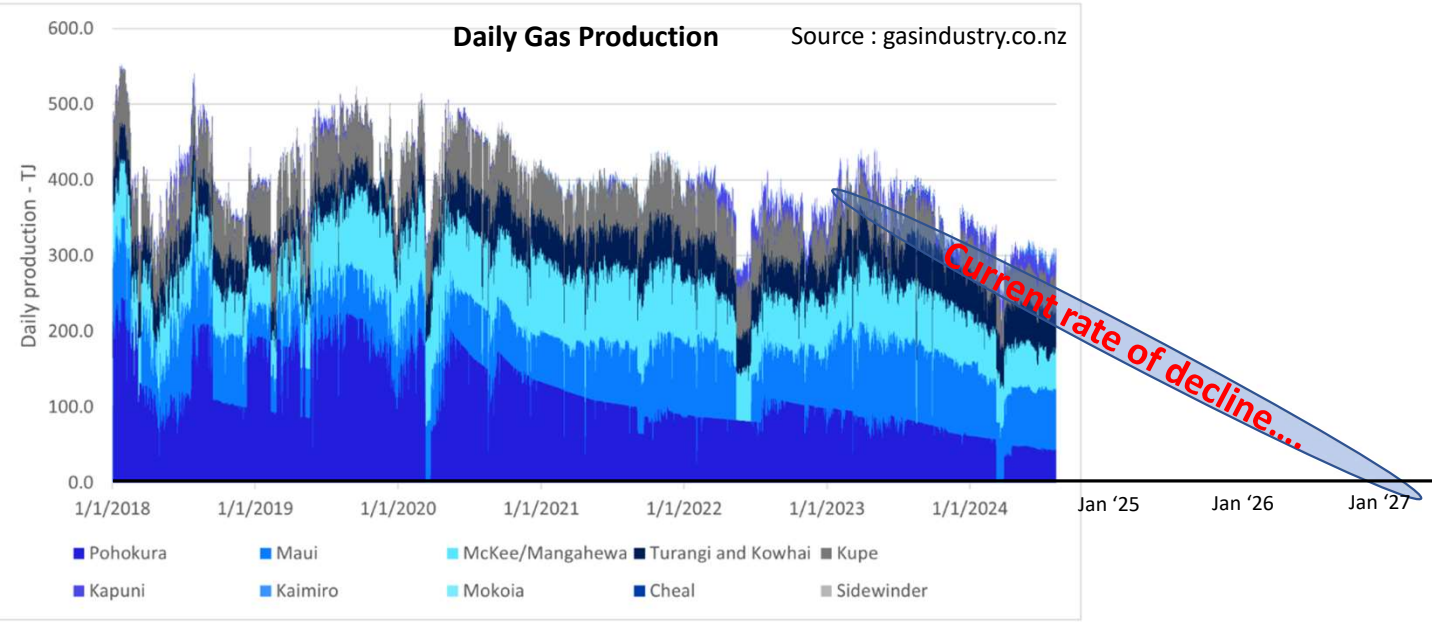
So even diesel 'peaker' is required !

6. Pressure to phase out coal (which could be replaced with bio-coal)
7. Rapidly declining natural gas resources **– even faster than expected**
8. Hang-over of offshore exploration ban, so no imminent new gas fields
9. The Oil Refinery is ceasing production (so is now available for biofuels!)
10. ETS (and end-customer) pressure to eliminate coal for industrial heat

"Electrify NZ" leaves NZ massively exposed to still days and Dry years

Our urgent energy challenges

New clean energy sources are needed – and fast !



- Is gas all gone by 2027 ?!
- Certainly declining rapidly
- So huge price rises for Industrial gas users, so uncompetitive
- Also facing increasing Elec costs
- Leading to de-industrialisation ?
- Impacting investment decisions

So what does North Island industry use for process heat ?

Biomass is available & ready to provide cost effective industrial heat.

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Biomass can provide heat – rapidly and cost effectively

Is biomass cost-effective for industrial process heat ?

- Log-making residues can be recovered, processed & delivered for $8-$13/GJ *
- If/when wood residues are all used up, then export logs can be used….
- Around 15-17 million tonnes of logs are exported from N.I. ports every year (!)
- At 100-115PJ this compares to the Maui gas field in its hey day – **but is every year….**
- Each tonne displaces c.7GJ of gas* so a max of 3.5m tonnes of logs is needed
- The Export price at Wharf of the lowest-value 3.5m tonnes is <$13/GJ

After chipping or hogging, export logs would be <$15/GJ delivered

So, compared to Natural Gas at around $30/GJ (and LNG even more) biomass offers process heat at less than half the cost of gas.

** N.B. All prices are $/GJ of gas equivalent, so reflect that a tonne of biomass at 55% mc would displace, accounting for relative boiler efficiency, around 6.7GJ of natural gas.*

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Biomass can provide heat – rapidly and cost effectively

Now let's look at the potential speed of adoption/transition :

- N.I. Industry uses 25PJ of gas for process heat
- Over 120 biomass projects were delivered in the last few years (source : EECA)
- This equates to over 400MW of installed capacity, being around 5.2PJ (source : EECA)
- The biomass boiler industry capability is strong – and growing
- There are over 20 makes of biomass boilers available in NZ
- Existing suppliers could install c.200MW of biomass boilers in Year 1, and climbing….

So industry can convert by 2030, assuming fast-track consenting

For fast-track consenting, just need simple nationwide rules (e.g. sub 50mg/Nm^3 of Particulates)

Well-targeted incentives will assist this rapid transition

The technology is proven – so what are we waiting for ?

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Other factors to consider when driving users towards Biomass boilers

Biomass is stored energy, dispatchable 24x7 year-round, providing industry with reliable, low cost heat

- Using biomass, not electrode boilers, keeps the lakes full for higher-value use (power)
- Using 3mt of export logs from the N.I. still leaves 12-15mT of export logs **(80-100PJ)**
- This can be used for drop-in fuels (bio-coal, biodiesel, renewable gas)
- South Island industry uses 16PJ of coal – and exports 30PJ of logs. Rinse & repeat
- That leaves **15PJ** of South Island export logs for value-add use (biodiesel etc)

80-90% of export logs go to China. Per the latest DANA forecast, **this demand is declining rapidly**, leaving Forest Industry very exposed, also to geo-politics

So how best to rapidly encourage industry to switch to biomass ?

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How to drive rapid industrial transition to biomass :

- Resurrect a GIDI-style scheme* but adapted to encourage fast-track projects
- Prioritise getting large heat users off natural gas (and coal) onto biomass
- While also encouraging Co-Gen (CHP or Combined Heat & Power)
- Encourage AD for biogas production (for clean-up & injection into the pipelines)
- Include large scale factory roof-top solar PV (say >200KWe)
- Include geothermal heat where economic and feasible
- Do **NOT** assist electrification of commercial or industrial heat (adding strain to grid)
- To accelerate, award a higher percentage of the capital cost (prior max 50%)
- Prioritise N.I. heat users (for urgent natural gas replacement) to protect GDP

GIDI & the technology is proven – so make this a top priority

** GIDI (Government Investment in Decarbonising Industry) awarded $122m to encourage 85 projects, which delivered 480,000 tonnes of CO2 abatement per year. Over a 20-year project life this equates to 9.6million tonnes at a cost of $12.7 per tonne of CO2 abated. This was by far the most cost-effective abatement programme.*

LET'S JUST HAVE A THINK……

Industrial heat can be taken care of, easily.

So can transport fuels and bio-gas <u>if</u> the will is there.

BUT what about electricity ???

Wind and solar are **92%** of the planned 17,160MW by 2030 *

So, with the vagaries of dry years and windless days, NZ's electricity supply risks being less reliable….

…..<u>unless</u> a fresh approach is adopted

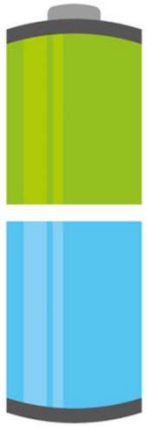
** Source : Electricity Authority June 2024, Committed & Actively Pursued 2023-2030. Wind 9,174MW, Solar 6,618MW, Hydro 75MW, Geothermal 558MW, Elec Battery Storage 735MW. Total of all 17,160MW.*

"Electrify NZ" is only possible with optimised energy matching

Yes, NZ is blessed with copious forms and volumes of Renewables

BUT…..

- Hydro, wind and solar are all reliant on the vagaries of nature
- These vagaries are only going to get more extreme and unpredictable
- To lean on natural gas for 'firming' power means an LNG terminal *
- So Huntly (coal or bio-coal) is going to be increasingly important



But there is a variation of "Electrify NZ" that can work :

Maximise non-hydro (geo, wind, solar, biomass) to allow the hydro-lakes to act as an Onslow-type battery. Save Water !!

** An LNG terminal would unnecessarily lock in $30+/GJ gas whilst also leaving NZ hugely exposed to international risk (geopolitical, shipping, FX, price risk etc). Furthermore, about $800m/yr would flow offshore from the 25PJ of North Island industry currently on natural gas whereas if biomass was used instead approx $350 million/yr would flow to NZ forest companies for biomass fuel.*

"Electrify NZ" is only possible with optimal use of energy storage

Hydro and gas should be used for its high-value use, Power, <u>not</u> for generating heat, where biomass can carry that burden.

And the spare 100PJ+ of biomass can take some load off EV's (via biodiesel) **<u>and</u>** help the gas sector (via biogas, or RNG).

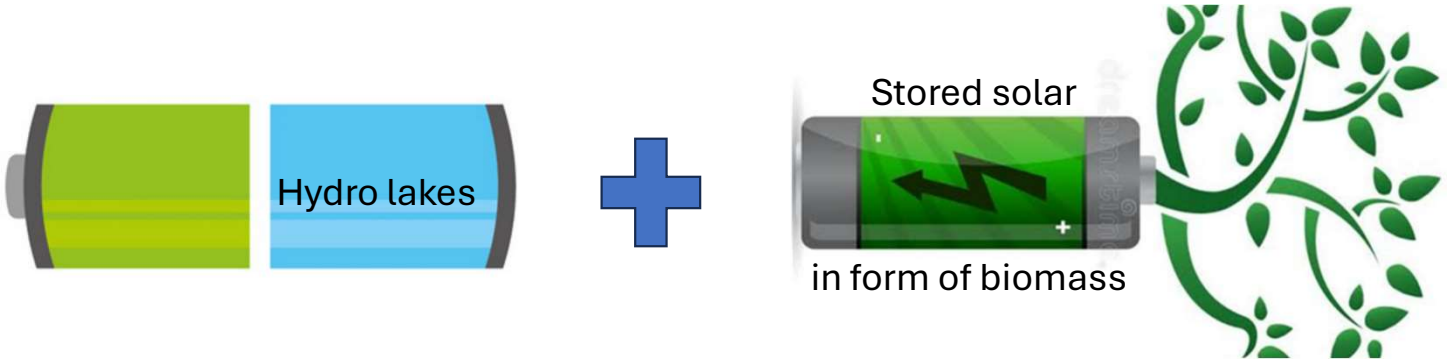
So how to deliver the quick wins ?

1. **Fast track new wind, solar and geothermal plants**
2. **Re-start a fast-track GIDI-style fund to incentivise industry to use biomass for process heat, freeing up gas for 'firming'**

A Clear Plan

In the ERP 2 discussion document, the Hon Simon Watts says :

"….we need a clear plan focused on impactful actions". A clear plan involves properly matching NZ's renewable resources to their most valuable and cost-effective end uses – **and using our battery resources**



- Use electricity to keep the lights on and industry running – <u>not</u> for heat
- Use biomass and bio-gas to meet heat demand and replace declining natural gas
- Provide consistent policy signals via a 30 year cross-party Energy Strategy

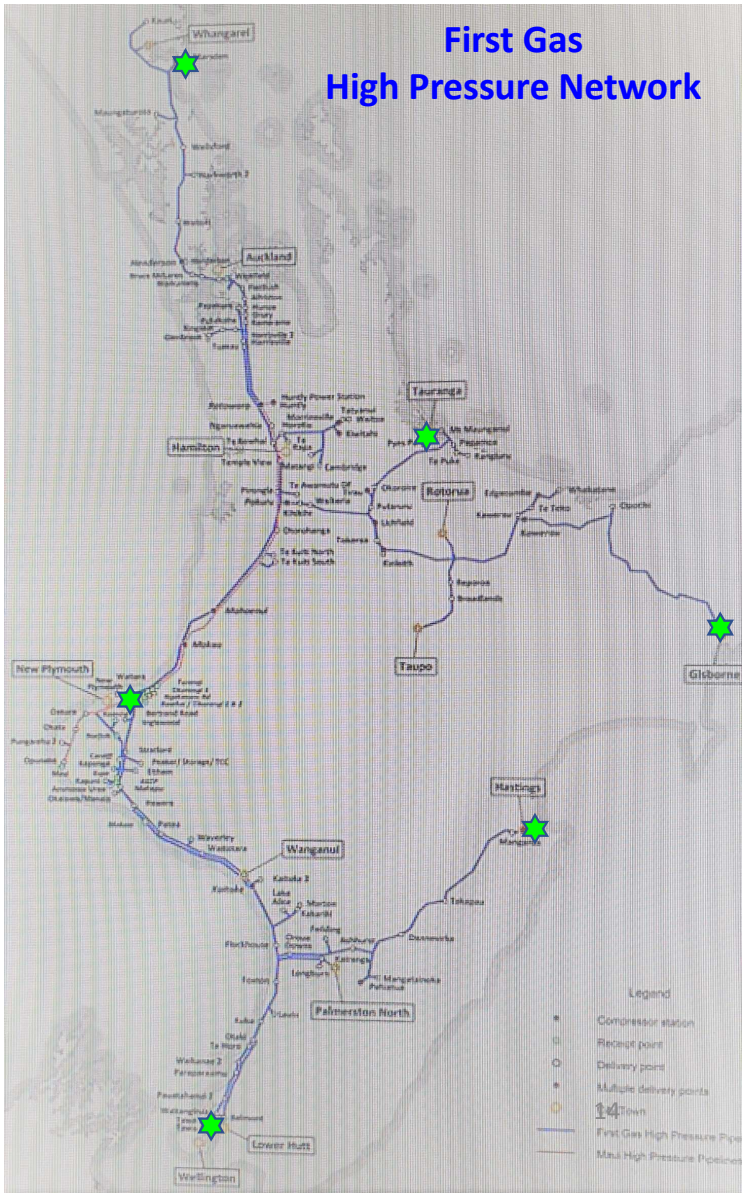
Using ETS $'s wisely - for rapid Emission reduction

Use the $6.4b* & ETS revenues to invest in Bio-refineries at 6 log export ports (see right)

* Proposed in Oct 2021 to be spent on international credits

Develop Renewable Natural Gas (RNG)

- The export log yards (✡) can be re-purposed for biorefineries
- The export log workers can be re-deployed to log handling & processing at the bio-refinery
- Inject bio-gas (RNG) into the high pressure network
- Use the bio-coal by-product as a drop-in replacement for Huntly coal, and/or in industrial coal boilers.



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Some mis-perceptions need to be corrected

- Wood fuel can be trucked 300km and the diesel used would only have emitted 375kg of CO_2, **but**
  - The cargo of wood fuel would displace 30,800kg of CO2 if replacing coal : so Net 98.8% carbon neutral
  - The cargo of wood fuel would displace 18,100kg of CO2 if replacing gas : so Net 98.0% carbon neutral
  - ….and biodiesel would further improve this – or electric trucks within 10 years
- **So every truck arriving on site with boiler fuel is like taking 7 or 12 cars of the road for a year !**
- (Compare that value-for-money to the cost/tonne of CO_2 abatement delivered by the EV scheme....)
- Once on the truck, wood can be taken a further 100km for approx $1/GJ – unlikely to be a deal-breaker
  - **So a long-distance haul to a boiler or bio-refinery is a relatively small additional cost - not a show-stopper at all**
- MBIE's "Energy in New Zealand Report 20", published Aug 2021, comments regarding process heat:
  a. "However in some regions, such as Canterbury, the supply of woody biomass residues falls short of the energy demand for process heat." (page 36)
  b. "Further developments are expected but may be constrained by regional biofuel availability." (page 36)

This is wrong : there are plentiful supplies of straw in Canterbury, as well as 'stranded' logs, and wilding pines just over the hill, and suppliers are already responding.

- Scrap PFSI except in highly erosion-prone areas – they just take land out of productive use. **We need fibre and fuel !**
- Biomass, through BECCS, is the only energy type that can be carbon negative, sucking CO_2 from the atmosphere.

To summarise succinctly…..

Per Marcus Musson, Forest360 Director, in Friday Offcuts (16 Aug 2024):

"So, with electricity and gas supply and price instability, it doesn't take a rocket scientist to figure out that we need another form of fuel to keep all manner of industries in operation.

Don't Stress NZ, we've got this : Woodfibre based biofuel is the future of large-scale industrial fuel.

Unlike electricity, it won't hold you to ransom in a dry, windless winter and doesn't carry the same level of sovereign supply risk that saw an end to gas exploration under the previous Government.

Long term supply is easy to see – it's growing in every forest."

With courageous decision making, NZ could aspire….

….to have low cost, renewable heat for 100% of industry

….to be the largest user of bioenergy per capita

….to have the lowest embodied carbon of any export products

….to be 100% energy independent

….to be the only country to be carbon negative (using BECCS)

….and to leverage all this to enhance our 'clean green' image

"….we want to take advantage of our opportunities in New Zealand, like our abundance of natural resources and capacity for renewable energy…"

Let's walk the Ministers talk !

Vision for 2030 : Robust Forest industry **and** energy resilience - and no need for international credits !!

- Forest skids are remediated as all usable fibre is recovered (5PJ if 2% of log volumes on average)
- Lower-grade export logs are used for energy (if 50% of total export logs, this is 75PJ/year)
  - For N.I. Process Heat - replacing gas (25PJ) and coal (3.3PJ). Same concept in the S.I.
  - For Drop-In Biofuel at 6 regional bio-refineries (replacing diesel) to complement the EV scheme
  - For drop-in Bio-Coal for power generation and industrial heat, with the syngas going to…..
  - ……Renewable Natural Gas (to replace fossil gas for power generation or for domestic use)
- A value-add strategy converts the higher-grade export logs into lumber and/or biomaterials

OUTCOMES by 2030 :

- Our forestry & logging industry has a secure long-term future, with most log demand onshore
- New & expanded sawmills are exporting value-add products, with rural jobs & happy communities
- Industry is near carbon zero using a secure & sustainable source of heat – with burgeoning exports
- ….**and** we have 100PJ of Biodiesel and RNG to meet domestic demand – with the rest exported

The power network is resilient & capable of meeting demand through dry and windless periods

With joined-up thinking and courage, this is a no-brainer !